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Prevalence and affecting factors of stunting in toddlers in Bandar Lampung City, Indonesia

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ABSTRACT: The prevalence of stunting in children under five (toddler) in Lampung Province reached 31.6 percent in 2017, after experiencing an increase for three consecutive years.In 2018 this figure may drop slightly to 27.5%, but this is still quite high. Some cities and districts have a much higher figure, including Bandar Lampung as the provincial capital, which reaches 33.4%. This study aims to determine the prevalence and influencing factors of stunting in toddlers in Bandar Lampung by a survey method that takes a sample of 124 toddlers who are registered in posyandu in three topographic regions. The three regions are lowland, urban and highland. The research data was collected in September-October 2019, including anthropometric data and nutritional intake of toddlers as well as the socio-economic characteristics of their families. The results showed that the prevalence of stunting was 43.5%, much higher than the provincial average. This research showed that stunting was also significantly influenced by the education and social status of the mother, namely the mother's occupation before marriage and the mother's employment status during pregnancy; not only caused by lack of nutritional intake.

KEYWORDS –*mother, nutritional intake, prevalence, stunting, toddlers*

I. INTRODUCTION

Stunting is a condition of failure to thrive in children under five (toddlers) due to chronic malnutrition, especially in the First 1000 Days of Life. Stunting caused by a chronic malnutrition due to lack of nutritional intake for a long time. Stunting children experience growth and development disorders, namely their height is lower or shorter than their age standard. According to World Health Organization, children have the same growth potential up to the age of five, regardless of where they were born [1]. Babies born are categorized as stunted if the body length at birth is less than 48 cm. Stunting infants and children under five who have the potential to experience growth failure (low birth weight, small, short, thin), cognitive, motor and metabolic developmental disorders, are at risk for non-communicable diseases (diabetes, obesity, stroke, heart disease) as adults. The condition of a child's short body is often said to be a hereditary factor (genetic) from both parents, so that many people just accept it without doing anything to prevent it. In fact, stunting is a preventable problem. This is because stunting is very little influenced by genetic factors compared to environmental factors, behavior and health services.

Currently, the number of stunted Indonesian children reaches 9 million and the number of stunted children in the world reaches 159 million. The economic impact of stunting has the potential to cause economic losses every year 2-3% of gross domestic product (GDP). If Indonesia's GDP is IDR 13,000 trillion, the potential loss is IDR 260-390 trillion/year [2]. In 2013, Indonesia is one of the 17 countries in the world with the highest prevalence of stunting (48%) which must work hard to reduce it [3]. The potential economic benefits from investment in reducing stunting in Indonesia can be up to 48 times. In 2018, the prevalence of stunting in children under five decreased to 30.8% where in the previous data in 2016 it was 33.6% [4]. This number in 2019 fell again to 27.7% and is expected to continue to fall to only 14% in 2024 [5].

Stunted children are not only disturbed by their physical growth (short/short stature), but also their brain development, which of course will greatly affect their ability and achievement in school, productivity and creativity in productive ages. Therefore, the high prevalence of stunting is a big threat to the quality of Indonesian people, as well as a threat to the nation's competitiveness. One of the government's current focuses is stunting prevention. This effort aims so that Indonesian children can grow and develop optimally and maximally, accompanied by emotional, social, and physical abilities that are ready to learn, and able to innovate and compete at the global level. The reduction in stunting is one of the National Strategic Programs contained in Presidential Regulation 42 of 2013 concerning the National Movement for the Acceleration of Nutrition

Improvement. The Health Development targets the prevalence of stunting in children under two years of age decreasing from 32.9% (2013) to 28% in 2019.

Based on the Nutrition Status Monitoring in 2017, stunting in Indonesia of 29.6% is included in the medium category. However, there are 17 provinces with high prevalence of stunting (30-39%), one of which is Lampung Province. For three consecutive years, Lampung Province was included in 8 provinces that experienced an increase in stunting prevalence. As the capital city of Lampung Province, Bandar Lampung City is also experiencing stunting problems. In 2017 the prevalence of stunting in Bandar Lampung reached 33.4 percent and 21.8 percent of them also experienced malnutrition. This is higher than the 31.6 and 18.5 percent prevalence for Indonesia [6]. This research objectivesare to measure the stunting prevalence, analyze the consumption patterns and the factors that influence stunting in toddlers in Bandar Lampung City.

