The prevalence and risk factors of stunting among primary school children in North Sumatera, Indonesia

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Abstract. Stunting in primary school-aged children is a kind of health and nutrition problem in Indonesia which has an impact on the human quality resources degradation. This research aimed to determine the stunting prevalence and the risk factors associated with stunting in primary school children in North Sumatra Province. This research is an analysis of cross-sectional approach. The total sampleis 400 children aged 8-13 years old were in the study from the Medan city and Langkat regency in July - October 2017. Data collected by using questionnaire and anthropometric assessment. Stunting (<-2 SD of height-for-age Z-score) were defined by using the World Health Organization reference 2007. Chi-square analysis and logistic regression were used toassess the association between risk factors and stunting. The prevalence of stunting in primary school children was 38.87%. The factors associated with stunting school children were theeducation of mother (OR=1.53), income (OR=2.27), work of mother (OR=1.39), energy intake (OR=2.66) and protein intake (OR=2.02). The dominant factor that influences stunting in school children was energy intake. The conclusion of this study is stunting prevalence in school children in NorthSumatra higher.

1. Introduction

Nutritional problems that typically occur in children of school age is stunning. Stunting (low height according to age) reflects a bad linear growth. This condition is the manifestation of chronic nutritional deficiencies that many experienced by children in poor and developing countries. According to the World Health Organization (WHO) [1], some countries reported that they had stunting incident number exceeds 40%, such as Bangladesh, Cambodia, Ethiopia, Nepal, Yemen, and Zambia. Based on the data Riskesdas 2013, stunting incident numbers in Indonesia on toddlers was 37.2%, children aged 5 – 12 years old was 30.7% (12.3% were very short, and 18.4% were short). North Sumatra is one of the 15 provinces with the prevalence of short children aged 5 – 12 years above the national prevalence 37.6%.[2]

Stunting at an early age will lead to adverse effects on psychomotor development, intelligence, motor skills and the integration of neuropathic sensory [3] and lower level of intelligence.[4] WHO [5] divided the impact caused by stunting into two consisting of short term and long term. The short-term impact of stunting can lead to increase a mortality and morbidity, decreasing in the development of cognitive, motoric, and language, and increasing for health care costs. Stunting can also cause long-

term impact such as a short stature, increasing a risk for obesity and comorbidity, and a decreasing in reproductive health, adecline of achievement and learning capability, and in the economic sphere is a decreasing in the ability and capacity of work. Another impact of stunting in children is the obstruction of mentality and motoric development.[6]Stunting can also affect levels of hemoglobin. Children in Tanzania showed that they who experienced stunting had a low blood hemoglobin levels.[7]

Previous studies concluded that factors related to stunting were the number of family members [8], short maternal posture [9], [10] the father work, education of the mother [11], the time of birth weight [12], the energy intake [3], the intake of protein, calcium, potassium, iron [13] and family economic status.[14]As the magnitude of the stunting in North Sumatra and its impact on human resource degradation so it needs to do a research to find out a factor related to the risks of stunting in North Sumatra in order to be developed as the appropriate nutritional intervention model.

2. Method

This research is an analytic survey of thecross sectional design. Samples were 400 primary school children aged 8-13 years who came from 4 primary schools: SDN 064026, SDN 067246 from the Medan city, and SDIT Al Ansar, SDIT Azdkia from Langkat regency, North Sumatra Province. Data is in July – October 2017.

The data collected in this research was the primary data, using a questionnaire and anthropometry measurements instruments. The interview was with a structured questionnaire to know the socio-demographic data, a history of illnesses and the habit of snacking on respondents. Food intake data obtained by using a food recall 24 hours. The measurement of Anthropometry includes height and weight. Height measurement using gauge height "microtome" with capacitymeasuring two meters and the accuracy of 0.1 cm. Stunting enforced nutritional status based on the criteria of height-2 SD <.[15]

Data analysis were univariate, bivariate and multivariate. Univariate analysis was used to describe the incidence of anemia in primary school children, gender and age range of the children of the school. Bivariate analysis was chi-square test to see the relationship of the anemia incidence with diet and sociodemographics. Binary logistic regression analysis was used in order to find out the dominant factor which was influential to the incidence of stunting in primary school children. The data were analyzed by using the SPSS Software 20.

