The factors affecting stunting among toddlers in Ende, Indonesia

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The factors affecting stunting among toddlers in Ende, Indonesia

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Abstract

Background: Short stature in toddlers indicates chronic nutritional problems that are influenced by maternal conditions, birth weight, toddler weight, and infant diseases or other problems that indirectly affect health.
Purpose: To determine the factors affecting stunting among toddlers in Ende, Indonesia
Method: Correlational using a cross sectional approach to 155 toddlers. Purposive sampling was used to collect samples from eight sub-districts in Ende Regency. Questionnaires were distributed for data collection. In this study, bivariate analysis used chi-square test, and multivariate analysis used logistic regression.
Results: Univariate analysis showed that most of the respondents (mothers of toddlers) had a history of short stature, was not at risk for gestational age, had poor nutrition, had a good level of knowledge about infant food and nutrition, had no history of infection during pregnancy, and always had antenatal care check-ups. Factors under five identified that almost all have a history of infectious diseases, have been sick in the last month, have no history of low birth weight, have complete vaccination, are not premature, and have intrauterine growth, and growth restriction. Environmental factors indicate that some respondents have clean latrines, have a distance to health facilities <1 km, have clean drinking water, and are not pregnant and breastfeeding.
Conclusion: Several variables have a significant relationship with stunting in such as exclusive breastfeeding, infectious diseases, drinking water quality, and distance to health facilities. The results of the multivariate analysis showed that the infectious disease variable was the dominant variable causing stunting in Ende Regency.
Suggestion: Local health authority to garner cooperation from various regional bureaucracies in Ende Regency to tackle stunting in this area.

Keywords: Family; Environmental; Stunting; Toddlers

INTRODUCTION

Short stature in toddlers indicates chronic nutritional problems that are influenced by maternal conditions, birth weight, toddler weight, including infant diseases, or other problems that indirectly affect health (Ministry of Health of the Republic of Indonesia, 2016). In 2017, 22.2% or around 150.8 million children under five in the world experienced stunting. However, it has decreased from the stunting rate in 2000 which was 32.6%. In 2017, more than half of the world's stunted children came from Asia (55%) while more than a third (39%) lived in Africa. Of the 83.6 million stunted children under five in Asia, the highest proportion came from South Asia (58.7%) and the lowest proportion in Central Asia (0.9%). According to

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stunting prevalence data released by the World Health Organization (WHO), Indonesia is included in the third country with the highest prevalence in the South-East Asia Region (SEAR). The average prevalence of stunting under five in Indonesia in 2005-2017 was 36.4% (Ministry of Health of the Republic of Indonesia, 2018).

The 2013 basic health research revealed that the national stunting prevalence was 37.2% (nearly 9 million). According to the Research and Development Agency of the Indonesian Ministry of Health, it increased from 35.6% in 2010 and 36.8% in 2007 (Balitbang, Ministry of Health, 2014). Indonesia is ranked fifth in the country with the highest stunting children. Toddlers who are stunted (toddlers) and toddlers will have intelligence that is not optimal so that it makes children more susceptible to disease and in later life, can be at risk of decreasing productivity levels. As a result, stunting will broadly hinder economic growth, increase poverty, and widen the gap between rich and poor (National Team for the Acceleration of Poverty Reduction/TNP2K, 2017).

Based on the data from basic health research, the prevalence of stunting in Indonesia is among the highest compared to other countries in Southeast Asia, such as Myanmar (35%), Vietnam (23%), and Thailand (16%) (UNICA-Indonesia, 2015; Rahmadi, 2017). In 2018, basic health research reported that the national prevalence of stunted children in Indonesia was 30.8%. Although the prevalence of stunting had decreased from 37.2% in 2013, the prevalence remained high (Ministry of Health of the Republic of Indonesia, 2018). East Nusa Tenggara (NTT) is one of the provinces in Indonesia that has a high prevalence of stunting compared to other provinces during the two consecutive periods: 51.7% in 2013 and 42.6% in 2018 (Ministry of Health of the Republic of Indonesia, 2018). This prevalence was the prevalence of stunting from various districts in East Nusa Tenggara, one of which is Ende district. Based on data from the nutrition status monitoring for children under five in 2017, the prevalence of stunting in Ende District was 34.1%, ranked 11th out of 22 regencies in East Nusa Tenggara province (Ministry of Health of the Republic of Indonesia, 2018). The high number of stunting cases in Ende Regency in 2018 was spread in eight districts of were 471 cases (Data from the Regional Secretary of Ende Regency, 2018). The high prevalence of stunting in Ende district is due to multiple causes, including mother's knowledge of nutrition, low family-conscious-nutrition behavior, and lack of clean and healthy living habits (Ende District Health Office, 2018)

