

Original Research Article

Stunting is influenced by toddler and maternal characteristics, history of infectious disease, IYCF practices, and protein intake: case control study in Nabire coastal areas, Indonesia

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ABSTRACT

Background: Stunting is one of the unresolved nutritional problems in Indonesia. The coastal areas of Nabire Regency have a high prevalence of stunting, which is more than 20%. This study aims to further analyze the risk factors for stunting in children aged 6-24 months in the coastal area of Nabire Regency.

Methods: The research design used was a case-control study with matching age, gender, socioeconomics, and village monographs, performed in August 2022-June 2023. The number of samples in this study was 112 subjects (children's 6-24 months). Collected by questionnaires, data of family characteristics, toddler characteristics, maternal characteristics, history of infectious diseases, IYCF practices, nutritional intake of toddlers, complete basic immunization status of toddlers, maternal anemia history, maternal SEZ history, and maternal ANC history. The risk of independent variables was analyzed by logistic regression test by SPSS 16.

Results: The results showed that the risk factors for stunting were birth length (OR=6.38), birth weight (OR=6.73), current weight (OR: 15.59), history of anemia during pregnancy (OR=19.60), history of ANC during pregnancy (OR=41.88), frequency of respiratory infection (OR=39.00), frequency of diarrhea (OR=2.37), early initiation of breastfeeding (OR=0.33), exclusive breastfeeding (OR=0.41), 6-24 months breastfeeding (OR=0.39), complementary feeding practices (OR=2.60), protein intake (OR=6.75).

Conclusions: Nabire Regency with its diversity of socio-cultural life, and unique geographical conditions, certainly has problems and determinants of stunting that are different from other parts of Indonesia. The most influential risk factor for stunting is the history of ANC during pregnancy and frequency of respiratory infections.

Keywords: Nabire, Risk factors, Stunting

INTRODUCTION

Stunting one of the nutritional problems in Indonesia that has not been resolved. If this problem is chronic, it will affect cognitive function, namely a low level of intelligence and have an impact on the quality of human resources.¹ The prevalence of stunting under five in Indonesia is still quite high and the distribution is uneven between villages, districts/cities and between provinces.

Eastern Indonesia has a higher prevalence of stunting than nationally, one of which is the province of Papua.

Based on the results of the 2022 Indonesia Nutrition Status Survey, the prevalence of stunting in Papua is 34.6%. Nabire Regency has a stunting prevalence of 17.1% in 2022 which is still above the national target of 14%.² Stunting Indonesia is caused by several factors including non-exclusive breastfeeding, low household

socioeconomic status, premature birth, short birth length and low maternal education, poor environmental sanitation, and culture.³ Low complementary feeding practices are also a strong determinant of stunting. The low practice of complementary feeding was identified as a risk factor directly related to stunting in the postnatal period, namely after a child is 6 months old.⁴ The low quality of complementary feeding practices has an impact on children experiencing malnutrition.⁵ Growth failure generally begins between 4 and 6 months of age and continues until 18 months of age.⁶ The greatest decrease in length-for-age occurs during the complementary feeding period from 6-24 months of age.⁷

Indirect factors such as household food security are also a risk factor for stunting. Aspects related to food security include the availability of food and its diversity. The availability and diversity of food is related to the socio-economic level of the family, while the diversity measures the quality of food consumed.⁸ Social culture of the community is also an indirect factor of stunting, where the population of Nabire Regency consists of ethnic Papuans and non-Papuans. All ethnic groups in Papua live with different customs, languages, practices and indigenous religions so that the culture in Papua is very diverse. Culture in each tribe has a very influential power in the selection of food consumption.⁹ Besides that, Papua, especially the Nabire Regency, with its diversity of socio-cultural life and unique geographical conditions, certainly has different problems and determinants of stunting than other parts of Indonesia. Therefore, this study aims to further analyze the risk factors for stunting in children aged 6-24 months in the Papua region, especially Nabire Regency, where the prevalence of stunting is still relatively high compared to the national target as a basis for optimizing efforts to deal with stunting problems so that it can be used as a reference in handling stunting in the future.

