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Food Intake and Food Security as Determinants of Stunting Children Under Five Years

Ayik Nikmatul laili[1(CA)], Al Munawir[2], Farida Wahyuningtiyas[3]

[1(CA)]Post Graduate School of Public Health Science, University of Jember, Indonesia; aik.nikmah89@gmail.com (corresponding author)

[2]Department of Pathology, Faculty of Medicine, University of Jember, Indonesia

[3]Faculty of Public Health, University of Jember, Indonesia

ABSTRACT

Stunting is a linier growth failure caused by chronic malnutrition or chronic infectious disease. Stunting became nutritional problem that need attention because it can influence quality of human resources. Factors associated with stunting, such as nutrition intake, household food security, and parenting. Three work area health centers in Jember such as Sumberjambe, Kasiyan, and Sumberbaru which has highest rate of stunting children under five years in 2006. The purpose of this research was to analyze the determinant of stunting children under five years. This research was analytical observational with case control design. This research was conducted in three work area health centers such as Sumberjambe, Kasiyan, and Sumberbaru in September to October 2017. The sample of this research was 71 case respondents and 71 control respondents. Sampling technique used cluster random sampling. Logistic regression statistic test with significant level $p < 0.05$ was used to analyze the data. The result of this research showed that nutrition intake and household food security could influence incidence of stunting children under five years (each p-value was 0.00). Conclusion of this research was there significant influence noted between nutrition intake and food security on incidence of stunting children under five years.

Keywords: Stunting, Nutrition intake, and Food security

INTRODUCTION

Today's nutritional problems which get many attentions were chronic malnutrition in short or stunting. Stunting is a linier growth failure caused by chronic malnutrition or chronic infectious disease. Thus conditions was occur continuously showed by the value of Z-score height for age (BH/ A) less than -2 standard of deviation (SD) based on WHO standards. Stunting became nutritional problem that need attention because it can influence quality of human resource(1).

Millennium Challenge Account Indonesia stated that stunting prevalence in Indonesia higher than other countries in Southeast Asia, such as Myanmar (35%), Vietnam (23%), and Thailand (16%). Prevalence of stunting children under five years in Indonesia according to RISKERDAS 2013 was 37.2%, it was higher than in 2010 35.6% and in 2007 was 36.8%(2). Short Prevalence was 37.2 % included 18.0 % very short, and 19.2 % short. In 2013 very short prevalence showed that it decreased from 18.8 % in 2007 and 18.5 % in 2010, while short prevalence increased from 18.0 % in 2007 became 19.2 % in 2013.

Health problems in society, especially in childhood according to data from Indonesian Ministry of Health (2013), it was considered hard if short prevalence 30- 39 % and serious if short prevalence was ≥ 40 % [2]. UNICEF (1998) stated that growth was influenced by direct and indirect causes. Direct causes such as nutrition intake (consumption of macro and micro nutrients) and health condition (infection diseases) while, indirect cause such as household food security, parenting, environmental sanitation, and use of health care.

A direct cause of stunting is nutrition intake; one of them is protein intake. The main function of protein for body is building essential body compounds which water balance regulation, maintaining neutrality in body, building antibody nutrient transport, and also for growing and maintaining tissues(3). The result of the research that was done by Sari (2016) stated that there correlation noted statistically between level of energy consumption and nutrient status, here index of BW/ A (p value 0.001)(4).

Indirect causes of stunting are household food security and parenting. Natalia reported ed that there was correlation between household food security level and toddlers' nutrients status which proven by the result of statistic test. Thus result of statistic test showed positive correlation, so it means that if food security increases,

toddlers' nutrients status will increase, vice versa.[5] Food security according to Act Number 12 Year 2012 was condition fulfillment of food demands for country and individual or person. Thus condition be described with the availability of enough food in amount and its qualities, safe, varieties, has nutrient value, equally, and affordable. The main point it is contrary with someone religion and belief, so it could be used as one of the active health basic living and productive sustainably.

