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Research

Determinants of Stunting in Children Aged 12 to 60 Months in Kota Waingapu District, East Nusa Tenggara, Indonesia

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ABSTRACT

Background: Stunting is a problem that is often not recognized in the community because short stature is so common and often considered normal. In Indonesia, the incidence of stunting under five is a major nutritional problem, with an average prevalence from 2015-2017 of around 36.4%. This study aimed to investigate the determinants of stunting in children aged 12 months - 60 months in the Waingapu District.

Subjects and Method: This was a cross-sectional study conducted at Posyandu, Waingapu District, in December 2020. A total of 105 samples were selected based on inclusion and exclusion criteria using non-probability consecutive sampling. The dependent variable was stunting. The independent variables were exclusive breastfeeding, birth weight, household income, maternal education, maternal nutritional status, and maternal age. The data were collected by questionnaire and analyzed by Chi-square.

Results: The prevalence of stunting in children aged 12 to 60 months in the Waingapu District was 24.8%. The bivariate analysis elucidated that the incidence of stunting was significantly increased by poor maternal education (OR= 3.40; 95% CI= 1.29 to 8.97; p= 0.011), poor maternal nutritional status (OR= 3.06; 95% CI= 1.05 to 8.89; p= 0.034), and low household income (p = 0.002).

Conclusion: Poor maternal education, poor maternal nutritional status, and low household income significantly increase the incidence of stunting.

Keywords: stunting, determinant, nutritional status, children

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BACKGROUND

Stunting is a problem that is often not realized in the community because short stature is very common and is often considered normal. The difficulty in visual identification and the lack of routine linear growth measurements in primary care explain why it took so long to realize how large this hidden scourge was (de Onis and Branca, 2016). Stunting is a significant irreversible impact of inadequate nutrition and recurrent infections over 1000 days first a child's life (Gordon and Maule, 1989).

Stunting is a condition where the child's height/length by age is below -2 SD based on the World Health Organization (WHO) curve (de Onis and Branca, 2016). Based on data compiled by WHO in 2019s, there were around 21.3% or 144 million children under five years old were stunted worldwide. From this number, around 78.2 million came from the Asian continent, of which 13.9 million came from Southeast

Asia (Unicef/ WHO/The World Bank, 2019).

In Indonesia, the incidence of stunting under five is a major nutritional problem, with an average prevalence from 2015-2017 of around 36.4%. The prevalence of stunted children under five tends to fluctuate from year to year. In 2016, the prevalence of stunting was 27.5% and 30.8% in 2018 and again fell to 27.67% in 2019. However, this number is still far above the world prevalence (Kemenkes RI, 2018; Riskesdas, 2018; SSGBI, 2019). East Nusa Tenggara is currently the province in Indonesia with the highest prevalence of stunting, with 43.8% in 2019. This number had decreased from the previous 51.7% in 2013. East Sumba, where this research was conducted, had a prevalence of around 37.02% in 2019, dropping from the last 51.31% in 2013. Although the prevalence had decreased, it was still very high (SSGBI, 2019).

Stunting has long-term effects on individuals and society, such as cognitive impairment and physical development, decreased production capacity, poor health, or even an increased risk of degenerative diseases such as diabetes (Unicef/ WHO/ The World Bank, 2019). Stunting is a vicious cycle because women with a history of stunting in childhood will tend to produce stunted offspring as well. Stunting is one of the major risk factors leading to failure in achieving children's potential development and other factors such as inadequate cognitive stimulation, iodine deficiency, and iron deficiency anemia (Prendergast and Humphrey, 2014).

Stunting prevention must be done seriously because the prevalence of stunting in a nation strongly reflects every child's actual food security status and nutritional fulfillment in a country. This condition also reflects on the potency of a nation in the future because it will greatly affect our productivity and effectiveness. By knowing the risk factors for stunting, we can prevent it early and save our future generations. Therefore, this study aimed to investigate the determinants of stunting in children aged 12 months - 60 months in the Waingapu District.

SUBJECTS AND METHOD

1. Study Design

This cross-sectional study was conducted at the Posyandu (Integrated Health Post) in Kota Waingapu District in December 2020.

2. Population and Sample

The study population was all children who came to Posyandu in Kota Waingapu District in December 2020. Samples were taken based on inclusion and exclusion criteria. The sampling technique used was non-probability consecutive sampling. A total of 105 children were eligible and became the samples of this study.

