Indonesian Journal of Nutrition and Dietetics
Vol. 5, No. 3, 2017: 113-118

Available *online* at: http://ejournal.almaata.ac.id/index.php/IJND
DOI : http://dx.doi.org/10.21927/ijnd.2017.5(3).113-118

Stunting is not associated with overweight among children aged 24-59 months

Adityas Afifah Hidayati[1], I Made Alit Gunawan[2], Bunga Astria Paramashanti[1]

[1]Departmen of Nutrition, Faculty of Health Sciences, Alma Ata University,Jalan Brawijaya 99, Tamantirto Yogyakarta
[2]Health Polytechnic Ministry of Health of Yogyakarta,Jalan Tatabumi No. 3, Banyuraden, Gamping, Banyuraden, Sleman, Kabupaten Sleman, Daerah Istimewa Yogyakarta

ABSTRACT

Background: Stunting was associated with cognitive development, morbidity and productivity in later life. Several studies and analysis also showed that stunting was related to overweight. In Indonesia, prevalence of stunted-overweight in children was 7.4% in 2007, then increased to 7.6% in 2010.
Objective: To understand the relationship between stunting and overweight among children aged 24-59 months.
Methods: Cross-sectional design was used in this study. Study location was Sedayu Subdistrict, Bantul District. Participants were a total of 185 children selected by *probability proportional to size* (PPS) sampling technique. Main variables included nutritional status of stunting, overweight, and energy, protein and fat intakes. Analysis used was chi-square test with the level of significance 0.05.
Results: The prevalence of stunting was 30.8%, whereas overweight prevalence was 10.3%. Bivariate analysis indicated that there was no significant relationship between stunting and overweight among children aged 24-59 months (OR= 1.3; 95%CI: 0.5-3.6). Energy, protein and fats intakes were not confounding variables, but effect modifier in the association between stunting and overweight.
Conclusion: There was no relationship between stunting and overweight in children aged 24-59 months.

KEYWORDS: stunting, overweight, children

INTRODUCTION

Stunting is a disorder of linear growth due to chronic malnutrition, this condition is characterized by less than normal height based on age and sex (1). Stunting or short is one indiator of chronic nutritional status that illustrates inhibition of growth due to long-term malnutrition (2).

The prevalence of stunting in the world is 26.9% and in developing countries in Asia it is 31.3% (2). In Indonesia, the higher is 35.6% and the 6-23 month age group is the highest (3). Based on Riskesdas 2013 stunting prevalence of 37.2% which means an increase from the state of 2010 where the prevalence of stunting amounted to 35.6%. Stunting with a prevalence of 37.2% consists of 18.0% very short and 19.2% short (4). Based on further analysis, stunting in children aged 6-23 months in Indonesia is 34.73% (5). As for the Sedayu subdistrict, the prevalence of stunting of children aged 6-23 months in April 2016 reached 30.5% (6).

Stunting in children is known to affect cognitive levels, morbidity, and even future productivity. Even some studies and analyzes that have been done previously suggests a relationship between abbreviation with the occurrence of obesity (7). An analysis conducted in 5 countries in Arabia found that short children were at greater risk than children who were not short to be obese (8).

Overweight is a world health problem with an ever increasing number of prevalence every year, both in developed and developing countries. The prevalence of overweight in children aged 2-19 years in the United States has increased year by year (9). The prevalence of underfives with short-fat status according to Riskesdas 2007 was 7.4%, and increased in 2010 to 7.6%. However, in 2013 it has decreased so that the short-fat prevalence becomes 6.8%, despite the decrease, stunting is a problem that needs to be considered and handled properly (4).

Based on Barker's theory, growth disorders reflect the decrease in the number and quality of cells

and tissues of internal organs of children, such as endocrine system disorders (10). These endocrine syndrome disorders affect the process of fat oxidation resulting in the buildup of adipose tissue. The results of the South American study of malnourished children also show evidence that there is greater fatty deposits than protein deposits when children experience improved nutrition (11). Incidence of overweight in children with a history of stunting one influential factor is the intake of children, such as energy intake, protein and fat (11). Based on this the researchers are interested to conduct research in Sedayu District associated with stunting and overweight events in children aged 24-59 months. So the purpose of doing this research is to know the relationship between stunting with overweight in children aged 24-59 months in Sedayu District.

MATERIALS AND METHODS

This research was conducted in the working area of Sedayu I and II Sedayu subdistrict in February 2017. This study used cross-sectional design with the sample of 185 children with the age of 24-59 months. The sample calculations are based on the Lemeshow formula and sampling based on the Probability Proportional to Size (PPS) method. The variable in this research is stunting based on measurement of TB / U as independent variable with stunting parameter if Z score <-2SD and not stunting if Z score ≥-2SD, overweight based on IMT / U as dependent variable with overweight parameter if Z score> 2SD and not overweight if Z score ≤2SD (2), and energy, protein and fat intake as confounding variables with adequate intake parameters if intake ≥80% of underfive needs and inadekuat intake if <80% of the needs of children.