The survey result of Determining Nutritional Status (DNS) Public Health Service in East Java province, 2013 that percentage of stunting in Jember was 43.3%. Work area health center of Kalisat has highest stunting prevalence in Jember 85.7% according to the result of stunting determination in Jember[6]. Prior study was done by Public Health Office Jember, showed that from the total of 50 health centers in Jember, 32 out of 50 there were incidence of stunting. According to the interview result with information staff of Public Health Office Jember (2017), showed that the highest prevalence data of stunting toddlers in 2016 in Sumberjambe Health Center was 35%, the second highest was Kasiyan Health Center 32%, and the third highest was Sumberbaru Health Center 28%.

The reason research was done for children under five years because it is critical period for growing and developing cells, where if health problem for children was disturbed, it would influence the process of this growth and development. This research was conducted in three areas of health centers which have the highest incidence of stunting in 2016, such as Sumberjambe, Kasiyan, and Sumberbaru.

The purpose of this research was to analyze determinant of stunting on children under five years case study in three work area Health Center of Sumberjambe, Kasiyan, and Sumberbaru.

METHODS

This research was observational analytic with case control design. It was conducted in three areas of health centers, such as Sumberjambe, Kasiyan, and Sumberbaru in September to October 2017. Samples of this research were 71 cases and 71 controls. Cluster random Sampling used as sampling technique. Interview using questionnaire used to collect the data. Logistic regression statistic test with significant level $p < 0.05$ was used to analyze the data.

RESULTS

Distribution of Stunting Based on the Characteristic of Children Under five Years

Table 1. Distribution of Stunting Based on the Individual Characteristic of Children Under five Years

Children Characteristics	Incidence of Stunting			
	n (Case)	%	n (Control)	%
Age				
Infant 0-12 Months	30	42.2	14	19.7
Toddlers 13-36 Months	34	47.9	33	46.5
Pre School 37-59 Months	7	9.9	24	33.8
Total	71	100	71	100
Gender				
Male	36	50.7	37	52.1
Female	35	49.3	34	47.9
Total	71	100	71	100
Status of LBW				
Yes	0	0	0	0
No	71	100	71	100
Total	71	100	71	100

Incidence of stunting on children under five years based on table 1, if it was seen according to children age, showed that most half of children (47.9%) who stunted were toddlers age 13- 36 months. Incidence of stunted or not stunted who born which low birth weight (LBW).

Data incidence of stunting according to parents age showed that most half (47.9%) by fathers age stunted children were approximately 26-35 years old. Mothers age also showed most half (49.3%) by mothers age stunted children were approximately 26-35 years old. Distribution of parents' age not stunted children under five years approximately 26- 35 years old were 45%. Data of distribution result incidence of stunting based on parents education of children, most of them were have basic education. Data of distribution result by parents' occupation of children, most of them were entrepreneurs 74.6% on stunted children and most of the fathers occupation of not stunted children (66.2%) were entrepreneurs. Data of mothers' occupation who stunted children, most of them 70.4% did not work, while mothers who not stunted children also did not work were 50.7%.

Table 2. Distribution Incidence of Stunting Based on Parents Characteristic

Parents Characteristics	Incident of Stunting							
	n (Case)				n (Control)			
	Father	%	Mother	%	Father	%	Mother	%
Parents Age								
17-25 Years	18	25.4	28	39.4	18	25.4	29	40.8
26-35 Years	34	47.9	35	49.3	32	45	32	45.1
36-45 Years	17	23.9	8	11.3	19	26.8	10	14.1
46-55 Years	2	2.8	0	0	2	2.8	0	0
Total	71	100	71	100	71	100	71	100
Education								
Basic/ Primary	55	77.5	51	71.8	54	76.1	52	73.3
Intermediate	12	16.9	18	25.4	13	18.3	17	23.9
High/ Advance	4	5.6	2	2.8	4	5.6	2	2.8
Total	71	100	71	100	71	100	71	100
Occupation								
Unemployment	0	0	50	70.4	0	0	36	50.7
Traders	2	2.8	6	8.4	2	2.8	12	16.9
Labor / Farmer	16	22.6	5	7.1	20	28.2	10	14.1
Civil Servant	0	0	0	0	1	1.4	0	0
Soldier / Police	0	0	0	0	1	1.4	0	0
Retirement	0	0	0	0	0	0	0	0
Entrepreneur	53	74.6	10	14.1	47	66.2	13	18.3
Total	71	100	71	100	71	100	71	100

