

RISK ANALYSIS OF STUNTING INCIDENCE OF TODDLERS IN MAJENE REGENCY, WEST SULAWESI

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ABSTRACT

Background: Stunting is a condition of failure to grow in toddlers due to chronic malnutrition, especially during the first 1,000 days of life. Less protein and zinc intake, history of low birth weight, and maternal height are predictors of stunting in <2 years toddlers.

Objective: To analyze the stunting risk factors in toddlers in Majene Regency, West Sulawesi.

Method: The case-control research design was employed for 58 cases and 58 control samples. The measurement of protein and zinc intake was completed by using a 24-hour food recall form, the birth weight and height of the mother were obtained by using a questionnaire. The data were analyzed using odd ratio and logistic regression.

Result: Those with less protein intake have 3.34 times higher risk of stunting, while those with less zinc intake have 34.46 times higher risk of stunting. Those with LBW history have 2.12 higher risk of stunting but not significant. Those whose mothers with short maternal height history have 1.85 times higher risk of stunting but not significant. Based on multivariate analysis, zinc intake is a risk factor for stunting (OR = 0.029 95% CI: 0.006-0.130).

Conclusion: Protein intake, zinc intake, low birth weight and maternal height history are risk factors for stunting occurrences.

Keywords: *stunting* protein; zinc; LBW; toddler

INTRODUCTION

Stunting is a public health problem due to chronic malnutrition and failure to grow conditions in toddlers, especially in the first 1,000 days of children's lives that they become very short for their age.^{1,2} Stunting can increase the risk of death in toddlers, poor cognitive and motor development, increased risk of obesity and non communicable diseases, and decreased productivity in adulthood.³ This is what caused losses in African and Asian countries up to 11% of their gross national products.⁴ In Indonesia, the incidence of stunting reached 30.8%. For West Sulawesi province, the prevalence of stunting is 39.7%.⁵

Intake of protein and zinc is a highly contributed factor to the problem of stunting. Quantity and quality of protein intake affect plasma insulin growth factor I (IGF I) as well as growth factors that play a role in bone formation.⁶ Zinc plays a role in the growth process. Based on the research, less zinc intake mostly occurs in stunting toddlers.⁷ One of the risk factors affecting the occurrence of stunting in toddlers is a history of low birth weight.⁸ Growth will be disrupted in LBW infants with inadequate nutritional intake and frequent infections that eventually will cause stunting.⁹ Family-related factors include a short maternal height that causes LBW due to impaired

blood flow in the uterus and impaired growth of the uterus, placenta and fetus of pregnant women with short bodies will let babies born with low body weight.¹⁰ Short mothers (height below 150 cm) that reflect poor nutritional status are likely to give birth to stunted children compared to normal height mothers.¹¹

Based on Majene District Health Office data, the prevalence of stunting was 106 cases in 2018. Majene Regency is one of the districts in West Sulawesi with a high prevalence of stunting. The purpose of this study was to analyze the risk factors of stunting incidence among toddlers aged 24-59 months in Majene Regency, West Sulawesi.

MATERIALS AND METHODS

This research used a case-control design, with inclusion criteria for toddlers aged 24-59 months in Majene Regency. The subjects comprised 58 stunting toddlers for cases and 58 non-stunting toddlers for control obtained by using purposive sampling. The variables in this study were protein intake, zinc intake, low birth weight, and maternal height history. Data were collected using microtoice to measure body height. The birth weight and height history of the mother were obtained from the MCH books. Protein

“RISK ANALYSIS OF STUNTING INCIDENCE OF TODDLERS IN MAJENE REGENCY, WEST SULAWESI”

and zinc intake data were obtained through food recall to the mother for 2x24 hours in sequential order. Data were analyzed in univariate, bivariate with odd ratio test and followed by a simple logistic regression multivariate test.

RESULT

Table 1 show that most toddlers have normal birth weight, toddler protein intake is categorized as sufficient, but toddler zinc intake is categorized as less. The history of antenatal care (ANC) belongs to the complete category. The mother's height history is mostly in the normal category.