METHODS

This research was conducted in August 2022-June 2023. The research design used a case-control study with matching age, sex, socio-economic area, and village monograph. This research was conducted in the coastal area of Nabire Regency (Kwatisore, Bawei, Yeretuar, Kalibobo, Mambor, Moor, Sanoba, Samabusa, Napan, and Maniwo) Papua Province. The location of this research was chosen purposively based on the consideration that the area has a high prevalence of stunting ($\geq 20\%$), homogeneous in terms of socio-economic aspects and regional monographs, heterogeneous ethnic and cultural aspects, language uniformity used by the community, as well as security and ease of access to the location. The population in this study were toddlers aged 6-24 months who were recorded in the ePPGBM recap data for July 2022. The inclusion criteria used in this study were toddlers aged 6-24 months, suffering from stunting based on anthropometric measurement results for the case group, not suffering

from stunting based on the results of anthropometric measurements for the control group, and were willing to be respondents in the study. Exclusion criteria in this study are subjects who are not willing to be respondents until the end of the study such as resigning, getting sick, leaving the city, moving, and dying. The number of samples in this study was 112 subjects (stunting = 56, normal = 56). Ethical approval for this study was based on ethically appropriate statement number 141/KEPK-J/VIII/2022 from the health research ethics committee of the Poltekkes Kemenkes Jayapura.

The data collection tool used questionnaire. The questionnaire used has been previously validated. The resulting sample body weight and length data were processed to determine the z-score value using the WHO Anthropometry software. Other data were processed and analyzed using Statistical Package for Social Science (SPSS) version 16.0 for Windows. Data processing is carried out through the stages of entry, coding, cleaning, and data analysis for each variable. Quantitative data analysis will use the SPSS version 16.0 application in univariate, bivariate and multivariate ways. Univariate analysis consisted of descriptive analysis including the mean, SD, frequency, and percentage. The relationship test used is the Chi-square test because the variables analyzed are categorical data. This test is also used because the samples are clustered and to find out how much risk the variables are analyzed using a multivariate logistic regression test.

RESULTS

The subjects in this study were mostly female, 62 children (55.4%), while 50 children (44.6%) were male. In the stunting group and the normal group, 31 children (27.7%) were female and 25 children (22.3%) were male. The distribution of child characteristics showed that most stunted children had a birth length < 48 cm as many as 43 children (38.4%), while normal children had a birth length ≥ 48 cm as many as 48 children (42.9%). The results of logistic regression test showed that subjects who had a body length of less than 48 cm were at risk of stunting 6.38 times greater than those whose body length was more or equal to 48 cm (OR = 6.38, 95% CI: 1.83-22.24). The distribution of subjects based on birth weight data shows that most stunted children have a birth weight < 2500 grams as many as 33 children (29.5%), while normal children have a birth weight ≥ 2500 grams as many as 53 children (47.3%). In this study it was found that birth weight less than 2,500 g had a risk of experiencing stunting 6.73 times greater than those with birth weight greater than or equal to 2,500 g (OR=6.73, 95% CI: 1.28-35.27). The subjects mostly had a current weight classified as normal as many as 30 children (26.8%) in the stunting group and 38 children (33.9%) in the normal group. In stunted children whose current body weight is classified as less as 21 children (18.8%) and 1 child (0.9%) in normal children. Subjects who are currently underweight are at risk of experiencing stunting

15.59 times greater than normal (OR: 15.59; 95% CI: 1.67-145.29) (Table 1).

Table 1: The influence of child characteristics on stunting.