World Health Organization (WHO) describes the determinants factors of stunting. The direct causes are household and family factors, inappropriate complementary feeding, breastfeeding practices, and infectious diseases. Household and family factors include maternal factors such as malnutrition before pregnancy, pregnancy, and breastfeeding conditions, as well as mother's short stature. Household environmental factors are the lack of stimulation and activity given to children and poor parenting. The inappropriate complementary feeding includes poor food quality in term of low micronutrient, inappropriate practices such as low frequency of feeding, food and water safety such as water and food contamination, and poor food hygiene practices. The breastfeeding factors include inappropriate breastfeeding practices, delayed initiation of breastfeeding, and inadequate breastfeeding. Infectious disease factors include enteric infections such as diarrhea, enteropathy, poor environment, and diseases caused by worms (Izwardy, 2019).

Child condition factors include weaning before six months, lack of animal source foods, food that is not suitable for the child's age, little menu diversity, and inappropriate meal frequency. Diarrhea and acute respiratory infections in the last seven years, history of other infectious diseases, low birth weight, frequency of examination of babies, birth length and weight, immunization, preterm birth, and gender are also the factors. The factors causing stunting originating from the community and social environment include the

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condition of latrines, the cheap and contaminated drinking water, household food insecurity, low purchasing power, smoking fathers, and inadequate health service providers, and environmental health (Ni'mah & Nadhiroh, 2015; Rahayu, Yulidasari, Putri, & Rahman, 2015; Aridiyah, Rohmawati, & Ririanty, 2015; Indrawati, 2017; Illahi, 2017; Rochmah, 2017; Sulistianingsih, & Sari, 2018; Fitri, 2018; Izwardy, 2019).

It is important to reduce the prevalence of stunting as early as possible to avoid long-term impacts that can harm children such as delayed growth. Stunting can affect brain development, causing the children to have intelligence level that is not optimal. It has the risk of reducing productivity as an adult. Stunting also makes children more susceptible to disease. Stunted children are at higher risk of developing chronic diseases in adulthood. Stunting and various nutritional problems are estimated to contribute to the loss of 2-3% of Gross Domestic Product (GDP) every year (Ministry of National Development Planning / National Development Planning Agency, 2018). In addition, the problem of stunting at an early age, especially in the first 1000 days of life will have an impact on the quality of Human Resources. Stunting causes organs not to grow and develop optimally. Stunting in children under five contributes to 1.5 million (15%) deaths of children under five in the world and causes 55 million disability-adjusted life years (DALYs), that is the loss of a healthy life span every year (Ministry of National Development Planning/ National Development Planning Agency, 2018).

Based on the foregoing description, it is necessary to carry out a study on the factors causing stunting in Ende Regency in 2019. Given the varied types of society and topography of the Ende Regency, the research was carried out in several areas that were considered representative of each administrative area of Ende Regency. This study aims to determine the factors causing stunting in Ende Regency in 2019.

RESEARCH METHOD

This study is an analytic observational study with a cross-sectional study design to determine the risk factors of stunting in toddlers in Ende Regency in 2019. In this study, the independent variables studied were the variables of family, child, and environment. The family variable includes maternal height, mother's age during pregnancy, mother's nutritional knowledge and attitude, number of family members, economic status, infection during pregnancy, and history of antenatal care (ANC) visits. Children variable includes exclusive breastfeeding, infectious disease, low birth weight, immunization, preterm birth/ IUGR, and gender. The environmental variable includes latrine conditions, drinking water quality, culture, and distance to healthcare facilities. The dependent variable was stunting prevalence. The sampling technique used was purposive sampling, with a total sample of 155 children taken proportionally from the eight districts in Ende Regency. The samples in this study must meet the inclusion and exclusion criteria. The inclusion criteria were children under five aged (13 months-60 months) and willing to be respondents. The Exclusion criterion was congenital malformation.

