



Energy, Protein and Calcium Intake are Determinants of Stunting in Toddler Aged 24 - 59 Months in Muna District

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Abstract

Stunting is a condition of failure to thrive in toddlers due to malnutrition, so toddlers are too short for their age. This study aimed to determine the factors related to the incidence of toddlers aged 24-59 months in the work area of the Lohia Health Center, Muna Regency. The research method used is an observational quantitative analytic study with a case-control study design using Chi-Square and Odds Ratio (OR) tests. The results showed a relationship between the incidence of stunting with p-value <0.05, namely energy intake (p-value 0.000 OR = 6.103), protein intake (p-value 0.000 OR = 22.671), and calcium intake (p-value 0.000 OR = 11.444), history of exclusive breastfeeding (p-value 0.000 OR = 4.563), level of knowledge (p-value 0.016 OR = 2.696), income level (p-value 0.000 OR = 5.317). The history of LBW is not associated with stunting (p-value 0.366 > 0.05 OR = 4.171). The results of the multivariate analysis of protein intake had the highest risk of stunting (p-value = 0.000 OR = 11.879 95% CI 3.685 – 38.300). Protein intake is the most dominant risk factor for stunting.

Keywords: Energy Intake, Calcium Intake, Protein Intake, Stunting, Toddler Age 24-59 Months

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1. Introduction

Stunting is a condition of growth failure in toddlers due to chronic malnutrition so that toddlers 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 toddlers. The most decisive intervention to be able to reduce the prevalence of stunting therefore needs to be done in the First 1,000 Days of Life (HPK) in toddlers [1].

Factors that cause stunting are influenced by low access to food in terms of quantity and quality of nutrition, and often not diverse. Then another factor that is thought to be the cause of stunting is the mother's pregnancy history which includes the mother's posture (short), the distance of pregnancy, the mother's age when pregnant is too young (under 20 years) at risk of giving birth to babies with low birth weight (BBLR) then other factors are not implementing Early Breastfeeding Initiation (IMD), failure of exclusive breastfeeding and early weaning process. In addition to these

factors, socioeconomic conditions and sanitation are also related to stunting [2].

Based on 2017 data in the Joint Child Malnutrition Estimates, the Asian continent contributes 55% of the proportion of stunted toddlers in the world, while the proportion of stunted toddlers is one third from the African continent, which is 38%. The 55% proportion of toddlers comes from South Asia, 58.7%, followed by Southeast Asia (14.9%) in second place, while the lowest proportion of stunted toddlers comes from Central Asia at 0.9% [3].

Data on the prevalence of stunting among children under five collected by the World Health Organization (WHO), Indonesia is the third country with the highest prevalence in the Southeast Asia/South-East Asia Regional (SEAR) region. The average prevalence of stunting in Indonesia from 2005-2017 was 36.4%. The incidence of stunting is one of the nutritional problems experienced by

toddlers in the world today. In 2017 22.2% or around 150.8 million toddlers in the world were stunted [2].

The incidence of stunting in Southeast Sulawesi according to the Indonesian Health Profile in 2017 and the Ministry of Health of the Republic of Indonesia in 2019 shows the incidence of stunting was 21.20% in 2017, and increased in 2018, namely 28.27% and in 2019 it increased further, namely 31.4% [4].

Based on data from the Muna Regency Health Office in 2019 the incidence of stunting in Lohia District ranked first with the highest case of stunting in Muna Regency with a prevalence of stunting incidence of 39.6% in 2020 the prevalence of stunting incidence ranked first was South Wakorumba District with 31.84% and Lohia District was ranked eighth with a prevalence of 22.47%. Then based on data from the Lohia Health Center in 2020 for ages 24-59 with a target number of 82 people who are stunted as many as 42 people, and in 2021 with a target number of 218 people who are stunted 82 people. Where the incidence of stunting may continue to increase if the factors previously described are not considered. Therefore, this study aims to analyze the factors associated with the incidence of stunting in toddlers aged 24-59 months in the Lohia Health Center Working Area, Muna District.

2. Methods

This study used a case control study design. The population in this study were all toddlers aged 24-59 months who conducted examinations and recorded data at the Lohia District Health Center. Calculation of the number of samples as many as 148 samples, namely case samples 74 toddlers and control samples 74 toddlers. The sampling technique used in this study was random sampling technique. Respondents in this study were mothers of toddlers and the sample was toddlers.