3. Results

3.1. Univariate analysis

The total respondents in this study were 400 people which came from the primary school children from the Medan city and Langkat regency, North Sumatra Province. Most respondents age distribution was 10-11 years of age amounted to 67.3%. Category female gender as much as 49.0% of respondents, while 51.0% was male-sex. Seen from the education of father category, most of them were high school to Diploma or University that was 81.3%, while the education of mother was dominated by thehighest school to theuniversity that was 60.5%. In terms of the number of family members, a total of 52.8% had family members less than 4 persons, while 47.3% had more 4 persons as family members. Seen from the parental income that was 56.6% had an income of more than IDR 1.8 million (Table 1).
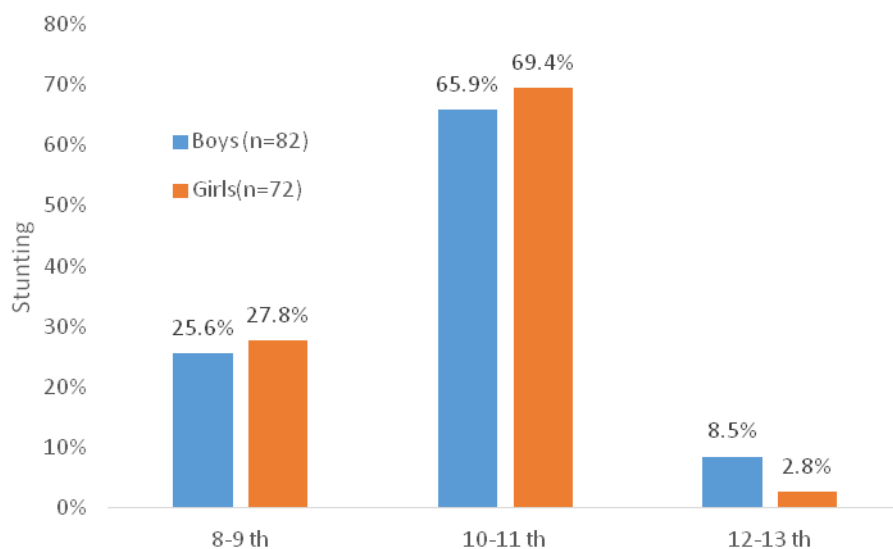
The prevalence of severe stunting, stunting, and normal on primary school children participated in succession is 5.8%, 32.8%,and 61.5%, respectively. While the average height according to the value of the z score in children with severe stunting-3.5, stunting - 2.2, and normal children-0.6 (Table 2). Subsequently, Figure 1 shows that there is no significant distinction. It occurred in stunting on neither older men nor women either (p 0.05 >). In the age range 8-9 years and 10-11 years, stunting occurred more in girls i.e. 27.8% and 69.4% than the boys. In the age range 12-13 years, the prevalence of stunting is declining and more happening to the boy that is 8.5% than girls i.e. 2.8%.

Table 1. The distribution characteristics of the socio-demographic elementary school children (n = 400).

Characteristics	Category	n	%
Gender	Male	204	51.0
	Female	196	49.0
Age (year)	8-9	119	29.8
	10-11	269	67.3
	12-13	12	3.0
Education of Father	Primary Elementary-School	75	18.8
	High School-Diploma-University	325	81.3
Family members	≤4	211	52.8
	>4	189	47.3
Education of Mother	Primary-Elementary School	158	39.5
	High School-University	242	60.5
Income of Parents	< IDR 1,800,000	174	43.4
	≥ IDR 1,800,000	226	56.6
Total		400	100.0

Table 2. The prevalence of stunting in children of the primary school in North Sumatra.