This study used four questionnaires, namely demographic questionnaires, knowledge questionnaires, behavioral questionnaires, and anthropometric standards to assess the nutritional status of children. The knowledge questionnaire used in this study was adopted from 25 questionnaire items (Munthofiah, 2007). The knowledge questionnaire provides True and False answers. These results are measured in the form of a score that is calculated from a value of 1 for each correct answer and 0 for each wrong/no answer (Munthofiah, 2007). The range of possible scores is 0-25, which is converted into a score as a percentage, where the score obtained is multiplied by 100 and divided by 25. Then the percentage is categorized into the category of poor knowledge (<56%), sufficient knowledge (56% - 75%) , and good knowledge (76% - 100%) (Nursalam, 2011). The questionnaire has been tested for validity and

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reliability. The questionnaire has good internal consistency with each statement item having a total item correlation value of > 0.20 and Alpha-Cronbach > 0.60 of 0.777 (Munthofiah, 2007). The behavioral questionnaire in this study was also adopted from research of the Munthofiah (2007). Mother's behavior about improving toddler nutrition in this study refers to the mother's real actions in providing food to toddlers, starting from how to choose, process, and feed. Behavioral questionnaires were collected using a questionnaire containing statements with four possible answers according to a Likert scale. Univariate analysis was used to determine the frequency of each variable. For the analysis of the bivariate test, Spearman's Rank test was used if the data were not normally distributed. This researcher has obtained an ethical permit from the Health Polytechnic Research Ethics Committee of the Kupang Ministry of Health on September 1, 2019 with the number: LB.02.03/1/0060/2019.

RESULTS

Table 1. Demographic Characteristic of Respondents (N=155)

Variables	Result
Age of Toddlers (Mean±SD) (Range)(Months)	(31.52±12.907)(12-60)
Height (n/%)	
<60 cm	9/5.8
>60 cm	146/94.2
Mother's Age (Mean±SD) (Range)((Years)	(32.64±8.225)(17-46)
Father's Education Levels (n/%)	
Have no Education	14/9.0
Elementary School	71/45.8
Junior High School	38/24.5
Senior High School	27/17.4
Diploma Degree	1/0.7
Bachelor Degree	4/2.6
Mother's Education Levels (n/%)	
Have no Education	11/7.1
Elementary School	68/43.9
Junior High School	36/23.2
Senior High School	28/18.1
Diploma Degree	4/2.6
Bachelor Degree	8/5.1

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Father's Occupation (n/%)	
Unemployment	1/0.7
Motorcycle taxi/Construction Worker/ Mason/Farmer/Fisherman 139/9.1	139/89.7
Government Civil Service	1/0.7
Private Employee	5/3.2
Trader /Entrepreneur	9/5.7
Mother's Occupation (n/%)	
Housewives	88/56.7
Government Civil Service	1/0.7
Private Employee	62/40.0
Trader /Entrepreneur	4/2.6
Have any Information Related to Stunting (n/%)	
Never	108/69.7
Ever	47/30.3

In table 1, the characteristics of stunting children involved in this study indicate that almost half of the respondents were aged 25 to 36 months (34.2%) with an mean result of 31.52 and almost all respondents had a height of more than 60 cm (94,2%). The characteristics of the families of respondents who have stunting toddlers involved in this study showed that almost half of the respondents were aged 26-35 years (48.4%) with an mean result of 32.64 and elementary education (45.8%). Most of the respondents (mothers) are housewives (56.7%) and have never received information related to stunting (69.7%).

Table 2. Frequency Distribution of the Factors Affecting Stunting (N=155)

Variables	Result
Stunted Status (n/%)	
Severe Stunting	80/51.6
Moderate Stunting	75/48.4
Family Factors	
Maternal Height (n/%)	
- Short	49/31.6
- Normal-Tall	106/68.4