Variables	Stunting	Normal	Total	P value	OR (95% IC)
	N (%)	N (%)	N (%)		
Characteristics of toddlers					
Birth length					
<48 cm	43 (38.4)	8 (7.1)	51 (45.5)	0.004*	6.38 (1.83-22.24)
≥48 cm	13 (11.6)	48 (42.9)	61 (54.5)		
Birth weight					
<2,500 g	33 (29.5)	3 (2.7)	36 (32.1)	0.024*	6.73 (1.28-35.27)
≥2,500 g	23 (20.5)	53 (47.3)	76 (67.9)		
Current weight					
Less	21 (18.8)	1 (0.9)	22 (19.6)	0.016*	15.59 (1.67-45.29)
Normal	30 (26.8)	38 (22.9)	68 (60.9)		
Overweight risk	5 (4.5)	17 (15.2)	22 (19.6)		

Table 2: The influence of maternal characteristics on stunting.

Variables	Stunting N (%)	Normal N (%)	Total N (%)	P value	OR (95% IC)
Mother's characteristics					
History of anemia during pregnancy					
Anemia (Hb≤11g/dL)	37 (33)	3 (2.7)	40 (35.7)	0.000*	19.60 (4.52-85.02)
Normal (Hb>11g/dL)	19 (17)	53 (47.3)	72 (64.3)		
ANC history during pregnancy					
< 6 times	40 (35.7)	2 (1.8)	42 (37.5)	0.000*	41.88 (8.23-212.92)
≥6 times	16 (14.3)	54 (48.2)	70 (62.5)		

Most mothers with stunted children had a history of anemia during pregnancy as many as 37 mothers (33%) while mothers with normal children mostly did not have a history of anemia during pregnancy as many as 53 mothers (47.3%). The results of the analysis on the characteristics of mothers where toddlers whose mothers have a history of anemia (Hb ≤11 g/dL) during pregnancy have a risk of experiencing stunting 19.60 times greater than toddlers whose mothers do not have a history of anemia during pregnancy (Hb >11 g/dL) (OR=19.60; 95% CI:4.52-85.02). Most mothers who had a history of ANC <6 times had stunted children at 35.7% (40 mothers), while mothers who had a history of ANC ≥6 times had normal children at 48.2% (54 mothers). Toddlers whose mothers had a history of ANC less than 6 times during pregnancy had a 41.88 times greater risk than toddlers whose mothers had a history of ANC more than or equal to 6 times during pregnancy (OR=41.88, 95% CI: 8.23-212.92) (Table 2).

This study found that children who frequently (>7x/year) had acute respiratory infections were 42 children (37.5%) in the stunting group and 4 children (3.6%) in the normal group. Meanwhile, children who were not frequently (<7x/year) affected by acute respiratory infections were 14 children (12.5%) in the stunting group and 52 children (46.4%) in the normal group. The results of the analysis show that toddlers who often experience frequency of

respiratory infection (>7x/year) have a risk of 82.48 times greater than toddlers who not often experience frequency of respiratory infection (<7x/year) (OR=39.00; 95% CI:11.95-127.33). Children who often (>2x/3 months) had diarrhea were 22 children (19.6%) in the stunting group and 12 children (10.7%) in the normal group. whereas, children who rarely (≤2x/3 months) had diarrhea were 34 children (30.4%) in the stunting group and 44 children (39.3%) in the normal group. Frequent toddlers (> last 2x/3 months) experiencing diarrhea also have a risk of experiencing stunting, which is 9.00 times greater than toddlers who rarely experience diarrhea (≤2x/last 3 months) (OR=2.37; 95% CI:1.031-5.46) (Table 3).