Table 3. Distribution Incidence of Stunting Based on Family Characteristic

Family Characteristics	Incident of Stunting			
	n (Case)	%	n (Control)	%
The Distance of Childbirth				
≤ 2 Year	26	36.6	36	50.7
> 2 Year	45	63.4	35	49.3
Total	71	100	71	100
Children Birth Order				
Eldest/ Only Child	30	42.2	29	40.8
Second Child/ Middle	19	26.8	22	31
Youngest Child	22	31	20	28.2
Total	71	100	71	100
Total Family Members				
Small Family	43	60.6	43	60.6
Medium Family	24	33.8	23	32.4
Big Family	4	5.6	5	7
Total	71	100	71	100
Family Income Level				
Under Minimum Wage	54	76.1	56	78.9
Above Minimum Wage	17	23.9	15	21.1
Total	71	100	71	100

Data of distribution incidence of stunting based on the distance of childbirth, mostly (63.3%) have more than two years for its on stunted children. The distance of childbirth who not stunted children, mostly (50.7%) have less than two years for it. Children birth order who stunted or not stunted children most of them were eldest child/ only child were 42.2% stunted children and 40.8% not stunted children. Total family members who stunted and not stunted children mostly have same members were small family 60.6%. Data of distribution children family income, most of them have income level under minimum regional wage 76.1% were stunted children and 78.9% were not stunted children.

The Effect of Nutrition Intake on Incidence of Stunting

Data in table 4 above showed that 71stunted children (64.8%) or 46 children who have less energy intake. Mostly, not stunted children (62%) or 44 children who have enough energy intake. The result of data analysis used Logistic regression statistic test showed significant result 0.000 ($P < 0.05$). Thus result showed there was

influence between energy intake and incidence of stunting children under five years. Coefficient influence value was 2.5 showed that there was positive influence between energy intake and incidence of stunting. Scale risk was 11.8, it means that children with less energy intake have risk 11.8 times bigger were stunted than children who have enough and good energy intake.

Table 4. The Affect of Nutrition Intake on Incidence of Stunting

Nutrient Intake	Incident of Stunting				Sig.
	Stunting		Not Stunting		
	n	%	n	%	
Energy					
Less	46	64.8	7	9.8	
Enough	24	33.8	44	62	0.000
Good	1	1.4	20	28.2	
Total	71	100	71	100	
Proteins					
Less	57	80.3	2	2.8	
Enough	14	19.7	56	78.9	0.000
Good	0	0	13	18.3	
Total	71	100	71	100	
Fats					
Less	32	45.1	4	5.6	0.000
Enough	29	40.8	36	50.7	
Good	10	14.1	31	43.7	
Total	71	100	71	100	
Carbohidrates					
Less	52	73.2	4	5.6	0.000
Enough	18	25.2	40	56.3	
Good	1	1.4	27	38.1	
Total	71	100	71	100	
Calsium					
Less	55	77.5	0	0	0.000
Enough	15	21.1	61	85.9	
Good	1	1.4	10	14.1	
Total	71	100	71	100	
Zink					
Less	46	64.8	14	19.7	0.000
Enough	24	33.8	43	60.6	
Good	1	1.4	14	19.7	
Total	71		71	100	

The data of research result related the influence between protein intake and stunting children under five years (it could be seen in attachment of table 4) showed that 71 mostly stunted children (80.3%) or 57 children who have less protein intake. On the other hand, not stunted children mostly, 78.9% or 56 children who have enough protein intake. The result of analysis used Logistic regression statistic test showed significant result 0.000 ($P < 0.05$). Thus result showed there was influence between protein intake and incidence of stunting children under five years. Coefficient influence value was 4.7 showed that there was positive influence between protein intake and incidence of stunting. Scale risk was 116.2, it means that children with less protein intake have risk 116.2 times bigger were stunted than children who have enough and good protein intake.