Sample inclusion criteria in this study were measurable children and weight and children whose parents were willing to be respondents by filling out informed consent form and had complied with ethical clearance from Universitas Alma Ata Yogyakarta (KE / AA / II / 80 / EC / 2017). While the exclusion criteria of this research is a toddler who is not when posyandu activities are implemented.

Data collected in the form of primary data and sekuder data, primary data in this research is height and body weight of child. using the instrument stamped with 0.1 grams accuracy and capacity up to 150 kg and microtoise measuring instrument with 0.1 cm accuracy. As well as data intake of children which includes energy intake, protein and fat obtained through the method of Food Frequency Questionnaire (FFQ) Semi Quantitative compared to the needs of infants. Secondary data in this research is data of toddler identity obtained from KIA book and posyandu cadre book. The data analysis used in this study include univariate analysis used to know the distribution of research variables (Stunting and Overweight), bivariate analysis using Chi Square test (x^2) to know the relationship between stunting with overweight, and stratification analysis using Haenszel coat to control the confounding variable has the potential to obscure the relationship between exposure (stunting) and outcome (overweight). All analysis is done using STATA software.

RESULT AND DISCUSSIONS

Characteristics of Responendents

Based on **Table 1** below shows that the number of male male-male subjects was 95 children and the subjects were 90 children. As for the characteristics of maternal employment, the highest percentage is another category that is equal to 73.5%. Characteristics of the highest percentage of father work is a private working father with a percentage of 55.1%. The difference in percentage of adequate and inadequate energy intake is not so great as that with a percentage of 47% adequate energy intake and 53% inadequate energy intake. As for protein and fat intake showed that the highest percentage of protein and fat intake belonging to adequate intake of adequate protein intake of 78.4% and adequate fat intake of 69.2%.

Based on the following **Table 2** shows that from 185 children under five in Sedayu sub-district, 19 children or 10.3% had overweight and 57 children or 30.8% had stunting.

Table 1 Distribution of characteristic frequency of subjects in Sedayu District

Characteristic		Total (n)	Percentage (%)
Sex	Female	90	48,6
	Male	95	51.4
Mother's Work	Government Employee	3	1.6
	Private Employee	45	24.3
	Farmer	1	5
	Others	136	73.5
Father's Work	Government Employee	8	4.3
	Private Employee	102	55.1
	Farmer	1	5
	Others	74	40
Energy Intake	Adequate	87	47
	Inadequate	98	53
Protein intake	Adequate	145	78.4
	Inadequate	40	21.6
Fat Intake	Adequate	128	69.2
	Inadequate	57	30.8

Table 2 Distribution of the frequency of overweight and stunting events in children aged 24-59 months in Sedayu District

Variable	Total (n)	Percentage (%)
Overweight		
Overweight	19	10.3
Not Overweight	166	89.7
Stunting		
Stunting	57	30.8
Not Stunting	128	69.2

Bivariate Analysis

Relationship between Stunting and Overweight in children aged 24-59 months

Bivariate analysis was performed to determine the relationship between stunting with overweight, with the following results in **Table 3**.

Based on **Table 3** shows that stunting respondents experienced overweight as many as 7 respondents (12.2%). As for respondents not stunting overweight was as many as 12 respondents (9.3%). The bivariate analysis using chi square test showed that stunting was not related to overweight, indicated by P value 0,5 (p> 0,05). With value OR 1,3 (CI 95% : 0,5-3,6) which means a child with a history of stunting is at risk of overweight by 1.3 times.

This may be due to obesity in short children depending on the availability of extra energy in children who have experienced programming to use more economical energy. Short itself is not a direct cause, because many children are short but not fat, even become thin (8).

This study is not in line with previous studies by showing that short children have 2.54 times the risk to become obese (12). studies conducted in South Africa and China have also shown that there is a significant relationship between abbreviation and obesity status with Risk Ratio (RR) ranging from 1.7 to 7.8 (13).The mechanism of this relationship is still inexplicable. One theory and the results of the study mentioned that in short children fatty oxidation disorder that causes obesity in the future (14). Based on Barker's theory, growth disorders also reflect the decrease in the number and quality of cells and tissues of internal organs of children, such as endocrine system disorders, endocrine disruption disorders that affect the process of fat oxidation resulting in adipose tissue buildup (15)

Stratification Analysis of Mantel-Haenszel

Effect of Energy, Protein and Fat on Stunting Relation with Overweight

The stratification analysis of the mantle-haenszel is used to control confounding variables that have the potential to obscure the relationship between stunting and overweight