In this study, 41 children (36.6%) in the stunting group did not receive early breastfeeding initiation, 42 children (37.5%) in the stunting group did not receive exclusive breastfeeding, 42 children (37.5%) in the stunting group did not receive breastfeeding for 6-24 months, and 42 children (37.5%) in the stunting group received complementary food for less than 6 months. The analysis showed that toddlers who received early breastfeeding initiation at birth could prevent stunting by 67% compared to toddlers who did not receive early breastfeeding initiation (OR = 0.33; 95% CI: 0.14-0.75). Exclusively breastfed toddlers can prevent stunting by 59% compared to those who are not exclusively breastfed (OR=0.41, 95% CI: 0.18-0.94). Children aged 6-24

months who were breastfed prevented 61% of stunting compared to those who were not breastfed (OR=0.39; 95% CI: 0.17-0.88). Poor complementary feeding

practices had a 2.60 times greater risk of stunting compared to good complementary feeding practices (OR=2.6; 95% CI: 1.17-5.79) (Table 4).

Table 3: The influence of infection disease on stunting.

Variables	Stunting N (%)	Normal N (%)	Total N (%)	P value	OR (95% IC)
Infectious disease					
Frequency of respiratory infection					
Frequent (>7x/year)	42 (37.5)	4 (3.6)	46 (41.1)	0.000*	39.00 (11.95-127.334)
Not often (<7x/year)	14 (12.5)	52 (46.4)	66 (58.9)		
Frequency of diarrhea					
Frequent (>2x/last 3 months)	22 (19.6)	12 (10.7)	34 (30.4)	0.001*	2.37
Rare (≤2x/last 3 months)	34 (30.4)	44 (39.3)	78 (69.6)		(1.03-5.46)

Table 4: The influence of IYCF practices on stunting.

Variables	Stunting N (%)	Normal N (%)	Total N (%)	P value	OR (95% IC)
IYCF practices					
Early breastfeeding initiation					
Yes	15 (13.4)	30 (26.8)	45 (40.2)	0.008*	0.33 (0.15 – 0.75)
No	41 (36.6)	26 (23.2)	67 (59.8)		
Exclusive breastfeeding					
Yes	14 (12.5)	26 (23.2)	40 (35.7)	0.034*	0.41 (0.18 – 0.94)
No	42 (37.5)	30 (26.8)	72 (64.3)		
6-24 months breastfeeding					
Yes	14 (12.5)	26 (23.2)	40 (35.7)	0.019*	0.39 (0.17 – 0.86)
No	42 (37.5)	30 (26.8)	72 (64.3)		
Complementary feeding practices					
< 6 months	42 (37.5)	30 (26.8)	72 (64.3)	0.019*	2.60 (1.17 – 5.79)
≥6 months	14 (12.5)	26 (23.2)	40 (35.7)		

Table 5: The influence of protein intake on stunting.

Variables	Stunting N (%)	Normal N (%)	Total N (%)	P value	OR (95% IC)
Protein intake					
Protein sufficiency level					
Deficit (<89%)	30 (26.8)	6 (5.4)	36 (32.1)	0.000*	6.74 (3.52-12.94)
Normal (90-119%)	21 (18.8)	9 (8)	30 (26.8)		
More (≥120%)	5 (4.5)	41 (36.6)	46 (41.1)		
Consumption of animal protein sources					
≤12% of total calories	55 (49,1)	46 (41,1)	101 (90,2)	0,020*	11,957 (1,475-96,919)
>12% of total calories	1 (0.9)	10 (8.9)	11 (9.8)		

In the stunting group, 30 children (26.8%) experienced a deficit in protein adequacy levels and 6 children (5.4%) in the normal group, while 41 children (36.6%) experienced an excess level of protein adequacy. Toddlers who experience a deficit in the level of protein adequacy have a risk of 6.75 times greater than toddlers who do not experience a deficit (OR=6.75, 95% CI: 3.52-12.94). Most subjects in both the stunting group and the normal group showed that food consumption of animal protein

sources was less than 12% of total calories, namely 49.11% in the stunting group and 41.07% in the normal group. However, subjects whose food consumption of animal protein sources was more than 12% of total calories in the normal group were more than in the stunting group, namely 8.93%. Children whose food consumption of animal protein sources was ≤12% of total energy had an 11.9 times greater risk of being stunted compared to children whose food consumption of animal

protein sources was >12% of total energy (OR=11.957; CI95%: 1.475-96.919) (Table 5).