3. Results and Discussions

Based on the results of the study, the characteristics of the respondents showed that most of the respondents were at the age of 35-44 years, namely with a total of 85 respondents from the stunting group 45 people (52.9%) and the non-stunting group 40 people (47.1%). While the age of the least respondents was 15-24 years old with 2 respondents (100%) and came from the stunting group.

Distribution based on age showed that all respondents were female 148 respondents (100%) consisting of 74 people in the case group (50%) and the control group (50%). The respondents who had the most toddler age were 36-47 months old with a total of 60 toddlers consisting of a stunting group of 28 toddlers (46.7%) and a non-stunting group of 32 toddlers (53.3%), while the least was 48-59 months old as many as 35 toddlers consisting of a stunting group of 18 toddlers (51.4%) and a non-stunting group of 17 toddlers (48.6%). The distribution based on gender shows that respondents who have toddlers of the most sex are women totaling 80 toddlers consisting of a stunting group of 40 toddlers (50.0%) and a non-stunting group of 40 toddlers (50.0%) while respondents who have male toddlers totaled 68

consisting of 34 toddlers from the stunting group (50.0%) and 34 from the non-stunting group (50.0%).

The results of this study state that energy intake is a factor associated with the incidence in toddlers in the Lohia Health Center Working Area where toddlers with low energy intake have a risk of 6.103 times compared to toddlers who have normal energy intake. In this study of 74 toddlers who were a case group 45 of them had low energy intake, besides that the results of this study also showed 29 toddlers out of 74 of the toddlers in the case group had sufficient energy intake but were still in a state. Children under five with stunting have a low level of development compared to children who have normal nutritional status [5].

Based on the 2x24 hour food recall interview in the field, it is known that the condition of toddlers whose energy intake is sufficient is due to the amount of food intake consumed by the toddler meeting the amount of calorie needs. While the condition of toddlers whose energy intake is less is caused by several factors, namely toddlers consuming small amounts of food, appetite also affects the amount of food intake consumed by toddlers so that it affects the amount of energy intake in toddlers, besides that some toddlers are also picky in consuming food which adversely affects the adequacy of the toddler's energy intake needs.

Energy deficiency in toddlers is an indication of deficiencies in other nutrients. The frequency of food consumption can be a predictor of nutrient adequacy, while energy adequacy is used to maintain body functions, muscle activity and growth, and protein adequacy is used for growth and maintenance of body tissues, regulators and as fuel [6].

The results of this study are in line with previous research conducted by Nugraheni et al, (2020) in Central Java, namely less energy intake, has an association with the incidence of stunting with a value (p -value = 0.001) and a value (OR = 1.495). Meanwhile, this study is not in line with research conducted by Syabandini et al, (2018) in the fishing area of Tambak Lorok Village, Semarang. The results of the chi square test obtained a value (p -value = 0.279) which means that there is no relationship between the level of energy adequacy and the incidence of stunting and OR > 1 indicates that the variables studied tend to be risk factors, but there is not enough evidence to be declared as risk factors. [7], [8].

The results of this study state that protein intake is associated with the incidence of stunting in the Lohia Health Center Working Area where toddlers with low protein intake have a risk of 22.671 times compared to toddlers who have normal protein intake. In this study 74 toddlers who were the case group 46 of them had low protein intake, besides this study also showed 28 of the 74 toddlers in the case group had adequate protein intake but were still in a stunted state. The results of this study also explain if protein is associated with toddler height, there are toddlers who have normal height who experience protein deficiency. Even on the contrary, toddlers whose height is short are currently having a good protein intake.

Table 1: Characteristics of respondents aged 24-59 months in Lohia District, Muna District

Variable	Jumlah			
	Case		Control	
	n	%	n	%
Energy intake				
Low	45	75.0	15	25.0
Moderate	29	33.0	59	67.0
Protein intake				
Low	46	90.2	5	9.8
Moderate	28	28.9	69	71.1
Calcium intake				
Low	66	68.0	31	32.0
Moderate	8	15.7	43	84.3
Exclusive breastfeeding history				
Yes	18	29.0	44	71.0
No	56	65.1	30	34.9
Low Birth Weight (LBW) history				
Yes	4	80.0	1	20.0
No	70	49.0	73	51.0
Knowledge levels				
Low	61	56.5	47	43.5
High	13	32.5	27	67.5
Income levels				
Low	58	65.9	30	34.1
High	16	26.7	44	73.3