Table 1 Characteristic of Respondents

Variable	Total (n)	Percentage (%)
History of ANC		
Complete	94	81
Incomplete	22	19
Birth Weight		
LBW	9	7.9
Normal	107	92.2
Mother's Height		
Short	42	36.2
Normal	74	63.8
Protein Intake		
Less	39	33.6
Enough	77	66.4
Zinc Intake		
Less	82	70.7
Enough	34	29.3

Risk analysis of Protein Intake and Zinc Intake

Adequate levels of protein and zinc are categorized as sufficient ($\geq 80\%$ RDA) and less

(<80% RDA). The insufficient level of protein in stunting children is 46.6% and the zinc adequacy rate in stunting children is 96.6% (Table 2). In normal toddlers, adequate protein intake is 79.3% and adequate zinc intake is 55.2%.

Table 2 shows that the risk factors for stunting are the intake of protein and zinc. The results of the odd ratio test show that protein intake had 3.339 times higher risk of stunting incidence. Zinc intake has 34.46 times higher risk of stunting incidence. The results of the multivariate analysis show that zinc intake is a factor that increases the risk of stunting incidence.

Table 2 Risk Analysis of Protein Intake and Zinc Intake

Variable	Stunting		Non Stunting		OR (95% CI)
	n	%	N	%	
Protein Intake					
Less	27	46.6	12	20.7	3.339 (1.473 – 7.569)
Enough	31	53.4	46	79.3	
Zinc Intake					
Less	56	96.6	26	44.8	34.46 (7.671 – 154.8)
Enough	2	3.4	32	55.2	

Risk Analysis of Low Birth Weight and Maternal Height History

Birth weight and height of the mother are risk factors for stunting incidence in toddlers. Birth weight is categorized as normal if the birth weight is ≥ 2500 grams. Low birth weight in stunted children is 10.3% while in normal

“RISK ANALYSIS OF STUNTING INCIDENCE OF TODDLERS IN MAJENE REGENCY, WEST SULAWESI”

toddlers, the normal birth weight is 94.8% (Table 3).

The height of the mother is categorized as normal if it is ≥ 150 cm. In children who suffer stunting, the history of short maternal height is 43.1% while in normal toddlers the history of normal maternal height is 70.7% (Table 3).

Table 3 shows that low birth weight has 2.12 times higher risk of causing stunting in toddlers. Likewise the mother's height, the short mother has 1.87 times higher risk of causing incidents of stunting. Regression test results show that zinc intake is the most influential on the incidence of stunting.

Table 3 Risk Analysis of Toddler Birth Weight and Maternal Height History

Variable	Stunting		Non Stunting		OR (95% CI)
	n	%	N	%	
Birth Weight					
LBW	6	10.3	3	5.2	2.12 (0.503 – 8.900)
Normal	52	89.7	55	94.8	
Mother's Height					
Short	25	43.1	17	29.3	1.87 (0.85 – 3.94)
Normal	33	56.9	41	70.7	

Table 4 Logistic Regression Test Results

Variabl e	B	SE	P	OR	95% CI
Zinc Intake	2.77 3	0.72 9	0.00 0	16.00 0	0.00 6 – 0.13 0

DISCUSSION

Insufficient intake of protein and zinc as well as a history of LBW and abnormal maternal height are the risk factors of stunting incidence in toddlers aged 24-59 months. The result yields that there is a relationship between protein intake with the incidence of stunting that they are 3.339 times more likely to suffer stunting. In previous research, the average protein intake is lower in stunting children compared to non-stunting children.⁶ The study in Pontianak revealed that the risk for stunting was 1.87 times higher in the stunting toddler group.¹² Protein intake is collected through food recall within 2 x 24 hours with a time that does not coincide, the food recall result showed that protein intake was low although not significant in the stunting toddler group. Less protein intake is a cause of failure to thrive in toddlers. The amount and quality of protein consumed will affect plasma levels of insulin growth factor I (IGF-I) which is a mediator of growth.⁶

Toddlers who have inadequate zinc levels have 34.46 times greater risk of stunting than toddlers who have adequate zinc levels. Zinc plays a role in the growth process of toddlers. Since zinc helps the work of growth hormone, zinc deficiency will inhibit the function of that hormone.¹³ The results of this study are in line with

research conducted in Semarang which showed that the level of zinc adequacy is a factor affecting the incidence of stunting in the toddler.¹⁴ From the study, it is found that the average amount of zinc intake for non-stunting toddlers is higher than for stunting toddlers. Multivariate analysis showed that zinc intake is the riskiest factor for the occurrence of stunting in toddlers aged 24-59 months.