Nutritional Status Heigh/Age	N	%	Mean Height-for-age Z-score (SD)
Severe stunting	23	5.8	-3.5(0.4)
Stunting	131	32.8	-2.2(0.2)
Normal	246	61.5	-0.6(1.0)
Total	400	100.0	-1.3(1.2)

Figure 1. Age and gender-specific prevalence of stunting among school children in North Sumatera.

3.2. Bivariate analysis

Bivariate analysis results in Table 3 shows that the variable which effects were stunting significantly in primary school children is the income of parents ($p = 0.001$) phi test results indicate that parental income variables give the contribution of 23.6% to the occurrence of stunting. Other variables are closely related to the incidence of stunting in children of the school, they are the number of family

members (p = 0.027), education of mother (p = 0.001), work of mother (p = 0.002), habitual breakfast (0.015), energy intake level (p = 0.001), protein intake rate (p = 0.001) and infectious diseases (p = 0.001).

Table 3. Bivariate analysis of factors related to the incidence of stunting.

Variable	Category	Stunting		Normal		P Value	*Phi*Value
		n	%	n	%		
Income of Parents	Less	91	51.7	85	48.3	0.001	0.236
	High	64	28.6	160	71.4		
Family members	Enough	71	33.6	140	66.4	0.027	0.111
	Many	84	44.4	105	55.6		
Education of Mother	Low	83	52.5	75	47.5	0.001	0.229
	High	72	29.8	170	70.2		
Work of Mother	NoneWork	70	31.8	150	68.2	0.002	0.157
	Working	85	47.2	95	52.8		
Breakfast habitual	Sometimes	68	46.6	78	53.4	0.015	0.122
	Every day	87	34.3	167	65.7		
Energy Intake	Less	103	53.9	88	46.1	0.001	0.298
	Proper	52	24.9	157	75.1		
Protein Intake	Less	108	51.4	102	48.6	0.001	0.296
	Proper	47	24.7	143	75.3		
Infectious Diseases	Never	65	28.1	166	71.9	0.001	0.255
	Ever	90	53.3	79	46.7		

3.3. Multivariate analysis

Multiple regression analysis results as shown in Table 4 shows the factors thatare influential to stunting incident are income, education, employment, energy consumption and the consumption of protein. The most dominant variable that influential to stunting in primary school children is energy consumption (p=0.001) in which children with less energy consumption will be experiencing a stunting of 2.66 times more than children with the proper energy intake.

Table 4. The result of binary logistic regression analysis.

Independent Variable	B	P	OR	CI 95%		
Income of family (X1)	0.823	0.001	2.278	1.397	-	3.713
Education of Mother (X2)	0.431	0.094	1.539	0.929	-	2.548
Work of Mother (X3)	-1.174	0.002	.309	.148	-	0.645
Protein Intake(X4)	0.706	0.005	2.026	1.241	-	3.309
Energy Intake (X5)	0.981	0.001	2.667	1.617	-	4.399

4. Discussion

The prevalence of stunting in children of the primary school in the region of research was 38.8% which was the outcome of screening on four public and private primary schools in The North Sumatra. This figure is higher than the number of national stunting based on Riskesdas 2013 results that are 30.7%. The results from this study are in the line with research of Sulastri [11] in elementary school children in the town of Padang that found the prevalence of stunting 35%. Studies conducted by Arfines [16] in elementary school children in the slums of Central Jakarta found a lower prevalence of stunting 21.5%. Likewise, research Picauly [17] in East Sumba and Kupang East Nusa Tenggara found 25.6% and 31.75% of elementary school children have short nutritional status. Mwaniki study [18] in Kenya involving 208 children aged 4-11 years found 24.5% were stunting. The low prevalence of stunting was found by Mushtaq [14] that examines 1860 children aged 5-12 years in Lahore Pakistan, found only 8% were stunting. Those studies show that stunting is a kind of nutrition and public health problem in many poor and developing countries.