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Maternal Age (n/%)	44/28.4
- At-risk	111/71.6
- Not at-risk	
Mother's Knowledge of Nutrition (n/%)	
- Lack	3/1.9
- Fair	24/15.5
- Good	128/82.6
Mother's Behavior (n/%)	
- Supportive	80/51.6
- Not Supportive	75/48.4
Number of Family (n/%)	59/38.1
- Large (≥7)	63/40.6
- Medium (5-6)	33/21.3
- Small (≤4)	
Economic Status (n/%)	
- Low	121/78.1
- Middle	34/21.9
Have Infections During Pregnancy (n/%)	
- Yes	12/7.7
- No	143/92.3
Have Antenatal Care (n/%)	
- Never	6/3.9
- 1-3 times	28/18.1
- ≥4 times	121/78.1
Toddlers Factors	
Optimal Duration of Exclusive Breastfeeding (n/%)	
- Yes	106/68.4
- No	49/31.6
Have an Infectious Diseases (n/%)	
- Ever	152/98.1
- Never	3/1.9
History of Disease for the Past Month (n/%)	
- Ever	126/81.3
- Never	29/18.7

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Low Birth Weight (n/%)	
- Yes	31/20
- No	124/80
Vaccination (n/%)	
- Incomplete	11/7.1
- Complete	144/92.9
Preterm Birth (n/%)	
- Premature	11/7.1
- Full-term	144/92.9
Intrauterine Growth Restriction (IUGR) (n/%)	
- Yes	12/7.7
- No	143/92.3
Gender (n/%)	
- Male	89/57.4
- Female	66/42.6
Environmental Factors	
Latrine Condition (n/%)	
- Poor	58/37.4
- Fair	97/62.6
Drinking Water Quality (n/%)	3/1.9
- Unworthy/ Under Standard	152/98.1
- Worthy/ Standard	
Cultural Factors	
Prohibition Rule During Pregnancy (n/%)	
- Yes	22/14.2
- No	133/85.8
Prohibition Rule During Breastfeeding (n/%)	
- Yes	20/12.9
- No	135/87.1
Distance to Healthcare Facilities (n/%)	
- >3 KM	25/16.1
- 1-3 KM	45/29.1
- <1 KM	85/54.8

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Table 2 shows that almost half of the respondents are children with very short stature (51.6%), and short stature (48.4%). The data in Table 2 also shows that almost all respondents in this study have good knowledge about nutrition for children (82.6%), have a monthly household income of less than one million rupiah (78.1%), have no history of infection during pregnancy (98.1%) and had a history of 4 antenatal visits (78.1%). Most of the respondents had a short stature during pregnancy (31.6%), had a gestational age that was not at risk (71.6%), and showed unsupportive behavior in food processing (1.9%). Almost half of the respondents have 5-6 family members or middle class family (40.6%).

Table 2 also illustrates that most of the respondents received exclusive breastfeeding (68.4%), almost all of the respondents had a history of infectious diseases since childhood (98.1%), had suffered from the disease in the last month (81.3%), had no history of infectious diseases. history of LBW (80%), had a complete history of LBW. immunization (92.9%), no history of preterm birth (92.9%) and no history of IUGR (92.3%).

The environmental variable (Table 2) shows that most of the respondents have clean latrines (62.6%) and the distance to health care facilities is <1 KM (54.8%). Almost all respondents have clean drinking water (98.1%), have a history of abstinence during pregnancy (85.8%), and have a history of abstinence while breastfeeding (87.1%).

Table 3. Analysis of Factors Related to Stunting (N=155)

Variables	Stunted		p-value
	Severe Stunting (n=80)	Moderate Stunting (n=75)	
Family Factors			
Maternal Height (n/%)			
Short	26/16.8	23/14.8	0.212
Normal-Tall	54/34.8	52/33.6	
Maternal Age (n/%)			
At-risk	29/18.7	15/9.7	0.124
Not at-risk	51/33	60/38.6	
Mother's Knowledge of Nutrition (n/%)			
Lack	2/1.3	1/0.6	
Fair	11/7.1	13/8.4	0.784
Good	67/43.2	61/39.4	
Mother's Behavior (n/%)			
Supportive	45/29	30/19.4	0.194
Not Supportive	35/22.6	45/29	