Table 3 Relationship between stunting and overweight in children aged 24-59 months in Sedayu District

Stunting	Overweight						OR (CI95%)	p-value
	Overweight		Not Overweight		Total			
	n	%	n	%	n	%		
Stunting	7	12,2	50	87,8	57	100	1,3 (0,5-3,6)	0,5
Not Stunting	12	9,3	116	90,7	128	100		
Total	19	10,2	166	89,9	185	100		

Table 4. Stratification analysis based on energy, protein and fat intake on the relationship between stunting and overweight

Intake	Stunting Status	Overweight Status		OR (95% CI)	COR (95% CI)	OR MH (95% CI)
		Overweight	Not Overweight			
Energy						
Inadequate	Stunting	4	21	1.2 (0.3-4.2)	1.3 (0.5-3.5)	1.5 (0.5-4.3)
	Not stunting	10	63			
Adequate	Stunting	3	29	2.7 (0.4-17.3)		
	Not stunting					
Protein						
Inadequate	Stunting	1	8	0.6 (0.6-6.4)	1.3 (0.5-3.5)	1.4 (0.5-3.9)
	Not stunting	5	26			
Adequate	Stunting	6	42	1.8 (0.5-5.8)		
	Not stunting	7	90			
Fat						
Inadequate	Stunting	2	12	0.8 (0.1-4.7)	1.3 (0.5-3.5)	1.4 (0.5-4.1)
	Not stunting	7	36			
Adequate	Stunting	5	38	2.10 (0.5-7.1)		
	Not stunting	5	80			

The results of stratification test in **Table 4** show that OR in the intake of energy, protein and fat groups inadekuat is different from OR in the Adequate category, so it can be seen that the energy, protein and fat intake is the effect modifier for the relationship between stunting and overweight in infants.

So it can be said that the relationship between stunting with overweight in children under five can be modified by energy intake, protein and fat. In the table can be seen on adequate energy intake, indicating that stunting children with adequate energy consumption can lead to overweight of 2.2 times.

It can be argued that in stunting children over the age of 24 months given energy with sufficient category alone can increase the risk of overweight.

Differences of OR crude with OR of Haenszel coated test results on energy, protein and fat intake showed no more than 25% result so it can be seen that energy intake, protein and fat are not disturbing variables for the relationship between stunting and overweight.

Theoretically, consumption of high-fat foods will increase the vulnerability of stunting children to starvation and overeating (16). Stunting children will produce more fat stores than normal children (13). Low energy intake during growth is known to decrease levels of growth factor 1 such as insulin (IGF1) and increase the ratio of cortisol to insulin. Low levels of IGF1 can damage lipolysis, as a consequence, increased body fat may be present in the presence of high-fat foods because of the reduced ability to oxidize fats from food (16).

Research in Brazil previously stated that stunting children may have damage to energy regulation. Based on the theory of energy regulation, depletion of carbohydrate deposits is a signal of hunger. Stunting children have an easy tendency to be hungry due to an increase in carbohydrate oxidation leading to rapid carbohydrate storage depletion (16)

Excess intake in the body including excess intake of protein will be stored in the form of fat. Increased protein ratios may also affect IGF1 which has an effect on cell enhancement across tissues including adipose tissue (17). Low energy intake during growth is known to decrease levels of growth factor 1 such as insulin (IGF1) so that high protein intake in stunting children is less likely to affect height growth (16).

In another previous study that wanted to know the relationship between energy and protein intake with nutritional status of children found that there is a relationship between energy intake with nutritional status according to indicator TB / U. that there is a relationship between energy intake with nutritional status according to indicator TB / U. In the indicator of BB / TB chi square test results showed no relationship between energy intake with nutritional status of BB / TB, which means toddlers with good energy intake and less risk have the same chances of being skinny or very thin, As for protein intake variables, showed chi square test results, it was found that there is no correlation between protein intake with nutritional status of infants indicator of TB / U and BB / TB. As many as 97% or almost all toddlers have a good protein intake so in this case it can be interpreted that protein intake does not contribute to malnutrition. (18).

Protein is an energy source that is equivalent to carbohydrates. If the body is in a state of lack of energy source substances such as carbohydrates and fats, the body will use proteins to form energy and defeat its main function as a building agent. In toddlers this condition has a disruption on growth (18).

CONCLUSIONS AND RECOMMENDATIONS

The prevalence of overweight of children aged 24-59 months in Sedayu District was 10.3%. Prevalence of stunting children aged 24-59 months in Sedayu District by 30.8%. There was no relationship between stunting with overweight in children aged 24-59 months in Sedayu District. Energy intake, protein intake and fat intake is not a nuisance variable but is an effect modifier between stunting relationships with overweight events in children under five.