In subjects found to have the habit of eating with family as many as 35 children (31.3%) in the stunting group and 45 children (40.2%) in the normal group. while subjects who did not have the habit of eating together were 21 children (18.8%) in the stunting group and 11 children (9.8%) in the normal group (Figure 1).

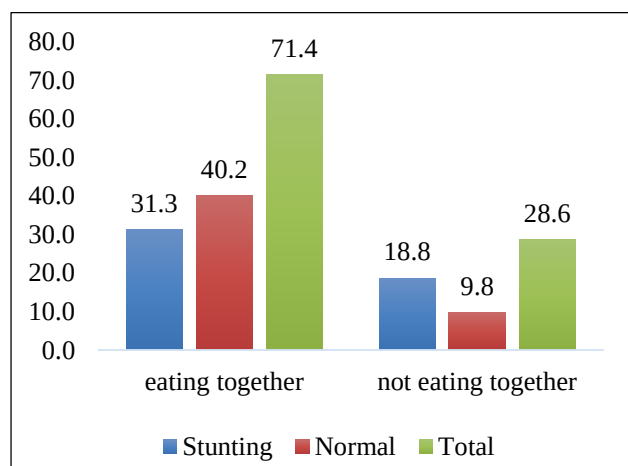


Figure 1: Family eating habits.

DISCUSSION

Stunting is a condition of growth failure in children under five due to chronic malnutrition so that children are too short for their age. Stunting is caused by multi-dimensional factors and is not only caused by malnutrition experienced by pregnant women and children under five. Stunting is a condition of failure to thrive in children under five due to chronic malnutrition so that children are too short for their age.¹⁰ In this study it was found that children with female gender experienced more stunting than male (female 27.7%, male 22.3%). This is in line with previous research in North Bijai which shows that women experience more stunting than male.¹¹ In some regions in Indonesia, especially women and girls receive lower priority than men and male in food consumption arrangements, making them vulnerable to unequal food distribution.¹²

Based on Table 1, the results of the analysis show that the characteristics of toddlers consisting of birth length, birth weight and current weight are factors that significantly influence the incidence of stunting. Subjects with a body length of less than 48 cm had a risk of experiencing stunting 6.38 times greater than those with a body length of more or equal to 48 cm (OR=6.38). This is in line with previous research showed that toddlers with low birth length had a 4.09 times the risk of experiencing stunting.¹³ Another study using the literature review method shows that short birth length is at risk of 16, Stunted 4 times.³ Low birth length indicates that the child

when in the womb experiences a lack of nutrient intake so that the impact on the child's growth is not optimal.¹⁴

In this study it was found that birth weight less than 2,500 g had a risk of experiencing stunting 6.73 times greater than those with birth weight greater than or equal to 2,500 g (OR=6.73). This is in line with previous research which shows that birth weight <2,500 g has a significant effect on the incidence of stunting and has a risk of experiencing stunting of 3.82 times.¹⁵ Besides that, it is also strengthened by the previous research in Ethiopia which showed that low birth weight was a risk factor for stunting, where birth weight less than 2,500 g had a 5.3 times risk of experiencing stunting (OR=5.3). Birth weight is a strong basis for determining size in later life. Low birth weight is very detrimental to the health and development of toddler. In malnourished toddler there is a decrease in growth hormone (IGF-1) and thyroid hormone which leads to lower linear growth.¹⁶

Subjects who are currently underweight are at risk of experiencing stunting 15.59 times greater than normal (OR: 15.59) is the result of an analysis that was also found in this study. Other research that supports the which showed that the problem of not gaining more than 2 times more weight was found in toddlers in the 13-24 month age group, where this condition was 2.105 times the risk of stunting (OR=2.105).¹⁷ This weight that does not increase will affect the condition of being underweight if not treated quickly. Stunting is always preceded by a slowing of weight gain (weight faltering) which can occur from in utero and continues after birth.