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Number of Family (n/%)			
Large (≥7)	30/19.3	29/18.8	0.090
Medium (5-6)	33/21.3	30/19.3	
Small (≤4)	17/11	16/10.3	
Economic Status (n/%)			
Low	58/37.4	63/40.6	0.459
Middle	22/14.2	12/7.8	
Infections during Pregnancy (n/%)			
Yes	9/6	3/1.5	0.797
No	71/46	72/46.5	
Antenatal Care (n/%)			
Never	6/4	0/0	0.221
1-3 times	13/8.4	15/9.5	
≥4 times	61/39.4	60/38.7	
Toddlers Factors			
Optimal Duration of Exclusive Breastfeeding (n/%)			
No	24/15.5	25/16.1	0.030*
Yes	56/36.1	50/32.3	
Infectious disease (n/%)			
Ever	78/50.3	74/47.7	0.001*
Never	2/1.4	1/0.6	
History of Disease for the Past Month (n/%)			
Ever	62/40	64/41.3	0.029*
Never	18/11.6	11/7.1	
Low Birth Weight (n/%)			
Yes	16/10.3	19/12.3	0.522
No	64/41.3	56/36.1	
Vaccination (n/%)			
Incomplete	7/4.5	4/2.5	0.244
Complete	73/47	71/46	

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Preterm Birth (n/%)			
Premature	7/4.5	4/2.5	0.747
Full-term	73/47	71/46	
Intrauterine Growth Restriction (IUGR) (n/%)			
Yes	8/5	4/2.5	0.486
No	72/46.5	71/46	
Gender (n/%)			
Male	45/29	44/28.3	0.145
Female	35/22.3	31/20	
Environmental Factors			
Latrine Condition (n/%)			
Fair	50/32.3	28/18.1	0.186
Poor	30/19.3	47/30.3	
Drinking Water Quality (n/%)			
- Unworthy/ Under Standard	0/0	3/2	0.001*
- Worthy/ Standard	80/52	72/46	
Cultural Factors			
Prohibition Rule During Pregnancy (n/%)			
Yes	18/11.6	4/2.6	0.232
No	62/40	71/45.8	
Prohibition Rule During Breastfeeding (n/%)			0.917
Yes	18/11.6	2/1.4	
No	62/40	73/47	
Distance to Healthcare Facilities (n/%)			
>3 KM	11/7.1	14/9	0.050*
1-3 KM	26/16.7	19/12.3	
<1 KM	43/27.7	42/27.2	

Description: Analysis was used a: Rank Spearman test and *the significance value was α = <0.05

Based on the results of the bivariate analysis (Table 3), the significance value of α = <0.05 was obtained in the variable of exclusive breastfeeding (*p*-value = 0.030), history of infection: Infectious disease since childhood (*p*-value = 0.001), and history of disease for the last 1 month (*p*-value = 0.029), drinking water quality (*p*-value = 0.001), and distance to healthcare facilities (*p*-value = 0.050). Meanwhile, the other variables obtained *p*-value > 0.05. This shows that these variables do not have a significant relationship with stunting.

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Based on the results of the analysis, the variables included in the multivariate modeling were variables with *p*-value <0.25 including the variables of history of infection: Infectious disease since childhood (*p*-value = 0.0[illegible] the history of disease in the last 1 month (*p*-value = 0.029), drinking water quality (*p*-value = 0.001), immunization (*p*-value = 0.244), exclusive breastfeeding (*p*-value = 0.030), mother's nutritional behavior (*p* value = 0.194), abstinence during pregnancy (*p*-value = 0.232), latrine condition (*p*-value = 0.186), distance to health service facilities (*p*-value = 0.050), maternal age (*p*-value = 0.124). Meanwhile, the variables that have a *p* value> 0.05 were removed from the analysis gradually. Based on the analysis, the final multivariate regression modeling is presented in Table 4.

Table 4. Multivariate Analysis of the Dominant Factors

Variables	p-value	OR CI 95% (Min – Max)
Toddlers Factors		
Infectious disease	0,014	6,46 (0.46 -28.50)
Exclusive Breastfeeding	0,015	0,43 (0.21 – 0.85)
Environmental Factors		
Drinking Water Quality	0,002	0,77 (0.41 – 1.63)
Distance to Healthcare Facilities	0,056	0,42 (0.17 – 1)

DISCUSSION

The bivariate analysis in Table 3 depicts that there is a significant relationship between exclusive breastfeeding and stunting (*p*-value = 0.030). This is confirmed by the finding of this study that almost half of the respondents (53 respondents/ 33.97%) who did [illegible]t receive exclusive breastfeeding are stunting. The results of this study are in line with Indrawati's research (2016) that exclusive breastfeeding has a significant relationship with stunting in children of 2 - 3 years old (*p*-value = 0.000). A study by Oktavia (2011) also revealed that 48 out of 51 stunted children (94.12%) did not receive exclusive breastfeeding.

