

## Original Research Article

# Association of household food security with toddler stunting in the Sleman Regency Indonesia

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## ABSTRACT

**Background:** Stunting prevalence in Indonesia toddlers has increased (37.2%) in 5 years and became risk factor of obesity and metabolic disease in adulthood. Identification of risk factors by looking at household food security as the cause of stunting can provide information to the appropriate interventions. This research aims to know association between households food security with stunting in toddlers.

**Methods:** This is observational study with retrospective cohort design. Anthropometry parameter and household food security data is used to assess the subject. The sample used is families who have toddlers from study Health Demographic Surveillance System (HDSS) in Sleman Regency which totaled 150 toddlers of households.

**Results:** There is no association between food expenditure proportion with stunting ( $p=0.089$ ), between energy consumption level with stunting ( $p=0.876$ ) and between households food security with stunting ( $p=0.357$ ).

**Conclusions:** Food security based on the food expenditure proportion and energy consumption level is not associated with stunting in toddlers in Sleman Regency.

**Keywords:** Food security, Food expenditure, Energy consumption, Stunting, Toddlers

## INTRODUCTION

Food security is a condition of food that fulfilled for the household, reflected in the availability of sufficient food, either amount or quality, secure, equitable, and affordable.<sup>1</sup> Food security in household is indirect affecting the nutritional status in toddlers.<sup>2</sup> Study of Frongillo et al stated that household food insecurity has been identified as a possible underlying determinant of malnutrition. The study in India revealed that under nutrition is a major nutritional problem of public health significance among preschool children residing in the tribal areas of the State.<sup>3</sup>

The prevalence of wasting in toddler increased from 17.9% to 19.6% ((2010 to 2013) and stunting in toddler was also increased from 35.6% to 37.2% nationally (2013).<sup>4</sup> The prevalence of stunting in DIY also increased from 22.5% to 27% (2010 to 2013).<sup>3</sup> A variety of indirect factors associated with stunting in addition to food security include social-demographic, namely income, parental education, and number of family members.<sup>5</sup>

Stunting is a linear growth disorder, indicated by the value of z-score TB/U less than -2 SD.<sup>4</sup> Stunting prevalence in the toddler in Indonesia has increased and reached 37.2%, with 1 in 3 children is stunted. Stunting in toddlers became risk of obesity and metabolic disease,

such as diabetes and hypertension in adulthood. Identification of risk factors by looking at food security in terms of food expenditures proportion and energy consumption level as the cause of stunting can provide information to the appropriate interventions and some prevention.<sup>1-5</sup> It is necessary to decide the best interventions and preventions effort, especially in sampling area (Sleman Regency) so prevalence of stunting in toddlers can be decreased. The aim of this study is to investigate the association of food security with prevalence of stunting in toddlers in Sleman Regency.

## METHODS

This was an observational study with retrospective cohort study design. The study was conducted in Sleman Regency on July-September 2015. The population was people residing in Sleman Regency in Indonesia for at least 6 months consecutively. Sample was taken by cluster sampling from HDSS research, namely 5 sub-districts in Sleman (Turi, Tempel, Minggir, Moyudan, and Seyegan) by questionnaire about subject characteristics, socio-economics data, food availability and food security in household. The sub-districts were chosen based on the high of stunting prevalence and represent urban and rural area. The subject was toddler (6-59 months) in each household, taken by purposive sampling and total of subjects were 150 toddlers.

The inclusion criteria were family who had a toddler (6-59 months), the parent able to be respondent in this study with signing the inform consent and toddler be able to measure body height. The exclusion criteria were the parent of toddler live in other area, one or both parents of toddler die and toddler was hospitalized. Primary data taken in July-September 2015 to assess nutritional status parameters using Anthropometry for toddler (height (H)/age (U), H/W (weight), and W/A).

Secondary Data using from HDSS, namely household food security data based on the food expenditure proportion and energy consumption level. Food expenditure proportion is good when  $\leq 60\%$  and less when  $>60\%$  while, energy consumption level is good when  $>80\%$  of RDA Indonesia and less when  $\leq 80\%$  of RDA Indonesia. Thus, food security is classified as good when energy consumption level  $>80\%$  RDA Indonesia and food expenditure proportion  $\leq 60\%$  and less when energy consumption level  $\leq 80\%$  RDA Indonesia and food expenditure proportion  $>60\%$ . Data were analyzed quantitatively by univariate, bivariate, and multivariate. Statistical test using chi-square ( $X^2$ ) and multiple linear regression with confidence interval (CI) 95%.

## RESULTS

### Subject characteristics

Nutritional status of most toddler according to index W/A was well nutrition (85.33%) and index W/H was normal (88.67%). However, toddler were classified as very short and short; 13.34% and 27.33% respectively according to index H/A. In this study, toddler who have index H/A less than -2 SD according to WHO standards (2005) (short and very short) categorized stunting. Hence, 40.67% of toddler classified as stunting, mean of the body length/height of toddler stunting group were  $82.72 \pm 9.30$  cm (Table 1).