The study subjects were included for the following reasons: (1) Children aged between 12 to 60 months in December 2020, and (2) Children with congenital disorders.

The study subjects were excluded for the following reasons: (1) The mother did not bring the child when visited the Posyandu, and (2) Parents did not agree to participate in the study and refused to sign the informed consent.

3. Study Variables

The dependent variable was stunting. The independent variables were exclusive breastfeeding, birth weight, household income, maternal education, maternal nutritional status, and maternal age.

4. Operational Definition of Variables

Stunting was defined when a child has a length- or height-for-age is more than two standard deviations below the WHO Child Growth Standards median. It was

categorized into stunted: ≥ -2 SD and not stunted < -2 SD.

Exclusive breastfeeding is defined as children being given breast milk exclusively for the first six months of age (breast milk consumption without complementary feeding within the first six months). It was categorized into not receiving exclusive breastfeeding and receiving exclusive breastfeeding.

Birth Weight is defined as the weight of children when they were born. It was categorized into normal birth weight: ≥ 2500 grams and low birth weight: <2500 grams.

Household income was defined as the combined gross income of all household members above a specified age. It was categorized into low household income: less than Rp 1,950,000 per month and average household income: more than Rp 1,950,000 per month.

Maternal education was a measure of maternal education level during pregnancy. It was categorized into not completed high school level of education and completed high school level of education.

Maternal nutritional status was defined as the nutritional state of mothers during pregnancy. It was categorized into chronic energy insufficient: mid-upper arm circumferences (MUAC) <23.5 cm and normal: MUAC ≥23.5 cm.

Maternal age was defined as the age of the mother during pregnancy. It was categorized into risk full childbearing age: <20 or ≥35 years old and low-risk childbearing age: 20 – 35.

5. Study Instruments

Data collection was carried out using primary data by conducting direct interviews. Direct interviews were conducted with the mothers of the children who visited the Posyandu. Previously written informed consent was carried out after consent was found, then the interview was continued for 3 minutes.

6. Data Analysis

Descriptive analysis was conducted to determine the frequency distribution of research subjects based on sample characteristics. The bivariate analysis was conducted using the chi-square test or other alternatives if it did not meet the requirements to analyze each determinant's relationship.

7. Research Ethic

Research ethical issues, including informed consent, anonymity, and confidentiality, were addressed carefully during the study process. The research ethical clearance approval letter was obtained from the Head of Waingapu Community Health Center (Puskesmas Waingapu), East Sumba, Indonesia No. 363/PKM.W/TU/III/2021, on March 29, 2021.

RESULTS

A. Sample Characteristics

In this study, Table 1 showed that the number of samples collected was 105 children. Based on the characteristics, the majority of study subjects were males, 56 (53.5%). Based on the age distribution, it was found that the age group 12-24 months was the largest with 55 children (52.4%), followed by the age group 24 - 36 with 24 children (24%), the age group 36 - 48 months with 19 children (19%), and the age group 49 - 60 months with 7 children (6.7%). Most of the study subjects were from the Sumba tribe, with 76 children (72.4%). Also, this study observed 26 stunted children (24.8%) of the total 105 included children. The majority of children in this study did not experience stunting (75.2%).

Table 1. Sample characteristics

Characteristics	Category	Frequency	Percentage
Sex	Males	56	53.5 %
	Females	49	46.7 %
Age	12 – 24 Months	55	52.4 %
	> 24 – 36 Months	24	22.9 %
	> 36 – 48 Months	19	18.1 %
	> 49 – 60 Months	7	6.7 %
Tribes	Sumba	76	72.4 %
	Non-Sumba	29	27.6 %
Stunting	Stunting	26	24.8 %
	Without Stunting	79	75.2 %

B. The result of bivariate analysis

Table 2. Determinants of stunting (an analysis by chi-square)