Stunting prevention begins in the womb to the child is around two years old. It is called the golden period of 1000 first day. The critical period for improving children's nutrition is highly prioritized in the 270 days during pregnancy and 730 days in the first days of life. One of the direct nutritional improvements is by giving exclusive breastfeeding and providing optimal nutrition according to their needs (Ministry of Health of the Republic of Indonesia, 2013). Breast milk is an ideal food for children's nutrition since it meets infants' nutritional needs in their first 6 months of life. Infants are allowed to take medicines, vitamins, and mineral drops referring to the doctor's advice. During the first 6 months of exclusive breastfeeding, infants are not given additional food and drinks, such as formula milk, oranges, honey, water, tea, and solid foods such as bananas, papaya, milk porridge, rice porridge, and biscuits. Predominant breastfeeding is nourishing breast milk but giving a little water or water-based drinks, for examples, tea, as a pre-lactal food before the breast milk "comes out" (Ministry of Health of the Republic of Indonesia, 2010).

Breastfeeding serves various health benefits, [illegible]ecially in terms of child development. Human breast milk contains long-chain polyunsaturated fatty acids (LCPUFA) which are not only an energy source

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but also important for brain development due to its dominant molecules in the myelin sheath. Breast milk also increases the child's immunity. Based on research, breastfeeding can reduce the frequency of diarrhea, chronic constipation, gastrointestinal diseases, respiratory tract infections, and ear infections. Breastfeeding also has an indirect effect on children's psychomotor development since children who are ill will find it difficult to explore and learn from their surroundings. Another benefit of breastfeeding is the stronger bond between mother and child that has a positive effect on children's development and behaviour (Henningham & McGregor, 2008).

Starting solids too early is significantly associated with an increased risk of respiratory infections and a higher incidence of malaria and eye infections. A study conducted by Kalanda, Verhoeff, and Brabin (2006) in Peru showed a significantly higher prevalence of diarrhea in children who were weaned early. It can be caused by the loss of immunity due to non-exclusive breastfeeding and the unhygienic supplementary foods that are prone to infectious diseases. Research in several developed countries shows that breastfeeding can reduce pneumonia and gastroenteritis (Kalanda, Verhoeff & Brabin, 2006).

The bivariate analysis in Table 3 shows that childhood illness since childhood has a significant relationship with stunting (*p*-value = 0.001) that most of the respondents who had a history of illness since childhood experienced stunting (50.3%). The results of this study confirm Maxwell's (2011) theory that one of the direct causes of malnutrition in children is the disease. This manifestation of malnutrition occurs as a consequence of the infection, which can reduce appetite or affect the absorption of nutrients in the intestine. Malnutrition and infection often occur at the same time. Malnutrition can increase the risk of infection, whereas infection can lead to malnutrition which leads to a vicious cycle. Malnourished children, whose resistance to disease is low, fall ill and will become increasingly malnourished, thus reducing their capacity to fight disease and so on. This is also called infection malnutrition (Maxwell, 2011).

The bivariate analysis in Table 3 shows that the drinking water quality variable has a significant relationship with stunting (p-value = 0.001). The results of this study are supported by previous research which explains that drinking water quality has a significant relationship with stunting (p-value = 0.001) (Oktarina & Sudiarti, 2013). Based on the research data in Table 3, there are 2% of people who have unclean drinking water quality. It also has something to do with diarrhea. Clean water facilities are one of the dominant factors causing diarrhea in toddlers. To prevent diarrhea, clean water should be taken from a source that is protected/not polluted.

Clean water is one of the basic human needs that must be enjoyed by everyone without exception. The availability of clean water that is easily accessible and sustainable affects people's health, economic productivity, and people's quality of life. The community is said to have access to clean water based on the following requirements: (1) the availability of water in sufficient quantities to meet their daily needs, (2) water quality that meets the quality standards set by the Regulation of the Minister of Health, and (3) water is always available. when needed (Azhar, Dharmayanti & Anwar, 2014).