II. MATERIALS AND METHODS

2.1 Research design, time and location

This research was carried out by an exploratory cross-sectional survey method, located in three regional topographies, namely highlands, lowlands and coastal in the city of Bandar Lampung. Data collection was collected in September to October 2019.

2.2 Population, Samples and Research Data Collection

In this study, the population is households in Bandar Lampung, which have stunting toddlers. Toddlers detected stunting in 10 sub-districts which are loci of stunting amounted to 1,340 toddlers. The research sample was taken by stratified sampling design, starting with location sampling, in which from 10 stunting sub-districts, six sub-districts were chosen to represent the topography of the region, namely Teluk Betung Timur and Teluk Betung Selatan sub-districts representing the coastal, Kedaton and Labuhan Ratu representing the urban lowlands, and Langkapura and Sukabumi represent the highlands. The number of stunting toddlers in the six selected villages was 798 children or 59.1% of the stunting population in Bandar Lampung City. The first inclusion criteria of the samples were toddler aged 12-59 months (toddlers) who were always present at the integrated services station (*posyandu*) on the last three months and from the results of measuring their birth height, it was detected that they had stunting problems. The exclusion criteria were children under five who were sick and or their parents were not willing to be respondents. As many as 124 toddlers who met this inclusion and exclusion criteria were finally recruited in this research, representing 15.5 % of the six-locus stunting villages or 9.2 percent of the stunting population in Bandar Lampung City. These toddlers come from 3 Posyandu in the coastal areas (39 toddlers), 3 Posyandu in the lowlands (41 toddlers) and 4 Posyandu in the highlands (44 toddlers).

The data collection and analysis of this research was carried out in two stages, the first was body measurement (anthropometry) of children under five and interviews with their parents' using questionnaires that was first tested for validity and reliability. Questionnaires for parents included family's demography, socio-economic factors, mother's pregnancy history, and parenting of the children. In the second stage, an analysis of the food patterns of children under five was carried out by taking children's consumption data using the recall method or recalling food consumption for the past 24 hours.

2.3 Data analysis

All research data was processed using Microsoft excel and statistical software SPSS 17. To answer the first objective, anthropometric measurements were used. The anthropometric of body weight (W) and body height (H) standard used in this study was the 2005 World Health Organization - Multicenter Growth Reference Study (WHO-MGRS) standard which was stipulated by the Decree of the Minister of Health of the Republic of Indonesia Number 1995/Menkes/SK/XII/2010 dated December 30, 2010. Stunting and nutritional status aremeasured based on body height according to age (A), referring to WHO standard using the z-score standardization [1].

The second to third objectives were analyzed descriptive quantitatively by measuring and evaluating existing food patterns of toddlers. Measurement of food patterns was carried out by food recall method for 2x24 hours to obtain food consumption and factual energy intake of toddlers. Calculation of the Nutritional Adequacy Level (NAL) using the Recommended Dietary Allowance (RDA) standard [7]). The toddler's nutritional intake and adequacy level of energy, protein, calcium, phosphor Fe and vitamin A were measured. Whereas the influencing factors of stunting was evaluated by Principal Component Analysis (PCA). Collecting data was covering 20 variables to be analyzed by PCA.

III. RESULT AND DISCUSSION

3.1 General description

This research was conducted in Bandar Lampung, a capital city of Lampung Province of Indonesia, involving 6 districts or 6 Community Health Centers (CHC). The toddlers (n = 124) involved in this research

came from 10 integrated services station (Posyandu). Age of the toddler was varied between 12 moths to 51 months. All of them were over 12 months old, so their nutritional status was relatively stable and some were normal, even though they were classified as stunted at birth (Table 1).

Table 1. Age and nutritional status distribution of toddlers

No	Ages (months)	Normal		Stunting		Total	
		n	%	n	%	n	%
1	12 - 19	20	16.13	4	3.23	24	19.35
2	20 - 27	15	12.10	10	8.06	25	20.16
3	28 - 35	17	13.71	18	14.52	35	28.23
4	36 - 43	21	16.94	11	8.87	32	25.81
5	44 - 51	5	4.03	3	2.42	8	6.45
	Total	78	62.90	46	37.10	124	100.00

It can be seen in Table 1 that 63 percent of children under five were in normal nutritional status, but 37 percent were still stunted. The prevalence of stunting was still the highest in toddlers aged 28-35 months. It was supposed because this age range was the weaning periods, so toddlers experience a period of adaptation in their diet, activities and parenting patterns. Most mothers of the toddler (Table 2) had low education level (>60%). They were working before married (>50%) and decided still working during pregnancy (>22%). Almost of them (90%) caring of their children by their own.