Characteristics	Stunting				OR	p
	No		Yes			
	N	%	N	%		
Exclusive breastfeeding						
No	20	71.4	8	28.6	1.31	0.586
Yes	59	76.7	18	23.4		
Birth weight						
Low birth weight (< 2500 grams)	9	81.8	2	18.2	0.64	0.593
Normal birth weight (≥ 2500 grams)	70	74.5	24	25.5		
Household income						
Low household income (<Rp. 1.950.000,00 per-month)	57	68.7	26	31.3		0.002
Sufficient household income (≥Rp. 1.950.000,00 per-month)	22	100	0	0		
Maternal education						
Not completed senior high school	14	56	11	44	3.40	0.011
Completed senior high school	65	81.3	15	18.7		
Maternal nutritional status						
Chronic energy insufficient (upper arm circumference < 23.5 cm)	10	55.6	8	44.4	3.06	0.034
Normal (upper arm circumference ≥23.5 cm)	69	79.3	18	20.7		
Maternal age						
< 20 years old or > 35 years old	19	65.5	10	34.5	1.97	0.154
20 – 35 years old	60	78.9	16	21.1		

Table 2 showed that children aged 12 to 60 months with not receiving exclusive breastfeeding had risk 1.31 times to stunting (OR= 1.31; 95% CI= 0.49 to 3.47; p= 0.586), but it was not statistically significant.

The children aged 12 to 60 months with low birth weight had 0.64 times as less

stunting incidence as children with normal birth weight (OR= 0.64; 95% CI= 0.13 to 3.21; p= 0.593), but it was not statistically significant.

The children aged 12 to 60 months from families with low household income or below the regional minimum wage had a significant difference in stunting incidence compared to children from families with average household income (p= 0.002).

The children aged 12 months - 60 months from mothers with not complete high school education had 3.40 times as many stunting incidences as children with complete high school education, and it was statistically significant (OR= 3.40; 95% CI= 1.29 to 8.97; p= 0.011).

The children aged 12 to 60 months from mothers with chronic energy insufficient had 3.06 times as many stunting incidences as children from mothers with normal nutritional status (OR= 3.06; 95% CI= 1.05 to 8.89; p= 0.034), and it was statistically significant.

The children aged 12 to 60 months from mothers with risk full childbearing age (<20 or ≥35 years old) had 1.97 times as many stunting incidences as children from mothers with low-risk childbearing age (20 – 35 years old) (OR= 1.97; 95% CI= 0.76 to 5.07; p= 0.154), but it was not statistically significant.

DISCUSSION

The study conducted in the sub-district of the city of Waingapu showed that 24.8% of these children were stunted. This prevalence was still lower than the prevalence of stunting in East Sumba at around 37.02%, East Nusa Tenggara province around 43.8%, and Indonesia around 27.67% (Kemenkes RI, 2018; Riskesdas, 2018; SSGBI, 2019).

These study findings showed not receiving exclusive breastfeeding among children aged 12 to 60 months increased the incidence of stunting, but it was not statistically significant (p= 0.586). These results are the same as the results obtained by Rusmi et al. (2019), which showed no difference in the proportion of stunting in children with or without exclusive breastfeeding. The consumption of formula milk may explain this, or supplementary food also can prevent stunting. Studies conducted by Huang and Hu (2020) and Daniels et al. (2019) showed that maternal nutritional intake is influenced the macronutrient and micronutrient content in breast milk.

The nutritional status of the mother also affects the breast milk content of the mother. Overweight women tend to have lower protein levels than women with average body weight (Bachour et al., 2012). Also, breast milk's energy density and fat concentration are positively associated with maternal body mass index, wherein general and maternal factors will significantly influence breast milk composition. Among them, body composition, diet, and parity, especially in the continued breastfeeding phase or more than the first three months (Nommsen et al., 1991), that's why children with exclusive breastfeeding also have the possibility of stunting, which depend on the nutritional content of breast milk itself. Conversely, a study from Lestari et al. (2018) elucidated a significant relationship between not receiving exclusive breastfeeding and the incidence of stunting with (p= 0.034).

We also found that low birth weight was a protective factor of stunting in this study, but it was not statistically significant (p= 0.593). This finding was opposed by a study from Aryastami et al. (2017), which showed a strong significant relationship between low birth weight and the incidence of stunting with (p<0.001). Children with

low birth weight tend to have functional gastrointestinal disorders (Baldassarre et al., 2020). Also, food intolerance often happens in children with very low birth weight or low birth weight who are premature (Carter, 2012). Studies had shown that children with digestive problems and food intolerance grow without achieving standard growth curves (Morton et al., 2017). But, if the optimal nutrition for low-birth-weight infants is initiated as early as possible with specific nutrition in the first 1000 days of life, it may prevent stunting (Ramayulis et al., 2018).