Bivariate test results showed stunting had a close relationship with the income of parents. School children who come from families with less income experienced stunting more often than children from families with high-income status. The results are in line with studies conducted by Ramli [19] in the Maluku islands found that there was a significant influence on theincome of parents and incidence of stunting. One of the causes of stunting is the lack of nutritional intake in pregnancy and babies. The limited availability of food and nutrition in the family may cause thelow income of theparent. A study by Riyadi et al. [20] reveals that the poverty is as the agent of malnutrition in various parts of the world. This factor should get serious attention because the economic circumstancesare relatively easily measured and influential on food intake. The poor in developing countries spend the largest part (about 75%) of their revenue to cater the food needs. Matianto [21] states that as the limited income as the limited availability to purchase good quality of food. So that food intake may also be low. Multivariate test results also showed that primary school children from families with less income experience stunting 2.2 more than primary school children from families with high incomes. The results of this study are strengthened by studies of Hong [22] that found there is a close relationship between economic and stunting.

In addition to the factor income, stunting is also closely related to the number of family members ($p < 0.005$). Children who come from a family with a number of members more than four persons tend to be anemic compared to children from families with fewer family members. This relates to the division of food in the family, more family members, less food portion will be consumed by children while most of them came from impoverished family. The results of this study are in line with studies byOktarina [8] that found there was a close relationship between the number of family members and the incidence of stunting in children in Sumatra.

The results of this study that there is aclose relationship between the education of mothers and stunting on primary school children. The study that supports is performed by Senbajo et al. [23] which revealed that low-educated mothers had a stunting children's opportunities of 2.4 times more than amother with high-educated. A study by Ramli et al. [19] also revealed there was a strong influence of maternal education to the incidence of stunting on school children. Semba et al research [24] in Bangladesh and Indonesia showed that the higher mother's formal education could decrease 4-6% the risk of stunting in Bangladesh, in Indonesia, the high level of maternal education was associated with parenting behaviors, feeding the children, immunizations, and better sanitation.

The work of mothers has a meaningful relationship with incidence of stunting. School children who experience stunting were in families with working mother. The results of this research are in line with Picauly [17] study on elementary school children in East Nusa Tenggara that found working moms had the risk of stunting on their son of 3.6 times more than none working mother. Working mothers tend to have a limited time to child care and not theproper nutritious feeding of children so that nutrition needs were not fulfilled properly.

The research found there was a close relationship between the energy intake and the incidence of stunting in primary school children ($p < 0.001$). School children with a less energy intake suffered stunting 2.66 times more than children with the proper energy intake. The research is in line with studies by Xiaoli et al [25] that also pointed out the causes of the incidence of stunting in China was energy and protein deficiency that had been going on a long term. Another study conducted by Esfarjani [26] in primary school students in Tehran Iran also found there was a close relationship between compliance to consume food source of carbohydrates and protein and a stunting incident.

The results of the logistic regression test indicated that the protein intake factorsignificantly affected the stunting on primary school children. School children of less protein intake could undergo a stunting two times greater than school children who consumed sufficient amounts of protein. Results in line were also found by Alshammari [13] in Saudi Arabia involving 1420 children aged 2-18 obtained results there was a difference between energy and protein intake of stunting and normal children, where the intake of energy and protein of stunting children was lower than normal children. Studies conducted by Darapheak [27] revealed that animal protein intake was associated with the decreasingrisk ofstunting in children at Cambia.

5. Conclusions

The results of this study showed that the prevalence of stunting in children of the primary school in North Sumatra was still high (38.8%). This prevalence figure was above the national figure as to Riskesdas 2013. It indicatedthat stunting incident on primary school children in North Sumatra became a significant public health problem because of its impact to decline the quality of human resources in the future.

While the risk factors of stunting in primary school children ($p < 0.05$) were parental income (OR = 2.27), education of mother (OR = 1.53), the work of mother (OR = 1.39), energy intake (OR = 2.66) and protein intake (OR = 2.02). The dominant factors which affected the incidence of stunting were the energy intake (OR = 2.66).Therefore, it needs to be immediately carried out a nutritional intervention in particular improvements to the intake of energy and protein on primary school children to decrease the incidence of stunting and improve a better child quality of life in the future.

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