Table 2. Toddlers' distribution based on mother's social status

Criteria		Normal		Stunting		Total	
		n	%	n	%	n	%
Education	Primary School	21	16.94	12	9.68	35	26.61
	Secondary School	30	24.19	12	9.68	40	33.87
	High School	20	16.13	19	15.32	39	31.45
	University	7	5.65	3	2.42	10	8.06
Job before married	Working	38	30.65	28	22.58	66	53.23
	Not working	40	32.26	18	14.52	58	46.77
Job when pregnant	Working	13	10.48	15	12.10	28	22.58
	Not working	65	52.42	31	25.00	96	77.42
Babysitter	Mother other	7	5.65	6	4.84	13	10.48
	Mother only	71	57.26	40	32.26	111	89.52

3.2 Toddlers' Nutritional Intake and Adequacy Level (NAL)

Differences in intake and level of nutrient adequacy among stunted and normal toddlers between three topographic areas were not significantly different [Table 3]. This implies that the consumption patterns of children under five in Bandar Lampung are still relatively the same, not showing significant differences even though their places of residence are in different topographic areas.

Table 3. Toddlers' nutritional intake and adequacy level (NAL)

Nutrition	Unit	Normal Mean ± SD	Stunting Mean ± SD	Sig. diff
Intake: Energy	Kcal	743 ± 257	869 ± 612	0.01
Protein	g	32 ± 19	30 ± 20	0.91
Calcium	mg	312 ± 223	433 ± 435	0.04
Phosphors	mg	597 ± 538	530 ± 413	0.55
Iron	mg	8.5± 7.3	7.3 ±4.5	0.02
Vita	RE	981 ± 987	1.775 ± 4.436	0.03
NAL: Energy	%	79 ± 32	103 ± 83	0.00
Protein	%	177 ± 110	186. ± 130	0.23
Calcium	%	56 ± 44	80 ± 85	0.07
Phosphor	%	129 ±107	131 ± 111	0.61
Iron	%	132 ± 108	128 ± 85	0.15
Vita	%	273 ± 275	574 ± 1.597	0.02

However, the consumption of energy, calcium and vitamin A was significantly greater in stunting toddlers, but the consumption of iron was much greater in normal toddlers;however, the level of iron adequacy of the two groups was still relatively normal. Iron deficiency is the major causes of anaemia and evidence from the Bangladesh demographic and health survey found that iron deficiency was found to be higher among stunted children compared to the healthy children [8].

From a number of nutrients, calcium intake in normal toddlers was deficient. If this happens continuously, it will cause stunted bone growth, so it can happen that the toddler's height gain is stunted or the toddler remains short according to his age.The low intake of calcium and vitamins in children aged 2-5 years may be due to lower consumption of milk after they are weaned, as was found by a study in South Africa[9].

3.3 Determinant Factors on Stunting

Analysis of PCA was conducted on the 20 predicted factors of stunted toddler. For reasons of multicollinearity, from initial list of 20 variables, some variables were excluded. Variables those had significant correlation were mother's education (X3), job status before married (X4), job status when having pregnancy (X7), babysitter (X13), source of cooking water (X16), frequency of attending Posyandu (X18) and Tribes (X20). Those listed in Table 4. All of selected variables have co-correlation coefficient higher than 0.5.

Table 4. Correlation matrix of selected variables

	x3	x4	x7	x13	x16	x18	x20
x3	.838a	.089	-.113	-.249	.162	-.020	.102
x4	.089	.706a	-.408	-.062	-.123	-.342	-.039
x7	-.113	-.408	.647a	-.586	.164	.260	.088
x13	-.249	-.062	-.586	.728a	-.035	-.145	.005
x16	.162	-.123	.164	-.035	.632a	.560	-.023
x18	-.020	-.342	.260	-.145	.560	.545a	.081
x20	.102	-.039	.088	.005	-.023	.081	.860a

Eigenvalues are shown in Table 5, together with the extracted component, it is to be noted that only the first two main components have values above 1 ($\lambda 1 = 2.938$ and $\lambda 2 = 1.229$), having information loss of approximately 40.57%. Therefore, the two principal components were considered for computing the composite index.

