

Original Research

Factors associated with stunting among children aged 0-24 months in Kecupak, Pakpak Bharat district, North Sumatra: a case-control study

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ABSTRACT:

Stunting is a major public health problem in Indonesia. Prevalence of severe stunting in Pakpak Bharat was 35.3%, the most highest prevalence after Langkat district. Pakpak Bharat District is the district formed in 2003 as a result of the expansion of the Dairi district, has 8 villages. One of them is the Pergetteng-getteng Sengkut districts and has five villages. Kecupak is the capital city of Pergetteng-getteng Sengkut districts with a population of 4.201 peoples and stunting prevalence in the region is 35.3%.

The purpose of this article is to determine factors associated with stunting among children aged 0-24 months in Kecupak, Pakpak Bharat District, North Sumatra. Sample size was calculated using formula of sample size with case control design, by assuming the odds ratio is two, it gave maximum sample size, 95% CI, 80% power, case to control ratio of 1:1. The total sample size was 140 (70 cases and 70 controls). The data have been collected and processed statistically and analyzed using bivariate analysis.

The results based on the analysis of all the independent variables with the dependent variable (stunting), have discovered the value of $p = <0.05$, it means that there is a relationship between access to improve toilet, birth weigh, mother's education, and the habit of consuming leaf torbanguns to stop stunting. Prevention and controlling of stunting needs a coordinated multi-sectoral and all relevant sectors. Intervention is needed using local food based to improve nutritional status of children aged 0-24 moths.

Keywords:

Stunting, factors, Kecupak.

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INTRODUCTION

Currently, Indonesia faces with the problem of nutrition in children, namely stunting. Stunting in children is a result of a combination of long-term chronic consumption of low-quality diets with morbidity, infectious diseases, and environmental problems. In the middle-income countries, stunting is a major public health problem. This is because stunting can increase the risk of death in children. Stunting can make child not to acquire the genetic potential, indicating the incidence of long-term and cumulative impacts of the inadequacy of nutrient consumption, health conditions and inadequate parenting (ACC/SCN, 1997).

Data from the WHO indicate that the prevalence of stunting in children under five years were 32% in developing countries. Indonesia is also known as a country with a high number of children under five short (stunted) and became the fifth country to have stunted children in the world after India, China, Nigeria, and Pakistan. In 2010, the prevalence of short children (stunting) is about 35.6%, which means that about 1 in 3 children are most likely to be at short stature. Riskesdas (2010) showed that 35.6% of Indonesian children stunt resulting productivity drops due to the individual living with a low income. Stunting is caused by malnutrition. Furthermore, malnutrition is caused by damage to the intestinal mucosa by the fecal bacteria that causes disruption in the absorption of nutrients.

According to UNICEF (1998), growth is affected by the direct and indirect causes. Direct causes include food intake and health status, while indirect causes include the availability and household consumption patterns, parenting, environmental sanitation and health services utilization. These factors are determined by human resources, economics and organization through educational factors. The fundamental cause of most of the growth is a matter of political structure, ideology, and socio-economic

potential based on the existing resources (Supariasa, 2012).

School-age children are the vulnerable group for nutrition and the social group most likely to suffer from nutritional disorders, when people affected by the shortage of foodstuffs supply. In general, this group is in the process of relatively rapid growth, which requires nutrients in relatively large quantities (Sediaoetama, 2008).

According to Semba and Bloem (2001), Children with nutritional status stunting have 5-10 points lower IQ than children who are normal. In addition, children who experience growth retardation in adulthood have important consequences in terms of body size, work performance and reproduction, and the risk of chronic disease. Stunting in early childhood may cause interference Intelligence Quotient (IQ), psychomotor development, motor skills, and neurosensory integration. Stunting is also associated with mental capacity and performance in school, both in moderate to severe cases often lead to decreased work capacity in adulthood.

Prospective cohort study was done by Merchant *et al.* (2003), and the result was that the risk of stunting was lowest in the group that came from homes that had both water and sanitation compared to children from homes without facilities. Among children stunted at baseline, those coming from homes with water and sanitation had a 17% greater chance of reversing stunting than those coming from homes without either facility (Merchant *et al.*, 2003).

Stunting is compounded by the state of nutritional conditions in Indonesia and are still experiencing multiple nutritional problems i.e. the problem of malnutrition and over nutrition. It can become an obstacle to impede the country's development, because the nutritional status of a nation is vital to the quality of human resources and the competitiveness of a nation.