The results of the analysis on the characteristics of mothers where toddlers whose mothers have a history of anemia (Hb $\leq$ 11 g/dL) during pregnancy have a risk of experiencing stunting 19.60 times greater than toddlers whose mothers do not have a history of anemia during pregnancy (Hb > 11 g/dL) (OR=19.60). In addition, toddlers whose mothers had a history of ANC less than 6 times during pregnancy had a 41.88 times greater risk than toddlers whose mothers had a history of ANC more than or equal to 6 times during pregnancy (OR=41.88, 95% CI: 8.23-212.92). This is in line with previous research showed that toddler of mothers who had a history of anemia during pregnancy had a 4.471 times greater risk of experiencing stunting compared to mothers who were not anemic (OR=4.471).¹⁸ In addition, a review of related articles found that mothers who made fewer than four antenatal care (ANC) visits during pregnancy were more likely to have toddler aged 0-23 stunted compared to four or more visits (OR=1.70).^{19,20} In addition, a previous study showed that mothers who did not perform ANC during pregnancy had a 3.4 times risk of giving birth to stunted toddler compared to mothers who did ANC during pregnancy.³ Antenatal Care (ANC) is a comprehensive and quality health service that is carried out through the provision of education and medical treatment for pregnant women with the aim of keeping the mother healthy during pregnancy until

delivery as well as for the fetus that is conceived until it is born.²¹ Regular ANC visits can detect early risks of pregnancy in mothers, especially those related to nutritional problems. Mothers who make ANC visits as recommended have a lower risk of having stunted toddler.¹³

A history of infectious diseases consisting of frequency of respiratory infections and diarrhea in this study is also a risk factor that influences the incidence of stunting. The results of the analysis show that toddlers who often experience frequency of respiratory infection ($>7x/year$) have a risk of 82.48 times greater than toddlers who not often experience frequency of respiratory infection ($<7x/year$) (OR=82.48). Frequent toddlers ($>last\ 2x/3\ months$) experiencing diarrhea also have a risk of experiencing stunting, which is 9.00 times greater than toddlers who rarely experience diarrhea ($\leq 2x/last\ 3\ months$) (OR=9.00) (Table 1). This is in line with previous research shows that a history of infectious diseases (acute respiratory infections and diarrhea) has 8.33 times the risk of experiencing stunting (OR=8.33).²² Other research that is in line showed that toddler who were frequently exposed to infectious diseases were 8.84 times more likely to experience stunting than those who had but rarely (OR=8.84).²³ In addition, the risk of stunting is 5.537 times greater in toddlers who experience diarrheal infection (OR=5.537).²⁴ As well as previous research shows that toddler who have been exposed to frequency of respiratory infection 3 for two weeks.²⁵

Inappropriate IYCF practices are also a risk factor for stunting. IYCF practices in this study consisted of early breastfeeding initiation, exclusive breastfeeding, breastfeeding 6-4 months, and complementary feeding, all of which were proven to be risk factors for stunting ($p<0.05$). Based on Table 1, the analysis showed that toddlers who received early breastfeeding initiation at birth could prevent stunting by 67% compared to those who did not receive early breastfeeding initiation (OR=0.33). Children who are exclusively breastfed can prevent stunting 59% compared to those who are exclusively breastfed (OR=0.41). Children aged 6-24 months who are breastfed can avoid stunting by 61% compared to those who are not breastfed (OR=0.39). Poor complementary feeding practices had a 2.6 times greater risk of stunting compared to good complementary feeding practices (OR=2.6). Late initiation of breastfeeding after one hour of birth had a 5.16 times greater risk of stunting.²⁵ In addition, another study showed that breastfeeding for less than 2 years had a 5.61 times greater risk of stunting compared to those breastfed for 2 years or more and toddlers who were exclusively breastfed for less than 6 months had a 3.27 times greater risk of stunting compared to those exclusively breastfed for the first 6 months.²⁶