Several studies in various countries have shown that the quality of drinking water sources has a positive relationship with a reduction of diarrhea and mortality in children. The source of drinking water cannot be separated from the physical properties of water quality. The appropriate source of drinking water is protected drinking water, including tap water, public taps, public hydrants, water terminals, rainwater storage or protected springs, and wells, boreholes, or pumps, which are at least 10 meters away from sewage, waste collection, and garbage disposal. Bottled water, water from vendors, water sold through tanks, unprotected well and springs are excluded (Ministry of Health of the Republic of Indonesia, 2018). A source of clean drinking water is an important factor for a healthy body,

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body development, and reducing the risk of various diseases such as diarrhea, cholera, and typhus. Children are susceptible to infectious diseases since naturally, children have low immunity. Death and morbidity in children are generally associated with contaminated drinking water sources and inadequate sanitation (Adewara & Visser, 2011).

The bivariate analysis in Table 3 shows that the distance to the healthcare facilities has a significant relationship with stunting (*p*-value = 0.050). Accessibility is the ability of the community to obtain healthcare services at the desired place and time regardless of income, culture, and physical location. Health services are the access of children and families to disease prevention and healthcare efforts. The difficult or inaccessible healthcare facilities cause children to be more susceptible to malnutrition as a result of inadequate treatment of the disease, low immunization rates, and poor pregnancy care, putting children at risk of infection which increases susceptibility to nutrition deficiency (Amir, 2008).

The multivariate analysis in Table 4 illustrates that the variable history of illness since childhood is the dominant variable causing stunting in children under five in Ende Regency with an OR value of 6.46 (95% CI = 0.46 - 28.50). This shows that toddlers who have a history of illness since childhood have a 6 times chance of experiencing stunting compared to toddlers who do not have a history of disease since childhood. The findings also show that all children under five who have a history of illness since childhood are often infected with ARI and diarrhea (100%).

Toddlers suffering from diarrhea have a positive relationship with the nutritional status index (height according to age) (Masithah, & Martianto, 2005). Other studies also confirmed that infectious diseases showed a significant relationship with the nutritional status index (height for age) (Neldawati, 2006). Infectious diseases such as diarrhea and ARI caused by poor feeding and sanitation are associated with stunting in infants aged 6-12 months (Astari, Nasoetion, & Dwiriani, 2005). Another study in Libya also showed that diarrhea was a stunting factor in children under 5 years old (Taguri, Betilmal, Mahmud, Ahmed, Goulet, Galan, & Hercberg, 2007).

The health status of children under five includes diarrhea and acute respiratory. Diarrhea is bowel movements with increased frequency and watery consistency that last for at least 2 days with the frequency of 3 times a day. The main cause of diarrhea in infants and children is *Enteropathogenic Escherichia coli* (EPEC). EPEC is also believed to be the cause of the death of hundreds of thousands of children in developing countries every year. This is also expressed by Budiarti, that in Indonesia, 53% of infants and children with diarrhea are infected with EPEC. Therefore, diarrhea is one of the main health issues in many developing countries, including Indonesia. Sanitation in slum areas is usually poor can lead to increased transmission of infectious diseases (Masithah, & Martianto, 2005).

In developing countries, infectious diseases in children are an important health problem that affects the growth and development of children, one of which is stunting (Masithah, & Martianto, 2005). In addition, the effect of infection on children's linear growth is affecting the nutritional status of children which then affects the children's linear growth. Infection can reduce food intake, interfere with nutrient absorption, cause direct loss of nutrients, increase metabolic needs or decrease nutrient catabolic processes that affect consumption patterns which in turn will affect the nutritional status of children under five. If this condition lasts for a long time it will affect the linear growth of children (Suiraoka, Kusumajaya, & Larasati, 2011).

CONCLUSION

The majority are toddlers with severe stunted. Most of the maternal had good knowledge of nutrition, had a low income, had no history of infection during pregnancy and had antenatal care, had short stature during pregnancy, had gestational age not risky, and exhibit unsupportive behavior in food processing. Almost half of them have 5-6 family members or are

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middle class. There was significant stunting with the variables of optimal duration of exclusive breastfeeding, history of Infectious diseases since childhood, history of disease in the last 1 month, quality of drinking water, and distance to health facilities.

SUGGESTION

The results of this study have significant implications for Provincial and District Apparatuses to increase cooperation regarding the determination of the number of children under five with stunting so that the interventions provided are right on target.

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