Prevalence of severe stunting in Pakpak Bharat district was 35.3%, with the most highest prevalence after Langkat district (Dinkessu, 2014). Pakpak Bharat district is formed in 2003, as a result of the expansion of the Dairi district, which have eight villages. One of them is the Pergetteng-getteng Sengkut districts having five villages. Kecupak is the capital city of Pergetteng-Getteng Sengkut districts with a population of 4.201 people (BPS Pakpak Bharat, 2017). This study reveals factors associated with stunting among children aged 0-24 months.

MATERIALS AND METHODS

Study setting, design and sampling

A community based case-control study was conducted from January to February 2017 in Kecupak, Pakpak Bharat district, North Sumatra, Indonesia. The distance between Pakpak Bharat district and Medan (the capital city of North Sumatra) is 200 Km. The cases were stunted children ageing 0 to 24 months with z -scores for age below - 2 SD (WHO, 2006). The controls were children ageing 0 to 24 months without stunting, living in the community where cases resided and selected randomly from the next house (neighbor), no symptoms of disease such as fever, diarrhoea and without undernutrition. The data was obtained from healthcare centre in Kecupak. Mothers of the respondent were interviewed by researchers based on a validated questionnaire (Wahyono, 2006). The validity of the question can be seen from the correlation value between each item to the total score. The criterion of a question item is considered valid if the correlation value > correlation table that is in parson correlation table. For the number of respondents 15 and 95% significance level, the value of table correlation shows the number of 0.514 (Wahyono, 2006). The result of the validity test shows that all questions have correlation value greater than 0.514, it means all questions are valid.

This study was an observational study with case control design. Sample size was calculated using formula of sample size with case control design, by assuming the odds ratio as two, it gave maximum sample size, 95% CI, 80% power, case to control ratio of 1:1 (Sastroasmoro, 1995). The total sample size was 140 (70 cases and 70 controls).

Sampling techniques both case and control are taken in the same way, i.e. consecutive sampling. This sampling technique was used to select the participants until the calculated sample size was attained (Swarjana, 2012).

Collecting Data

Data were collected using structured questionnaire *via* face to face interview with mothers as respondent. In this study, the following independent variables or factors were assessed: access to toilet, baby's birth weight, mother's education and the habit of consuming leaf torbangan soup. The questionnaire distributed to the respondents was in simple Indonesian language. It is intended that respondents more easily understand the purpose of the research contained in the question (Lapau, 2012). Filled questionnaires were checked daily for its completeness by enumerators and supervisor.

Data analysis

Data were analyzed using SPSS 14.0 software (Wahyono, 2006). Bivariate analysis have been performed to identify factors related to stunting in children aged 0-24 months. Each research variable that has a P value of less than 0.25 in bivariate analysis, will be included in a logistic stepwise regression procedure. Odds ratios (95% confidence interval) were calculated to determine the relationship between stunting and independent variables. The research data that has been collected is presented by using table.

Ethical consideration

The ethical clearance was obtained from ethical committee in health polytechnic, ministry of health,

Table 1. The relationship between access to improved toilet with stunting

No	Access to improved toilet	Stunting among children aged 0-24 months				P Value	OR
		Case		Control			
		(n)	%	(n)	%		
1	No	42	60.0	27	38.6	0.011	2.3
2	Yes	28	40.0	43	61.4		
Total Number		70	100	70	100		

Surabaya, East Java. Written informed consent was obtained from mothers who were respondent.

RESULTS AND DISCUSSION

The relationship between access to improved toilet and stunting

Table 1 shows the results of the bivariate analysis between access to improved toilet with stunting. The majority of respondents who were case had no access to improved toilet. Likewise, the majority of respondents who were control had access to the improved toilet. Statistical analysis showed an association between access to improved toilet with stunting (P value = 0.011 and OR =2.3).

A study has been conducted to find out the relation between water, sanitation and child growth. The method is to estimate the staging risk ratio (height ratio for Z ages <-2 SD) and lean (BMI-Z <-2 SD) using data from 7.715 Ethiopian, Indian, Peruvian and Vietnamese children from the Young Lives study. Based on these studies, it can be seen that access to improved sanitation is more often associated with reduced risk of stunting than access to water enhancement (Kirk *et al.*, 2017).