This study showed a significant relationship between low household income and stunting (p= 0.002). This result was the same as the results obtained by Barir et al. (2019), showing a significant relationship between family income and the incidence of stunting (p= 0.041). Likewise, a study by Nshimyiryo et al. (2019) in Rwanda also showed a significant relationship (p= 0.010). It is most likely because children from low-income families receive fewer energy sources and are deficient in almost all the nutrients needed (Shariff et al., 2015).

Other studies had shown that children from low-income families consume fewer calories, total carbohydrates, and fruit than children from high-income families. They found some significant differences between the two in nutritional and anthropometric measures (Casey et al., 2001). An inadequate diet in terms of quality and quantity significantly contributes to stunting. Stunting and household income are closely related because low-income households often find it difficult to buy expensive food items such as animal food sources, fruits, and vegetables, containing higher micronutrients than staple foods (Horton, 2015).

This study also showed that poor maternal education during pregnancy (<high school) was 3.4 times more likely to have stunted children than those who graduated from high school (p= 0.011). This result was in line with the results obtained by Susilowati et al. (2019) and Nshimyiryo et al. (2019), which showed a significant relationship.

Other studies in Indonesia also showed that mothers with high educational levels had a very low probability of having a stunted child (Laksono et al., 2019). Mothers who have higher education can better understand the high nutrition diet and suitable for children (Susilowati et al., 2019). Glewwe (1999) stated that at least three factors that make the mother's education significantly affected their child's nutrition: formal education teaches health science to prospective mothers, good numeracy, and literacy skills. These factors will enable mothers to know their children's health problems and to manage them. Also, the exposure to modern life obtained in formal schools makes mothers more able to accept modern health care. Research in Malawi, Zimbabwe, and Tanzania in 2013 showed that measures of three children's nutritional status (stunting, wasting, and underweight) decreased as the mother's education level increased (Makoka, 2013).

Another variable that also had a significant relationship was the poor maternal nutritional status during pregnancy (p= 0.034), where mothers with poor maternal nutritional status (MUAC <23.5 cm) were three times more likely to have stunted children than mothers with normal nutriational status. This result aligned with Fitriani and Nurdiana (2020) showed the nutritional deficiencies in pregnant women are usually followed by deficiencies in macro and micronutrients. It that can affect the fetus during conception or after birth

(Black et al., 2013; Cetin and Laoreti, 2015). Micronutrient deficiency, especially iron during pregnancy, affects the child's development (Vir, 2016). Inadequate maternal micronutrient status has many potential side effects on many developmental processes during fetal and breastfeeding babies, both short and long-term (Cetin et al., 2019).

This study also showed that maternal age during pregnancy had no relationship with the incidence of stunting (p= 0.154). This result aligned with the studies of Susilowati et al. (2019) and Sumiaty et al. (2017). Pregnant age, mostly young gestational age, correlated with intrauterine growth retardation, low birth weight, preterm birth, child mortality, stunting, and anemia in mothers (Gibbs et al., 2012). Research in Ghana showed that children raised by mothers who are still adolescents were eight times more likely to be stunted than adult mothers because adolescent mothers cannot pursue adequate diets, clean water, and optimal sanitation (Wemakor et al., 2018). So, we can prevent stunting even if the mother is very young or old if she can maintain adequate nutrition and other factors after giving birth. All these factors can be pursued within the first 1000 days of life, and this period is an opportunity to establish the foundation for optimal health and development throughout life. During this period, proper nutriation and care affect whether the child will survive or not and his ability to grow, learn, and escape poverty. So that this signifycantly contributes to the health, stability, and prosperity of society in the long run (UNICEF, 2014).

The limitations of this study were historical restraint data of the study subjects during the Covid-19 pandemic. This study can be concluded that low household income, poor maternal education during pregnancy, and poor maternal nutritional status during pregnancy had a significant relationship with the incidence of stunting. We also can conclude that maternal factors hold significant roles that contributed to stunting in children. We expected that these results could become a source of information for government to create a policy to prevent stunting in the future.

AUTHOR CONTRIBUTION

The authors contributed to the concept, design, analysis, and discussion of data.

CONFLICT OF INTEREST

The authors declared that the study was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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