The research related the influence between fats and incidence of stunting children under five years showed that 71 stunted children mostly half (45.1%) or 32 children who have less fats intake. On the other hand, not stunted children mostly, 50.7% or 36 children who have enough fats intake. The result of analysis used Logistic regression statistic test showed significant result 0.000 ($P < 0.05$). Thus result showed there was influence between fats intake and incidence of stunting children under five years. Coefficient influence value was 1.5 showed that there was positive influence between fats intake and incidence of stunting. Scale risk was 4.5, it means that children with less fats intake have risk 4.5 times bigger were stunted than children who have enough and good fats intake.

The data of research result related the influence between carbohydrate intake and stunting children under five years, showed that 71 mostly stunted children (73.2%) or 52 children who have less carbohydrates intake.

On the other hand, not stunted children mostly, 56.3% or 40 children who have enough carbohydrates intake. The result of analysis used Logistic regression statistic test showed significant result 0.000 (P < 0.05). Thus result showed there was influence between carbohydrates intake and incidence of stunting children under five years. Coefficient influence value was 3.2 showed that there was positive influence between carbohydrates intake and incidence of stunting. Scale risk was 23.9, it means that children with less carbohydrates intake have risk 23.9 times bigger were stunted than children who have enough and good carbohydrate intake.

Data of research result related the influence between calcium and incidence of stunting children under five years (table 5) showed that 71 stunted children mostly (77.5%) or 55 children who have less calcium intake. On the other hand, not stunted children mostly, 85.9% or 61 children who have enough calcium intake. The result of analysis used Logistic regression statistic test showed significant result 0.000 (P < 0.05). Thus result showed there was influence between calcium intake and incidence of stunting children under five years. Coefficient influence value was 5.2 showed that there was positive influence between calcium intake and incidence of stunting. Scale risk was 191.1, it means that children with less calcium intake have risk 191.1 times bigger were stunted than children who have enough and good calcium intake.

Data of research result related the influence between zinc and incidence of stunting children under five years, showed that 71 stunted children mostly (64.8%) or 46 children who have less zinc intake. On the other hand, not stunted children mostly, 85.9% or 61 children who have enough zinc intake. The result of analysis used Logistic regression statistic test showed significant result 0.000 (P < 0.05). Thus result showed there was influence between zinc intake and incidence of stunting children under five years. Coefficient influence value was1.8 showed that there was positive influence between zinc intake and incidence of stunting. Scale risk was 6.2, it means that children with less zinc intake have risk 6.2 times bigger were stunted than children who have enough and good zinc intake.

The Effect of Household Food Security on Incidence Stunting Children Under Five Years

Table 5. The Influence of Affect Food Security on Incidence Stunting Children Under Five Years

Food Security	Incident of Stunting				Sig.
	Stunting		Not Stunting		
	n	%	n	%	
Non- Food Security	61	85.9	37	52.1	0.000
Food Security	10	14.1	34	47.9	
Total	71	100	71	100	

Data of research result related the influence between household food security and incidence of stunting children under five years (table 5) showed that 71 stunted children mostly (85.5%) or 61 children family with nonfood security. On the other hand, not stunted children mostly, 52.1% or 37 family children with non-food security. The result of analysis used Logistic regression statistic test showed significant result 0.000 (P <0.05). Thus result showed there was influence between household food security and incidence of stunting children under five years. Coefficient influence value was 1.7 showed that there was positive influence between household food security and incidence of stunting. Scale risk was 5.6, it means that families children with non-food security have risk 5.6 times bigger were stunted than family children with food security.

DISCUSSION

Food Intake

1. Energy

Energy in the body has function as basal metabolism, that is energy needed when someone take a rest, then specific dynamic action (SDA), energy which is needed for its food processing, physic activities, thinking, growth, and removal food loss[7]. The result of this research showed there was influence noted significantly between energy intake and incidence of stunting children under five years. This result aligned with research which done by Sari stated that there was correlation noted between energy consumption level and nutritional status, here height for age (BH/ A)[4]. Lack of energy will inhibit all physic activities, thinking, and other activities in the body. Lack of energy assumed as lack of carbohydrates consumption and as its substitute fats and energy will be used as source of energy. Lack of energy can cause protein- energy malnutrition (PEM) which is signed marasmus and kwashiorkor. Children with protein energy malnutrition, their growth and development will obstruct.