Household access to toilet facilities is related to the possibility of illness among children ageing 0-23

months. Children become more easily contaminated by the environment as they begin to crawl, walk, explore and put objects in their mouth, which increases the risk of ingesting fecal bacteria from human and animal sources. This condition increases the risk for children to experience recurrent cases of diarrhea and worms, thus exacerbating the nutritional status of children. The evidence that can be seen is that one of the main causes of child malnutrition is the fecal bacteria swallowed in large quantities and living in the environment in poor sanitary and hygiene conditions (Humphrey, 2009).

The relationship between birth weight of children and stunting

Table 2 shows the results of the bivariate analysis between birth weight with the incidence of stunting. The majority of case have birth weight \leq 2500 g (81.4%). Statistical test results showed that there is relationship between birth weight with the incidence of stunting (P value = 0.001 and OR = 3.7). Recent studies in countries such as East-Central Africa (Kenya), Turkey and East Africa (Burundi), show that children born with low birth weight have a 20% risk of stunting. Based on these studies it is known that infants with low birth weight have a higher risk for stunting (Loida *et al.*, 2017). Another study found that infants with low birth

Table 2. The relationship between birth weight and stunting among children ageing 0-24 months

No	Birth weight of children	Stunting among children aged 0-24 months				P Value	OR
		Case		Control			
		(n)	%	(n)	%		
1	\leq 2500 gram	57	81.4	30	42.9	0.001	5.8
2	$>$ 2500 gram	33	18.6	40	57.1		
Total Number		70	100	70	100		

Table 3. The relationship between mother's education and stunting

No	Mother's education status	Stunting among children ageing 0-24 months				P Value	OR
		Case		Control			
		(n)	%	(n)	%		
1	Primary	49	70.0	28	40.0	0.002	3.5
2	Secondary	21	30.0	42	60.0		
Total Number		70	100	70	100		

weight were born with low essential nutritional reserves; Vitamin A, zinc, and iron (Gluckman, 2003).

The food is a source of energy to support all human activities. Burning carbohydrates, protein, and fat will produce energy in the human body. Therefore, in order to get adequate energy, humans need food for the body adequately and is inevitable. Stunting is caused by three factors: individual factors which include food intake, birth weight and state of health (Fitri, 2012).

Adequate nutrition is necessary to ensure optimal growth and development of infants and children. Daily nutritional needs are used to maintain the normal function of the body that can be done by selecting and food intake in good quality and quantity (Almatsier, 2004).

The relationship between mother's education and stunting

Table 3 shows the results of the bivariate analysis between mother's education with the incidence of stunting fat. The majority of case had mother's education primary, i.e. 49 people (70.0%). The test results showed a significant relationship between mother's education with the stunting (p value = 0.02 and OR = 3.5). Nababan (2015) reported that mother's education, father's and mother's occupation, energy

intake solution and protein intake are predictors for the height of school age children.

Stunting is a major nutritional problem which impact on social and economic life in the community, where individuals stunting has a higher death rate from all causes and an increase in disease. Stunting affects the performance of physical and intellectual work. It is stated that the child's reading ability will be lower than the normal children, and by the time they mature child stunting productivity becomes lower than normal children. Stunting indicates poor linear growth accumulated during the period before and after the birth due to malnutrition and poor health (Fitri, 2012).

Children who were born to uneducated mothers and also had poor households have been found to have increased risk of stunting. It is needed to give special attention for mother's education and household income improvement to reduce the incidence of stunting (Rina et al., 2014).

Several studies have shown that maternal education provides a protective effect on all the malnutrition indicators in children. Maternal education is a strong predictor of the nutritional status of children in urban slums. Stunting is a strong predictor of human capital, by improving maternal education one can contribute to

Table 4. The relationship between the habit of consuming leaf torbangun soup and stunting

No	The habit of consuming leaf torbangun soup	Stunting among children ageing 0-24 months				P Value	OR
		Case		Control			
		(n)	%	(n)	%		
1	No	51	72.9	37	52.9	0.014	2.3
2	Yes	19	27.1	33	47.1		
Total Number		70	100	70	100		

Table 5. Nutritional content of torbangun leave per 100 gram

S.No.	Nutritional content	Amount
1	Energy (Kal)	27.0
2	Protein (g)	1.3
3	Fat (g)	0.6
4	Carbohydrate (g)	4.0
5	Fiber (g)	1.0
6	Ash (g)	1.6
7	Calcium (g)	279
8	Phosphor (g)	40
9	Fe (mg)	13.6
10	Carotene total (mkg)	13288
11	Vitamin B1	0.16
12	Vitamin C	5.1
13	Water	92.5

Source: Batubara *et al.* (2004)

breaking the cycle of poverty in poor urban environments (Abuya *et al.*, 2012).