Table 5. The total variance explained

	Initial Eigenvalues		
Component	Total	% of variance	Cumulative %
1	2.938	41.974	41.974
2	1.229	17.558	59.533
3	0.961	13.735	73.268
4	0.797	11.383	84.651
5	0.483	6.904	91.555
6	0.374	5.346	96.902
7	0.217	3.098	100.000

The first principal component (PC1) explained 41,97% of total variance (Table 6) of the initial data and is strongly correlated with mother's education (X3), job status before married (X4), job status when having pregnancy (X7) and babysitter (X13). Practically, the PC1 is an element describing the educational and social status of the mother. The second principal component (PC2) explained 17.56 % of total variance of the initial data (Table 6) and is strongly correlated with source of cooking water (X16) and frequency of attending Posyandu (X18). Practically, the PC2 is an element describing the health attitude of the family. This finding is supported by a study that showed the number of stunted children 2-4.9 years old in Indonesia during 1993 until 2007 was highest in the lowest mother's education level. Stunting in children was also higher in mothers who did not check their pregnancy compared to those who did [10].Component plot of rotated space indicates that X3, X4, X7 and X13 variables are grouped in the same quadrant (Fig. 1). Meanwhile, X16 and X18 are positioned on the different quadrant.

In our study, as shown in Table 2, the lowest prevalence of stunting occurs in those whose mothers are highly educated, working before married or during pregnancy, and the child is raised by someone other than the mother. In fact, in the PCA analysis as shown in Table 6, it is proven that all of these variables are the main components. The results presented in Table 6 are in line with a study that found the risk of stunted toddler in West Kalimantan Province of Indonesia, was indirectly and significantly influenced by maternal education [11].

Table 6. Rotated Component Matrix Component

Variables	1	2
Mother's education (x3)	**0.571**	0.281
Job status before married (x4)	**0.665**	0.214
Job status when having pregnancy (x7)	**0.907**	0.052
babysitter (x13)	**0.869**	0.145
source of cooking water (x16)	-0.161	**-0.856**
frequency of attending Posyandu (x18)	0.113	**0.879**
Tribes (x20)	-0.233	-0.274

Other study conducted in Aileu District of Timor Leste, also found that in most stunted toddlers most of their mothers have low education, predominantly employed with low incomes and having large number of the average amount of family [12]. Likewise, latest study found that the odds of stunting decreased significantly among children whose parents were more educated [13].

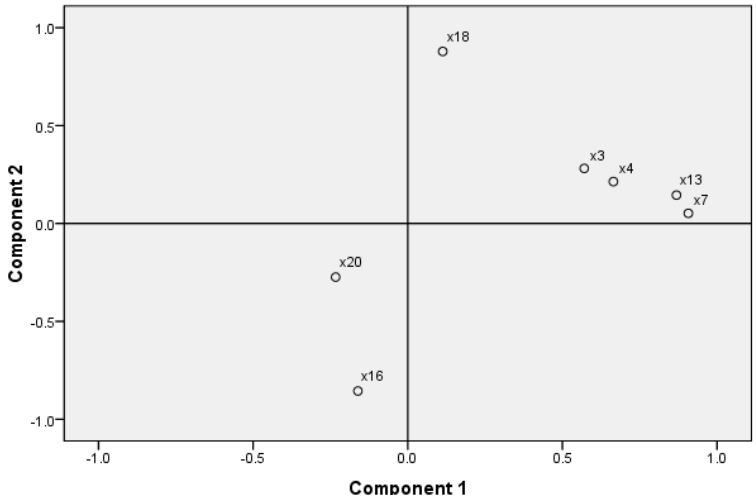

Figure 1. Component plot in rotated space

IV. CONCLUSION AND RECOMMENDATION

The prevalence of stunting in toddlers in the study area is still high, namely 37 percent. There is no difference in food consumption patterns in stunted and normal children. Partial Component Analysis revealed that stunting significantly affected by the educational and social status of the mother and the health attitude of the family. The educational and social status of the mother is strongly correlated with education of the mother, job status before married, job status when having pregnancy and babysitter. The health attitude of the family is strongly correlated with source of cooking water and frequency of attending Posyandu. Supporting education for women and focusing on mother worker during pregnancy is strategic issue for reducing stunting prevalence in Bandar Lampung. Moreover, health attitude of family members should be improved to reduce risk of stunting.

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