Table 2: Relationship between energy intake, protein intake, calcium intake, exclusive breastfeeding history, LBW history, knowledge level, and income level with the incidence of stunting in Lohia sub-district, Muna district

Independent Variables	Occurrence of Stunting				Total		P – Value	OR	CI
	Case		Control		n	%			
	n	%	n	%					
Energy intake							0,000	6.103	2.929 - 12.718
Low	45	75,0	15	25,0	60	100%			
Moderate	29	33,0	59	67,0	88	100%			
Protein intake							0,000	22,671	8.158 - 63.004
Low	46	90,2	5	9,8	51	100%			
Moderate	28	28,9	69	71,1	97	100%			
Calcium intake							0,000	11.444	4.809- 27.232
Low	66	68,0	31	32,0	97	100%			
Moderate	8	15,7	43	84,3	51	100%			
Exclusif breastfeeding history									
Yes	18	29.0	44	71.0	62	100%	0,000	4,563	2,254- 9,237
No	56	65.1	30	34.9	86	100%			
LBW history							0,366	4,171	0,455- 38,243
Yes	4	80,0	1	20,0	5	100%			
No	70	49,0	73	51,0	143	100%			
Knowledge levels							0,016	2,696	1.257- 5.782
Low	61	56,5	47	43,5	108	100%			
High	13	32,5	27	67,5	40	100%			
Income levels							0,000	5.317	2.582- 10.948
Low	58	65,9	30	34,1	88	100%			
High	16	26,7	44	73,3	60	100%			

Table 3. Risk factors for stunting among children aged 24-59 months in Lohia sub-district, Muna district

Variable	Koef.β	P-Value	OR	95% CI
Protein intake	2,475	0,000	11,879	3,685 – 38,300
Exclusif breastfeeding history	1,491	0,003	4,443	1,687 – 11,701
Calcium intake	1,160	0,054	3,189	0,981 – 10,366
Knowledge levels	0,855	0,103	2,352	0,842 – 6,570
Energy intake	0,340	0,534	1,405	0,481 - 4,107
Income levels	0,054	0,924	1,005	0,351- 3,174

Based on the 2x24 hour food recall interview in the field, it is known that toddlers who have an adequate level of protein intake because the toddler consumes foods that contain high protein such as fish, eggs, tofu, tempeh and so on and other conditions that have an influence on protein adequacy in toddlers, namely the level of parental knowledge of nutritional needs in toddlers. While the condition of toddlers who have a low level of protein intake is caused by several factors in addition to appetite, most toddlers choose food so that it is quite difficult for parents to complete the nutritional needs of these toddlers, and besides that the parenting patterns of some parents are also not good where toddlers are often given snacks and always follow the wishes of toddlers who eat instant noodles on the grounds that their children want to eat, this is the reason for the lack of protein intake in toddlers. Toddlers who experience a deficiency in protein intake that lasts a long time even though their energy intake is sufficient will experience stunted height growth so that they will experience stunting [9].

The relationship between protein and growth causes a toddler who lacks protein intake to experience slower growth than a toddler with sufficient protein intake and in worse circumstances protein deficiency over a long period of time can result in the cessation of the growth process. Protein intake is needed more for growth, child development and bone formation [10], [11]. This research is in line with research conducted by Aisyah & Yunianto, 2021 in Karanganyar Village, Tasimalaya City with the results of Chi-Square, namely the level of protein consumption is a risk factor for stunting (p-value = 0.000) OR = 5.160. In addition, other research conducted by Gunawan & Seprina, 2019 based on the chi square test there is a significant relationship between protein intake and the incidence of stunting in toddlers (p < 0.05) where the value (p-value = 0.009) [12], [13].

The results of this study state that calcium intake is associated with the incidence of stunting in the Lohia Health Center Working Area where toddlers with low calcium intake have a risk of 11.444 times compared to toddlers who have normal calcium intake. In this study 74 toddlers who were the case group 66 of them had low calcium intake, besides that the results of this study also showed 8 toddlers out of 74 toddlers in the case group had adequate calcium intake but were still in a stunted state.

Based on the 2x24 hour food recall interview, it is known that toddlers who have sufficient calcium intake are due to the toddler consuming foods or drinks that contain high calcium such as milk. While toddlers who have a low level of calcium intake are caused by a lack of consuming foods or drinks that are high in calcium such as milk, cheese, yogurt

and others. Where these foods are still lacking to be consumed in the Lohia Health Center Working Area, besides that, in terms of price, it is quite expensive when viewed with the income level of the parents of toddlers who are sampled in this study, most of whom are construction workers.