Relationship between the habit of consuming leaf torbangun soup and stunting

Based on Table 4, the majority of case had no habit of consuming leaf torbangun soup, i.e. 51 people (72.9%). The test results showed a significant relationship between the habit of consuming leaf torbangun soup with the incidence of stunting (p value = 0.014 and OR = 2.3). It means that consumption of leaf torbangun soup was a protective factor to prevent stunt among children at 0-24 months.

Torbangun is a local name among the Batakese people for the *Coleus amboinicus L* plant. Torbangun leaves have two local names among the Batakese people: namely, bangun-bangun among the Toba Batakese and torbangun/tarbangun among those from the Simalungun or Karo Batakese. Batakese people in Indonesia has consumed torbangun for hundreds of years. Study was conducted to gather information regarding the traditional use of torbangun and found its

nourishing qualities and is usually given to the mother for one month after giving birth; perceived to enhance breast milk production, and the tradition adherence is still strong (Damanik, 2009).

The nutritional content of torbangun leaves per 100 grams is as in the Table 5. Food intake, with low consumption of fats significantly contributes to stunting. The low consumption of fat has the most significant impact on the uptake of energy from food. Malnutrition is closely related to the incidence of stunting. The state of malnutrition can be found in every community. This can be seen as a process of less food intake when the normal requirements of the nutrients are not met, or the nutrient is lost by a larger amount than that obtained. The energy intake had a significant relationship with stunting. The consumption of protein also contributed in this case; food intake and health status associated significantly to the nutritional status of stunting (Fitri, 2012).

Torbangun leaves soup has a distinctive flavor and tastes different from other soups. Torbangun is not only given to the mother for one month after giving birth, but also given to all family members, including their children. Nowadays, some of batakese restaurants have provided torbangun as vegetables. Based on nutrient content found in the leaves of torbangun (Table 5), it can be used to prevent and reduce the prevalence of stunting. Torbangun can be made as a snack or as an additional food in children. It is expected that through this way, the adequacy of nutrition in children can be fulfilled.

CONCLUSION

Stunting case has multi risk factors, so prevention and controlling of it needs a coordinated multi-sectoral approach. This requires dialogue between all relevant sectors, including policymakers, civil society, the private sector, consumers, producers and funding resource. Intervention is needed using

torbangun as a local food base to improve nutritional status of children.

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APPENDIX:

PENELITIAN:

FACTORS ASSOCIATED WITH STUNTING AMONG CHILDREN AGED 0-24 MONTHS IN KE-CUPAK, PAKPAK BHARAT DISTRICT

FOR INTERVIEWER

Date of Interview :
 Number of Respondents :
 Respondent's Address :

I. Characteristics of respondents

Name :
 Age :(year)
 Mother's Education : 1). SD 2). SLTP 3). SLTA 4). PT
 Father's Occupation : 1). Civil Servants 2). Trader 3). Farmer 4). Pension
 Mother's Occupation : 1). Civil Servants 2). Trader 3). Farmer 4). Pension
 7. Family income per month : Rp.
 Family expenditure per month : Rp.

II. Factor associated with stunting among children aged 0-24 months

8. Child's name :
 Child's Height :
 Child's Weight :
 Age : (year)
 9. Sex : 1). Laki-laki 2). Perempuan

10. Birth weight :

11. Number of Children under five years : (orang)

12. Number of Family Members : (orang)

13. Do you have any children with stunting in your family??

a). Yes b). No (continue to no. 14).

If yes, what is your relation to the sufferer?

Biological father

Biological mother

Siblings

Brother of the real father

Brother of the real mother

Parents of the real father

Parents of the real mother

14. At the time of new birth, do mothers consume leaf soup torbangun and become a vegetable of all family members including children?

- a. Yes b. No (Continue to no 15)

If yes, how many times in 1 day the mother consumes torbangun leaf soup.

- a. 1 time a day b. 2 times a day c. 3 times a day

How long time mother consumes until no longer consumes leaf soup torbangun.

- a. <6 months b. <6 months - 1 year c. > 1 year

15. Do you have good access to the toilets

- a. Yes b. no

If yes, what type of toilets do you have?

- A. Private toilet b. public toilet

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