This research can be taken suggestion that the intake of energy, protein and fat in the category enough just to give the risk of overweight in child stunting, so need to be considered in giving feed intake to stunting toddler to provide as needed. As well as the need for measurements of height and weight of children under five regularly so that the condition and nutritional status of toddlers are always monitored properly.

REFERENCES

1. Eugene M. Lewit, Nancy Kerrebrock. Population-Based Growth Stunting [serial online]. The Future of Children CHILDREN AND POVERTY Vol. 7 • No. 2 – Summer/Fall. 1997 [dikutip 6 Mei 2017]. Diunduh dari: http://www.princeton.edu/futureofchildren/publications/docs/07_02_Indicators.pdf
2. Kementerian Kesehatan. 2011. *Keputusan Menteri Kesehatan Republik Indonesia No.:1995/Menkes/SK/XII/2010.* Jakarta: Kementerian Kesehatan Republik Indonesia.
3. Umeta, M., West, C., Verhoef, H., Haidar, J. & Hautvast, j. (2003) *Factors Associated with Stunting in Infants Aged 5-11 Months in the Dodota-Sire District, Rural Ethiopia*. *J. Nutri,* 1331064-1069.
4. Kementerian Kesehatan. 2010. *Laporan Hasil Riset Kesehatan Dasar Indonesia Tahun 2010.* Jakarta : Kementerian Kesehatan Republik Indonesia.
5. Kementerian Kesehatan (2013). *Laporan Nasional Riset Kesehatan Dasar 2013.* Badan Penelitian dan Pengembangan Kesehatan, Jakarta.
6. Paramashanti, dkk. 2015. *Pemberian ASI eksklusif tidak berhubugan dengan stunting pada anak usia 6-23 bulan di Indonesia.* Jurnal Gizi Dan Dietetik Indonesia, Vol.3 No.3 162-174
7. Khasanah, dkk. 2016. *Waktu pemberian makanan pendamping ASI (MP-ASI) berhubungan dengan kejadian stunting anak usia 6-23 bulan*

di Kecamatan Sedayu. Jurnal Gizi Dan Dietetik Indonesia, Vol 4 No.2 105-111

8. El Taguri a., Besmar F, Abdel Monem A, Betilmal I, Ricour C & Rolland Cachera MF (2009). *Stunting is a major risk factor for overweight: results from national surveys in 5 Arab Mediterr Health J.* 2009 May-Jun;15(3) : 549-62.countries. East
9. CDC (Centers for Disease Control and Prevention). 2012. "National Health And Nutrition Examination Survey III". Westat Inc. Diakses pada 18 September 2016 dari www.cdc.gov
10. C Nicholas Hales, David J P Barker. The Thrifty Phenotype Hypothesis. *British Medical Bulletin* 2001; 60: 5–20
11. Usfar, A.A., Lebenthal, E., Atmarita, E., Achadi, Soekirman, Hadi, H. (2010). *Obesity as a povertyrelated emerging nutrition problems: the case of Indonesia. Obesity reviews* 11 : 924928.
12. N, Handayani. 2015. Resiko Terjadinya Kegemukan Pada Anak Usia 3-5 Tahun Dengan Status Gizi Pendek di Indonesia. Jurnal Ekologi Kesehatan Vol.14 No, September 2015 : 273-283
13. Barry M. Popkin, Marie K. Richards, Carlos A. Mohtiero. Stunting Is Associated With Overweight In Children Of Four Nations That Are Undergoing The Nutrition Transition. J. Nutr.-1996-Popkin- 3009-16
14. Hoffman, DJ, Sawaya AL, Verreschi L, Tucker KL, Roberts SB (2000). *Why are nutritionally stunted children at increased risk of obesity? Studies of metabolic rate and fat oxidation in shantytown children from Sao Paulo, Brazil 1-3. Am* J Clin Nutr 2000;72:702-7
15. Barker DJP. *Fetal and infant origins of adult disease*. London: British Medical Journal Publishing, 1992
16. Daniel J. Hoffman, Susan B. Roberts, Ieda Verresch, *et al*. Regulation of Energi Intake May Be Impaired in Nutritionally Stunted Children from the Shantytowns of Sao Paulo, Brazil. J. Nutr. 130:2265–2270, 2000.
17. Jana Parizkova, Andrew Hills. Childhood Obesity Prevention and Treatment, Second Edition crc press 2004 US
18. Muchlis. N, dkk. 2014. *Hubungan Asupan Energi Dan Protein Dengan Status Gizi Balita Di Kelurahan Tamamaung*. Makasar : Program Studi Ilmu Gizi FKM Universitas Hasanuddin Makassar