The results showed that birth weight in stunting toddlers has a risk of 2.12 times higher compared to toddlers with normal birth weight. Birth weight is a parameter that is often used to describe the growth of the fetus during pregnancy.¹⁵ Research in Nepal showed that low birth weight had a stunting risk of 4.47 times greater than that of toddlers born with normal weight.¹⁶ Failure to thrive at early age indicates the risk to experience failure to thrive in the next age period.

Based on the study, a short maternal height has a 1.87 times higher risk of causing stunting in toddlers. This study is in line with research conducted in Egypt that mothers who have a short height (<150 cm) are at risk of having stunting children compared to those with a height of >150 cm.¹⁷ Generally, parents who have genes in chromosomes that carry short traits will increase the chances of children inheriting these genes. The mother's height is related to

the physical growth of the child. This is due to the limitation of uterine blood flow and the growth of the uterus, placenta and fetus of short mothers that their babies are born at risk of having a low birth weight which will cause fetal growth retardation.¹⁰

CONCLUSION

Risk factors affecting the occurrence of stunting in toddlers aged 24-59 months are protein intake, zinc intake, low birth weight, and a history of maternal height. However, the highest risk of the occurrence of stunting is the intake of zinc.

REFERENCES

1. Cruz LMG, Azpeitia GG, Suarez DR, Rodriguez AS, Ferrer JF, Majem LS. Factors associated with stunting among children aged 0-59 months from the Central region of Mozambique. *Nutrient*, 2017; 9,491
2. Ramayulis, Kresnawan, Iwaningsi, Rochani. Stop stunting dengankonselinggizi. Jakarta Penebar Plus+: 2018.
3. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*, 2013; doi: 10.1016/50140-6736(13)60937-x.
4. Horton S, Steckel RH. Malnutrition: global economic losses attributable to

“RISK ANALYSIS OF STUNTING INCIDENCE OF TODDLERS IN MAJENE REGENCY, WEST SULAWESI”

- malnutrition 1900-2000 and projection to 2050. In: Lomborg B, editor. How much have global problems cost the world? A scorecard from 1900 to 2050. Cambridge: Cambridge University Press; 2013.
5. Kementerian Kesehatan. Laporan hasil riset kesehatan dasarnasional tahun 2018. Jakarta: Kemenkes, 2018.
6. Mikhail WZA, Sabhy HM, El-sayed HH, Khairy SA, Salem HYHA, Samy MA. Effect of nutritional status on growth pattern of stunted preschool children in Egypt. *Acad J Nutr*, 2013;2(1):1-9.
7. Adani FY, Nindya TS. Perbedaan asupan energi, protein, zink, dan perkembangan balita stunting dan non stunting. *Amerta Nutr*, 2017;45-61
8. Proverawati A, Ismawati C. BBLR (berat badan lahir rendah). Yogyakarta: Nuha Medika; 2010.
9. Soetjiningsih. Tumbuhkembangan anak. Jakarta: Buku Kedokteran EGC; 2012.
10. SCN. Maternal nutrition and the intergenerational cycle of growth failure sixth report on the world nutrition situation, 2013.
11. Sumarmi S. Maternal short stature and neonatal stunting: an inter-generational cycle of malnutrition. *In conference*, 2016;265-272.
12. Endah MS, Mohammad J, Neti N, Mei NS. Protein, calcium and phosphorus intake in for *stunting* and *non-stunting* children aged 24-59 months. *Jurnal Gizi Klinik Indonesia*, 2016;12(4):152-156.
13. Adriyah FO, Rohmawati N, Ririanty M. Faktor-faktor yang mempengaruhi kejadian stunting pada anak balita di wilayah pedesaan dan perkotaan. *E-Jurnal Pustaka Kesehatan*, 2015;3(1).
14. Anindita P. Hubungan tingkat pendidikan ibu, pendapatan keluarga, kecukupan protein & zinc dengan stunting (pendek) pada usia 6-35 bulan di Kecamatan Tembalang Kota Semarang. *Jurnal Kesehatan Masyarakat*, 2012;1(2):617-26.
15. Umboh A. Berat lahir rendah dan tekanan darah pada anak. Jakarta: Sagung Seto, 2013.
16. Paudel R, Pradhan B, Wagle RR, Pahari DP, Onta SR. Risk factors for stunting among children: A community based case control study in Nepal. *Kathmandu University Medical Journal*, 2012;10 (3),18-24
17. Zottareli LK, Sunil TS, Rajaram S. Influence of parental and socioeconomic factors on stunting in children under 5 years in Egypt. *Eastern Mediterranean Health Journal*, 2014.