The association of calcium intake with stunting is explained by the central role of calcium and bone. Stunting is the result of growth failure that decreases the development and maturation of bone chondrocytes. Calcium is the main constituent of the bone chondrocyte matrix. Chondrocytes are the part of the bone that responds to growth hormone and oversees the process of bone formation. Adequate calcium intake can help protect bones throughout our lives while in toddlers, adequate calcium intake can help produce bone mass [8].

This study is also in line with research conducted by Wati, 2021 where the results of statistical tests with the chi-square test obtained a p-value = 0.046 (<0.05) so this shows that there is a significant relationship between calcium intake and the incidence of stunting with an OR value = 5.400, meaning that children under five who lack calcium intake have a 5.400 times higher risk of being stunted than children under five who have adequate calcium intake. In addition, other studies that are in line with the research are research conducted by Ferani, 2019 in the Siulak Mukai Kerinci Jambi Health Center Working Area which shows that calcium intake has a statistically significant relationship with the incidence of stunting with an OR value = 20.727, meaning that toddlers with insufficient calcium intake have a risk of 20.727 times suffering from stunting compared to toddlers with adequate calcium intake [14], [15].

In this study, 74 toddlers who were the case group, 56 of whom did not have a history of exclusive breastfeeding, and 18 of the 74 toddlers in the case group had a history of exclusive breastfeeding but were still stunted. In this study 74 toddlers who were the case group 56 of them did not have a history of exclusive breastfeeding, besides that 18 of the 74 toddlers in the case group had a history of exclusive breastfeeding but were still in a state.

Based on interviews and field observations in the field, it is known that the circumstances that cause mothers not to provide exclusive breastfeeding to their babies in the Lohia Health Center Working Area are giving complementary foods to toddlers who are under 6 months of age, when newborns are given formula milk for help when breast milk (ASI) has not come out, babies who do not want to accept breast milk and prefer formula milk and some mothers still believe in customs by doing various food restrictions so that it has an impact on the amount of breast milk that is insufficient so that it is assisted by formula milk.

Human milk is a nutritional intake that is in accordance with the needs will help the growth and development of children. Babies who do not get enough breast milk have poor nutritional intake and can cause malnutrition, one of which can cause stunting [16]. The benefits of exclusive breastfeeding for infants include complete nutrition, increased body power, increased mental intelligence and stable emotional and spiritual maturity followed by good social development, easy to digest and absorb, has a composition of fat, carbohydrates, calories, protein and vitamins, protection of infectious diseases, allergic protection because breast milk contains antibodies, provides stimulation of intelligence and nerves, improves optimal health and intelligence [17]. The lack of exclusive breastfeeding is one of the triggers for stunting in children under five, which is caused by past events and will have an impact on the future of children under five, otherwise good breastfeeding will help maintain the nutritional balance of children so that normal and optimal child growth is achieved [18].

However, the results of this study are not in line with research conducted by Chyntia, Suryawan, & Widiassa, 2019, namely the results of hypothesis testing in their research using the chi square test with a p-value of 0.604. Because the p-value > 0.05, it can be concluded that there is no significant relationship between exclusive breastfeeding and the incidence of stunting in children aged 12-59 months. While this study is in line with research conducted by Fitri & Ernita, 2019 statistically obtained p value = 0.000 < α 0.05, it can be concluded that there is a significant relationship between exclusive breastfeeding and the incidence of stunting in toddlers in the working area of the Sidomulyo Pekanbaru Inpatient Health Center [18], [19].

Results of this study indicate that the history of low birth weight (LBW) is not associated with the incidence of stunting in the Lohia Health Center Working Area where (p-value 0.366 > 0.05) this is because most toddlers, both from the case and control groups do not have a history of LBW where the case group there are 70 of 74 toddlers and the control group 73 of 74 toddlers who do not have a history of LBW. This is due to the fact that pregnant women in the Lohia Health Center Working Area are active enough to come to the posyandu to get monitoring and education from midwives, and it is one of the steps to avoid the occurrence of low birth weight in their babies (LBW).