Incidence of stunting because of lack of energy intake in work areas health center of Sumberjambe, Kasiyan, and Sumberbaru were caused by many factors. Some factors such as non-household food security that caused by parents education, occupation, and less daily income, it was caused decreasing of society purchasing power, so they cannot meet family nutritional needs. Other factor for stunting caused by lack of energy was society in thus areas have good food source, but they can't use it right away. The example of food sources from

their own crops such as, rice, corn, soybean in agriculture areas and fish in fishing areas. Thus conditions caused by society prefer selling half, even though all their crops in order to meet other needs.

2. Protein

This result aligned with research which done by Sari (2016) stated that there was correlation noted statistically between energy consumption level and nutritional status, here height for age (BH/ A)[4]. Proteins are essential nutrients for human body because aside as energy sources, they also as the building block of the body and substance regulator. The main function of protein for human body, such as creates essential body compounds, regulating of water balance, maintaining equilibrium, produce antibodies, transportation of certain molecules, and also growing and maintenance of body tissue[3]. Protein best quality was complete proteins, here containing essential amino acids and typically possess a higher biological value for growth.

Food intake, here protein intake in work areas health center of Sumberjambe, Kasiyan, and Sumberbaru were low or less, so it may cause stunting in thus areas. Lack of food intake could influence by characteristic of individual itself and family. Family characteristics were associated in stunting such parents education and parents occupation, where both of them can influence family income. Parents education, especially mother education, most of them was basic education. Thus condition became triggers the lack of parents knowledge, especially mother knowledge about nutrients in food. The lack of family income will decrease society purchasing power, so it will influence daily needs of society it self.

3. Fats

Fats like protein, is essential energy sources for human body. Lack of essential fat acid will inhibit growth for infant and children, failure of reproduction, and some disorders for skin, kidney, and heart[8]. The research result showed that there was influence between fats intake and incidence of stunting children under five years. This result aligned with research which done by Oktarina and Trini stated that there was correlation noted between fats intake and incidence of stunting[9]. Finding research showed that children in research area often consume fried food, such as fried Tempe, fried Tofu, sauté vegetables, so fats intake which is gained only comes from thus fried food. Other food which has essential nutrient fats was rare to consume by them.

Parents' reason did not give food fat sources because parents did not know about nutrient in food. Another reasons because parent did understand about the function of food and nutrient in food for human body. The cause of parents did not know and understand about nutrient in food because they have basic education. Another cause was low income level, so their purchasing powers also lower. They prefer other needs than family nutrient needs, especially for their children. As a result, children were stunting caused by lack of fats intake in their body. In line with theory stated by Almatsier that lack of essential fats will inhibit growth for infant and children, failure of reproduction, and some disorders for skin, kidney, and heart[8]. Energy weight that provided per gram fats 2¼ times bigger than carbohydrates and protein. 1 gram of fat provides 9 calories, while 1 gram carbohydrate and protein only provide 4 calories[10].

Other factor of family characteristics was total individual in thus family. It is more and more members of family who live at one home, so the consumption needs will increase. Increasing of consumption needs if it is not follow by big income, it will not fulfill. Other causes because lack of attention from society and health staffs about the importance of nutrient needs for children. Heath staffs never give education about the importance of nutrient needs openly, because they often give education through activities in integrated health post for children. As a result, societies who never join thus activities did not understand about thus nutrient information.

4. Carbohydrates

This result showed that there was influence between carbohydrates intake and incidence of stunting children under five years. This research analysis aligned with Sari stated that there was correlation noted significantly between carbohydrates consumption level and nutritional status, here height for age (BH/ A)[4]. Carbohydrates are essential nutrients for human body because it is body's main sources of fuel for human and animals and the price was less expensive. The function of carbohydrates were body's main source of fuel, giving sweet taste in food, save protein in human body, setting fats metabolism in our body and helping in fesses disposal.

Finding research was mostly of children consumed carbohydrates from grains such rice. Children rare to consume carbohydrates from other food sources like dry nuts or tubers. Thus reasons because parents did not understand about the importance of food needs for children in their growth period. Some of children in this research area prefer eating cakes and snacks which have less of carbohydrates. This condition become one of cause stunted children. In accordance with the theory stated by Adriani & Wirjatmadi that carbohydrates is needed by children who in growth period as energy sources[11]. No rules about minimum carbohydrates needs, it was because glucose in circulation can be formed from protein and glycerol. Other cause was parents' lower income so it reduces economy access and purchasing power of parents.