**Table 1: Subject characteristics.**

Characteristics	n	%
<b>Gender</b>		
Male	80	53.33
Female	70	46.67
<b>Age</b>		
7 – 11 months	11	7.33
1 – 3 years	62	41.33
4 – 5 years	77	51.34
<b>Birth Body Weight</b>		
<2.5 kg	13	8.67
$\geq 2.5$ kg	137	91.33
<b>Nutritional Status Weight/Age (W/U)</b>		
Poor nourished (<-3 SD)	1	0.67
Lack nourished (-3 s.d.<-2 SD)	17	11.33
Well nourished (-2 s.d. +2 SD)	128	85.33
Excess nourished (> +2 SD)	4	2.67
<b>Height/Age (H/A)</b>		
Very short (<-3 SD)	20	13.34
Short (-3 s.d.<-2 SD)	41	27.33
Normal (-2 s.d. +2 SD)	83	55.33
Tall (> +2 SD)	6	4
<b>Weight/Height (W/H)</b>		
Very wasted (<-3 SD)	2	1.33
Wasted (-3 s.d.<-2 SD)	5	3.33
Normal (-2 s.d. +2 SD)	133	88.67
Obese (> +2 SD)	10	6.67
<b>Residence</b>		
Rural	67	44.67
Urban	83	55.33
<b>Family Members</b>		
Family member >4	87	58
Family member $\leq 4$	63	42

### Mean of birth weight and height

The birth weight was no mean difference in normal and stunting toddlers but, there was mean difference birth height in normal and stunting toddlers which normal

toddlers have height birth taller than stunting toddlers (Table 2).

#### Association of parental height with stunting in toddler

There was association between mother's height with stunting in toddler but no association in father's height. Parental height showed difference mean in nutritional status of toddler. Toddler in stunting has lower parental height than toddler in normal nutritional status (Table 3).

#### Association of food expenditure proportion, energy intake, and food security with stunting

Food expenditure proportion in most household classified as good ( $\leq 60\%$ ) with nutritional status in the most of toddlers are normal (59.33%). There was no significant association between food expenditure proportions with stunting in toddlers ( $p > 0.05$ ). There was no association between energy consumption level with stunting in toddlers ( $p > 0.05$ ). But, the most of households classified

**Table 2: Mean of birth weight and height**

	Nutritional Status	n	Mean $\pm$ SD	P Value* (CI)	Std. Error Mean
<b>Birth Weight</b>	Normal	89	3.12 $\pm$ 0.42	0.16 (-0.04-0.25)	0.04
	Stunting	61	3.01 $\pm$ 0.47		0.06
<b>Birth Height</b>	Normal	79	49.24 $\pm$ 4.39	0.04 (0.09-2.60)	0.49
	Stunting	56	47.89 $\pm$ 2.99		0.40

\* $p < 0.05$  is significant

**Table 3: Association of parental height with stunting in toddler.**

	Nutritional Status	n	Mean $\pm$ SD	P Value* (CI)	Std. Error Mean
<b>Father</b>	Normal	89	164.11 $\pm$ 0.07	0.13 (-0.044 – 0.254)	0.127
	Stunting	61	162.23 $\pm$ 0.075		
<b>Mother</b>	Normal	79	152.22 $\pm$ 0.68	0.04 (0.09-2.61)	0.037
	Stunting	56	150.41 $\pm$ 0.64		

\*p is significant when  $< 0.05$ .

**Table 4. Association of food expenditure proportion, energy intake, and food security with stunting.**

		Nutritional Status				Total	P Value
		Normal		Stunting			
		n	%	n	%		
Food expenditure proportion	Good	75	56.82	57	43.18	132	0.089
	Lack	14	77.78	4	22.22	18	
Energy consumption level	Good	47	58.75	33	41.25	80	0.876
	Lack	42	60.00	28	40.00	70	
Food Security	Good	37	55.22	30	44.78	67	0.357
	Lack	52	62.65	31	37.35	83	

Food expenditure proportion: good,  $\leq 60\%$  of food expenditure proportion and lack,  $> 60\%$  of food expenditure proportion; Energy consumption level: good,  $> 80\%$  Recommended Dietary Allowance (Indonesia) and lack,  $\leq 80\%$  Recommended Dietary Allowance (Indonesia); Food security: good, Energy consumption level  $> 80\%$  RDA (Indonesia) and food expenditure proportion  $\leq 60\%$  and lack, Energy consumption level  $\leq 80\%$  RDA (Indonesia) and food expenditure proportion  $> 60\%$ .

as good in energy consumption level ( $> 80\%$ ) with nutritional status of most toddlers were normal (59.33%). There was no association between food security with stunting in toddlers ( $p > 0.05$ ) (Table 4).