Results of this study are in line with research conducted by Maulidah, Rohmawati, & Sulis, 2019 Based on the results of the analysis using the Chi Square test obtained a value of p = 0.737, indicating that there is no significant relationship between the history of LBW with the incidence of stunting in toddlers in Panduman Village, Jelbuk District, Jember Regency. While this study is not in line with research conducted by Fitri L., 2018 where the chi-square results obtained a p value of 0.000 < 0.05, it can be concluded that there is a significant relationship between low birth weight and the incidence of stunting in toddlers at the Fifty Health Center [20], [21].

Furthermore, the results of this study state that the level of parental knowledge is associated with the incidence of stunting in the Lohia Health Center Working Area where toddlers with a low level of parental knowledge have a risk of 2.696 times compared to toddlers who have a high level of parental knowledge. In this study 74 toddlers who were a case
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group 61 of them had parents with low levels of knowledge, besides 74 toddlers from the control group 47 toddlers had parents with low levels of knowledge.

Based on the results of interviews and observations in the field, some parents are still confused about the nutritional content of some of the food ingredients listed in the questionnaire, this is due to the lack of education obtained by the community regarding information about nutrition and the level of education in the community, especially mothers, which is also one of the factors of low knowledge levels in the Lohia Health Center Working Area community.

In addition, the results of this study showed that 13 out of 74 toddlers in the case group had parents with a high level of knowledge but were still stunted. Inadequate nutritional knowledge, lack of understanding of good eating habits, and lack of understanding of the nutritional contributions of various types of food will cause nutritional problems. In families where the mother's knowledge is low, children often eat by not meeting nutritional needs so that children can experience stunting [9].

This research is in line with research conducted by Based on the results of research conducted by Ari, 2020, it is known to have a relationship between the level of maternal knowledge and the incidence of stunting in Teruman Hamlet, where the test results obtained are p-value = 0.000 OR = 0.208 (0.084-0. 519) and other studies that are in line, namely Oktavia S et al, (2017) in their research it can be concluded that maternal knowledge about nutrition that there is a relationship between maternal nutritional knowledge and the level of energy and protein adequacy of toddlers with a value of p=0.001 for energy and p=0.006 for protein, with a lack of knowledge about nutrition, especially in the mother, will have an impact on the lack of ability to apply information, especially about nutrition which will result in the nutritional status of toddlers [22], [23].

In this study, the income level of parents was associated with the incidence of stunting in the Lohia Health Center Working Area where toddlers with low parental income levels had a risk of 5.317 times compared to toddlers who had parents with high income levels. In this study 74 toddlers who were a case group 58 of them had parents with low-income levels, besides 74 toddlers from the control group 30 toddlers had parents with low-income levels.

Based on field observations for toddlers who have a high level of parental income, one or both parents have a permanent job, for example one of them is a civil servant or both parents work as traders in the market. While toddlers who have parents with low-income levels are caused by having parents who do not have a permanent job, namely the father working as a builder and the mother as a housewife (IRT) so that the amount of income cannot be ascertained every month.

This research also shows that 16 toddlers out of 74 toddlers in the case group have parents with high income levels but are still in a state. Socio-economic community is a factor that plays a role in determining the purchasing power of the family, families with high income will have easier access to education and health so that the nutritional status of children can be better [24].

However, this is in line with the results of Wahyuni & Fitriyuna's research, (2020) which shows that there is a significant relationship between income level and the incidence of stunting in Mataram Ilir Village, Seputih

Surabaya Subdistrict in 2019, another study that is also in line was conducted by Setiawan, Machmud, & Masru, 2018, which shows that there is a relationship between the level of parental income and the incidence of stunting in the Andalas Puskesmas Working Area, Padang Timur Subdistrict, Padang City in 2018 [25], [26].

4. Conclusions

Energy, protein and calcium intake as well as exclusive breastfeeding history, knowledge level and income level are factors associated with the incidence of stunting in the Lohia Health Center Working Area, Muna Regency. The greatest risk factor for stunting in the Lohia Health Center Working Area is protein intake with an OR = 11.879. Suggestions from researchers in this study for health workers to increase the role of nutritional surveillance, especially on stunting, namely by continuing to increase education to the community and paying attention to nutritional intake (energy, protein and calcium intake) of children from an early age and the importance of exclusive breastfeeding, because knowing earlier related to these things is expected to minimize the risk of stunting. For mothers who have children under five should be more concerned about increasing the food needs of toddlers so that toddlers can consume foods that contain adequate nutrients with a composition that is in accordance with the nutritional adequacy rate.

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