5. Calcium

The research result showed that there was influence between calcium intake and incidence of stunting children under five years. This result aligned with research which done by Oktarina and Trini stated that there

was correlation noted between calcium intake and incidence of stunting. Calcium is one of the essential elements in human body[9]. The main function of calcium is to fill bone density. Calcium in bones has two functions thereby supporting skeletal structure and place to storage calcium[12]. Other functions of calcium was help build strong bones and teeth, build blood clots process, as catalyst for biological reaction, and also it essential in growth[3].

The finding research when collecting data taken that mostly stunted children rare to consume food with high calcium. Some example of food containing calcium that consumed by children were Tempe and tofu. But, only that kind of food that consumed by them, so it was not varieties. Toddlers' period should be introduced varieties of food, because it was not only to give knowledge about kind of food but also to meet nutrients needs in order to help growth process. The reason why parents did not meet children calcium needs because their lack of purchasing power. Most of them have lower income, so they cannot meet daily needs. Another reason was parents education which most of them only have basic education. Thus condition that cause lack of parents knowledge about the importance of calcium for their children.

6. Zinc

Zinc is essential minerals found in cells throughout the body. Zinc is needed for the body's defensive (immune). Zinc also needed for wound healing, the sense of smell and taste, and to regulate DNA synthesis. Another function of zinc was for normal growth and human development, started in pregnancy period, children until adults[13]. The result of this research showed that there was influence between zinc and incidence of stunting children under five years. This research aligned with Anindita (2012) stated that there was correlation noted statistically between zinc intake and incidence of stunting children 6- 35 months[14].

Food intake, this matter energy intake, protein, fats, carbohydrates, calcium, and zinc in in three work area health centers such as Sumberjambe, Kasiyan, and Sumberbaru was less or low, so it may cause incidence of stunting in this areas. Lack of food intake might was influenced by individual characteristic itself and family. Family characteristic contributed incidence of stunting was parent education and parents occupation, where both of them will influence the family income. Parents education, especially mother education, most of them was basic education. Thus condition became triggers the lack of parents knowledge, especially mother knowledge about nutrients in food. The lack of family income will decrease society purchasing power, so it will influence daily needs of society itself.

Food Security

The research result was aligned with research conducted by Natalia, *et al* stated that there was correlation between household food security level and toddler nutrients status which proven by the result of statistical test. Thus result showed positive correlation, it means that if food security increases, toddler nutrients status will also increase, vice versa[5]. Another research was done by Striningsih and Lasri (2017) in Malang district stated that there was correlation between food security and toddler nutrients status[15]. Food security in family level according to Prihatin *et al* defined that convenience of accessibility by individual to get enough food source in order to work and doing daily activities [16].

Three work areas health centers such as Sumberjambe, Kasiyan, and Sumberbaru included area which condition of non-food security. Food security is influenced by three main factors such as food availability, economy of food stability, and physic access and economic access for individual to get food sources. The reasons why three work area health centers such as Sumberjambe, Kasiyan, and Sumberbaru included area which condition of non-food security was because less of society physic access and economic access. Thus thee work areas were remote areas and far from center of the crowd, so the access to get food source also limited. The other reason was society economic access to get food source also limited. It is known that in these three areas was agriculture area and one of them was fishing area, however because of the limitation of knowledge about nutrients needs, so ignores the important elements of food. Mostly the majority of population in three work areas health centers such as Sumberjambe, Kasiyan, and Sumberbaru have farms, but their own crops did not used to meet nutrients needs but to meet other needs.

CONCLUSION

Based on the result of this study, it could be concluded that food intake and food security as determinants of stunting incidence in toddlers children under five years. It was needed counseling for parents about nutritional status, especially about stunting children under five years. Not only counseling in posyandu for toddlers, but also all elements of society, especially parents who has children under five years. It must do in order to give education about the importance of nutrient in daily food. So it will press the prevalence of stunting on children under five years.

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