Toddlers who experience a deficit in the level of protein adequacy have a risk of 6.75 times greater than toddlers who do not experience a deficit (OR=6.75). This is in line

with previous research in Keerom Regency, Papua, showed that toddler with low protein intake were 13.77 times more likely to experience stunting than toddler with sufficient protein intake (OR=13.77).⁹ It is also reinforced by the others findings show that low protein intake has a 1.71 times higher risk of causing stunting (OR=1.71).²⁷

The habit of eating with family is also one of the things that affects toddler's nutritional intake. Eating with family can cause feelings of happiness in toddler that support good nutritional intake in toddler, one of which is a better appetite. The habit of eating with family includes aspects of behavior formation such as thoughts and feelings.²⁸ Most of the subjects had the habit of eating with family (71.4%). Subjects who had the habit of eating with their family were more common in the normal group (40.2%). Likewise, in the stunting group, most subjects had the habit of eating with family (31.1%). Meanwhile, subjects who did not have the habit of eating with the family were 28.6%, where in the stunting group more than the normal group, namely 18.8% in the stunting group and 9.8% in the normal group. In Papuan coastal communities, food is used as a means of communication, where based on the way food is distributed in the family, coastal communities adhere to a system of eating together, where all families sit together and eat together when meal time arrives. This is done with the aim of establishing togetherness and kinship between families. Apart from within the family, this is also commonly done during traditional parties or wedding parties. Usually there will be a big cooking event and eating together.²⁹

This research was conducted limited to the coastal area of Nabire district so that it could not describe the overall condition of Nabire district. Where the Nabire Regency area itself includes mountainous and coastal areas so that further analysis is needed in other areas of Nabire Regency to support optimal interventions as a priority program for handling and preventing stunting in Nabire Regency. Then, the analysis related to infectious diseases in this study is limited to respiratory infections and diarrhea. This is because other infectious diseases such as HIV/AIDS, Sexually Transmitted Infections (STIs), malaria, and tetanus have a high prevalence and are among the top ten highest cases. In addition, the limitation of this study is that it does not specifically look at the consumption of food sources of protein in each type of food such as eggs, milk, meat, and fish. So that further research can be analyzed further regarding this matter.

CONCLUSION

Nabire Regency with its diversity of socio-cultural life, and unique geographical conditions, certainly has problems and determinants of stunting that are different from other parts of Indonesia. In this study, most of the subjects were female, parents had a medium level of education, namely SMA / equivalent, the distribution of parents' occupations showed that both stunted and normal children worked more as fishermen, most household

incomes were classified as less than the minimum wage, most household expenses were classified as large ($\geq 60\%$), and most of them were Papuan ethnicity. Risk factors for stunting consisted of low birth length, low birth weight, current underweight, mothers who had a history of anemia during pregnancy, a history of ANC less than 6 times during pregnancy, frequency of frequent sore throat, frequency of frequent diarrhea, toddlers who did not get IMD, toddlers who did not get exclusive breastfeeding, toddlers who did not get breastfeeding at the age of 6-24 months, poor complementary feeding practices, protein intake deficits, and food consumption of animal protein sources $<12\%$ of total energy.

Recommendations

Furthermore, the recommendation that can be given is the need to consider the risk factors for stunting in determining local government policies and regulations so that the optimization of handling and preventing stunting in the Nabire Regency area can be realized properly. Further research is recommended to be able to further analyze several infectious diseases that occur in Nabire Regency such as HIV/AIDS, STIs (sexually transmitted infections), malaria, and tetanus which have not been analyzed in this study, which are currently high in Nabire Regency. In addition, interventions using the concept of positive deviance are considered good to use in handling stunting because by looking at the same sample conditions (socioeconomic) but there are sample groups that are not problematic.

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