## DISCUSSION

Global Nutrition Report stated that nutritional problems, especially stunting in toddlers becoming national issue (2014) which Indonesia is ranked 17<sup>th</sup> among the 117 countries with high prevalence of stunting in toddlers. The result showed that based on the indicator of H/A, most toddlers (40.67%) was stunting (Table 1). This

number illustrates stunting prevalence in sampling area (40.67%) is larger than in national (37.2%).<sup>4</sup> Data showed stunting prevalence in Sleman was high that is very short was 8.5% and short was 19.9%.<sup>4</sup> This study is supported by study of Gorstein et al which stated if prevalence of stunting is high but wasting is low or normal, preventive strategies should be directed towards socio-economic conditions, dietary quality, hygiene-sanitation and adequate potable water.<sup>6</sup>

Stunting is an indication of chronic nutritional problems has been occurrence in the past. Stunting prevalence occurred since childhood has been associated with a slow

motoric development and lower level of intelligence.<sup>7</sup> The study on children (24-60 months) in Mexico stated that children who suffer from stunting have a tendency to be obese in adulthood.<sup>8</sup>

Stunting toddler ( $47.89 \pm 2.99$ ) have birth height (H/A) lower than normal toddlers ( $49.24 \pm 4.4$ ). This result is consistence with study of Deshmukh et al which stated that height-for-age (H/A) indicates linear growth in a child.<sup>9</sup> Low H/A also called stunting is a consequence of long term, cumulative inadequacies of health and nutrition. In young age, it indicates continuing process of failing to grow while in older children, it means failed to grow. Study in Brazil also stated that low H/A was an indication of chronic malnourishment and be the most prevalent form of protein-energy malnutrition in Brazilian children.<sup>10</sup>

In parental side, we could see that stunting toddler has lower parental height than normal toddler. This result is in accordance with Zottarelli et al that stated toddler is stunting if their mother have body height <150 cm (30.89%) and toddler have normal nutritional status if their mother have body height >160 cm.<sup>11</sup> Study of Rahayu showed that normal toddler had risk 1.7 times greater to be stunting if the mother have body height <-2SD and 1.4 times greater to be stunting if the father have body height <-2SD.<sup>12</sup> Stunting toddler can reflect genetic growth factor that was inherited by the parent.<sup>12</sup> Some studies state that there were inclusion of genetic characteristics in child health and nutrition but study about genetic components was not adequate yet.<sup>13-15</sup>

In this study, no association between food expenditure proportion with stunting in toddlers ( $p=0.089$ ). Energy consumption level in households also is not associated with stunting in toddlers ( $p=0.876$ ). Study explains that toddlers are at risk of energy and protein intake deficits 1.440 times greater on poor households ( $p<0.001$ ) than infants who are in non-poor households.<sup>16</sup> Poverty levels are low in the most of samples can be linked to purchasing power and greater access to food in households, which support the fulfillment of the nutritional adequacy of family members, especially toddlers.

There was also no association between households food security with stunting ( $p=0.357$ ). The result is in contrast with study of Hackett et al which stated that children in food insecure households showed significant statistically higher risk for stunting or risk of stunting and also underweight or risk of underweight in the multiple logistic regression model compared with children in food secure households ( $p>0.05$ ).<sup>17</sup> Both of study are different, it may cause the study uses different form to measure food security in households, namely Criterion validity of the Colombian Household Food Security Scale (CHFSS) and also the aged of toddlers as subjects are different from this study (6 to 23 months).

This is also in contrast with Masrin which stated there is a significant relationship between household food security with stunting in “*baduta*” ages 6-23 months (under 2-years old) in Bantul, DIY as well as Ali Naser which stated that food insecurity has associated with the incidence of stunting and underweight in Malaysia.<sup>18,19</sup> This difference is possible because household food security was not associated to energy and protein intake in toddlers ( $p=0.93$ ), while deficiency of nutrients intake was one of the factors that may cause stunting in toddler.<sup>20</sup> Therefore, food access for fulfillment nutritional needs of toddler was no different between households food secure with households food insecure, so households food security is not a causes of stunting in toddlers.

Food security is one of the methods that can be used to determine the nutritional status, but not enough to explain overall of nutritional status.<sup>21</sup> In addition, food security was not associated with stunting in toddlers who came from very poor families due to food availability are more stable with food production activities (farming or livestock) carried out independently.<sup>22</sup>

The process of stunting in toddlers in poor region is started from the age of 6 months and appears mainly two to three years early in life and continues until 18 years.<sup>23</sup> Some studies suggest that growth failure in infants and toddlers started from the aged of 7 months when breast milk and complementary food were inadequate so nutrition needs of infants and toddlers could not be fulfilled.<sup>24</sup> In other study, economic problem in households conduce inability of fulfill food needs so nutrition needs of toddler could not be fulfilled.<sup>25</sup>

In this study, toddler in stunting has lower birth height and lower parental height than toddler in normal nutritional status. There was no association between food expenditure proportion with stunting, between energy consumption level with stunting and households food security with stunting in toddlers in Sleman Regency ( $p>0.05$ ). Food security based on the proportion of food expenditure and household energy consumption level is not risk factor of stunting in toddlers in Sleman Regency. Further studies with more variables needs to determine association between social-demographic factors with food security and prevalence of stunting in toddlers..

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