Conference Paper

Different Intakes of Energy and Protein in Stunted and Non-stunted Elementary School Children in Indonesia

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Abstract

Stunting is a nutritional problem in Indonesia, especially in the coastal areas of the Dumai district in the Riau province. This study aimed to identify the stunting data from an elementary school in the Sungai Sembilan Dumai municipality, and the different average intakes of energy and protein in the stunted and non-stunted children. This was an observational study with a cross-sectional design that evaluated 299 children between 5 and 14 years old. The participants were chosen using a random sampling technique. The stunting data was obtained using anthropometry, and the energy and protein intake data were obtained from a food record. The collected data were processed and analyzed using univariate and bivariate analyses. There were 108 subjects (36.1%) who suffered from stunting, of which 15.7% were overweight and 10.2% were underweight. There was no significant difference in the average energy intakes between the stunted and non-stunted children (p=0.70). However, there was a significant difference in the average protein intakes between the stunted and non-stunted children (p=0.00).

A low protein intake was a risk factor for the incidence of stunting in the primary school aged children. Therefore, early detection is needed to reduce the incidence of stunting, mainly during the first 1,000 days of life.

Keywords: stunted, protein, energy, intake, children

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1. INTRODUCTION

The incidence of nutrition problems in primary school children is still quite high (Riskedas 2010). In a 2013 Indonesian national survey (Riset Kesehatan Dasar or Riskesdas), the prevalence of stunting in primary school aged children was reported as 12.3% very short and 18.4% short, while it was 12% very short and 16% short in

the Riau province (Riskedas 2013). For the whole survey population (n=834) in East Semarang, Indonesia, the prevalence of stunting was 19.3% [3].

Stunting increases the risk of childhood death, adversely affects cognitive and motor development, lowers school performance, increases the risk of overnutrition and non-communicable diseases, and reduces productivity in adulthood [4]. The key findings of the Lancet Series on Maternal and Child Undernutrition (MCUN) revealed that undernourished children are more likely to become short adults, destined to give birth to smaller infants, with consequent lower educational achievement and economic status in adulthood [5].

Stunting and underweight are related to a lower birth weight, being breastfed for 6 months or more, having parents who are underweight or of short stature, and having mothers with no formal education [6]. Previous research has established the particular importance of energy and protein consumption in growth, and that one of the most influential factors in stunting is a child's diet. The school context provides an important opportunity to promote healthy eating, particularly among adolescents who have the poorest school-hour dietary practices [7].

Sungai Sembilan is one of the districts located in the coastal city of Dumai, with livelihoods consisting of fishermen and palm oil and banana farmers. This area is the only sub-district in the Dumai municipality with a minimal infrastructure, so that the distribution of food to this area is a bit difficult.

2. METHODS

This was an observational study with a cross-sectional design. For the purposes of this research, 299 subjects were selected via a proportional random sampling technique from 1,250 students. The inclusion criteria were that the child did not have chronic pain and that there was a statement of willingness from the parents to allow their child to be involved.

The variables in this study were the nutritional status, energy and protein consumption, age, sex, economic status of the family, and the mother's literacy. The nutritional status data obtained via anthropometric measurements was analized using the World Health Organization's Anthro Plus software. The energy and protein intake data was obtained from a food record that was filled out by the respondents for three days.

3. RESULTS

3.1. Participant Characteristics

Table 1 shows that 36.1% of the students exhibited stunting, with 14.7% very short students and 21.4% short students. Among these, 15.7% were overweight and 10.2% were underweight.

Table 1: Participant characteristics.

Variable	n	%
Variable N % Sex		
Male	122	40.8
Female	177	59.2
Age (years old)		
4–6	3	1.0
7–9	140	46.8
10–12	135	45.2
13–15	21	7.0
Economic status of family		
Poor	225	75.3
Middle class or rich	74	24.7
Mother's literacy		
Primary and high school	269	90.0
Secondary education	30	10.0
BMI/Age nutritional status		
Severely wasted	12	4.0
Wasted	8	2.7
Normal	218	72.9
Overweight	52	17.4
Obese	9	3.0
Height/Age nutritional status		
Very short	44	14.7
Short	64	21.4
Normal	191	63.9
Energy consumption		
< 80% RDA	159	53.2
≥ 80% RDA	140	46.8
Protein consumption		
< 80% RDA	177	59.2
≥ 80% RDA	122	40.8
BMI = body mass index, RDA = recommended dietary allowance		

Table 2 shows the different energy intakes between the stunted and non-stunted children.

Table 2: Energy intake differences between the stunted and non-stunted children.

Energy consumption	Stunted (n=108) mean±SD	Non-stunted (n=191) mean±SD	Mean difference	p value
Energy intake (kcal)	1515±497	1590±525	75	0.7*
% RDA energy	76.3±25.2	82±28.6	5.7	0.2*
SD = standard deviation, RDA = recommended dietary allowance				
*Independent t test				

Table 3 shows the protein intake differences between the stunted and non-stunted children.

Table 3: Protein intake differences between the stunted and non-stunted children.

Protein consumption	Stunted (n=108) mean±SD	Non-stunted (n=191) mean±SD	Mean difference	p value
Protein intake (g)	46.2±18	52.1±20	5.9	0.00*
% RDA protein	73.6±35.8	93±48.8	19.4	0.00*
SD = standard deviation, RDA = recommended dietary allowance				
*Independent t test				

4. DISCUSSION

Regarding the participants in this study, 36.1% were stunted, with 14.7% being very short and 21.4% being short. These results were much higher than the average nutritional status of the primary school aged children in the Riau province in Indonesia (12% very short and 16% short) (Riskedas 2016). Nutritional status (height for age Z score) and wealth could be modifiable factors to improve academic performance of school age children [8]. Several studies have shown that stunting is related to a child's learning achievement in school [9]. One possible factor leading to the low intake and nutritional status in this study is high food prices, since the incomes in the majority of the population may not be sufficient to meet the energy and nutritional needs of the subjects. Therefore, the economic status of the family is one factor affecting the children's nutritional status [10].

In Table 2, it can be seen that there was a difference in the energy intakes between the stunted and non-stunted students. The energy intake of the stunted children [1,515

calories, 76.3% of the recommended dietary allowance (RDA)] was lower by 75 calories when compared to the non-stunted students (1,590 calories, 82% of the RDA), but this difference was not statistically significant ($p>0.05$). The results of this research were different from the research conducted on preschool children in Egypt, in which the average energy intake was 927 calories (74% of the RDA) for the stunted group and 1,265 calories (101% of the RDA) for the non-stunted group ($p=0.00$) [12]. The differences in these results may be due to the difference in the age ranges, since the study subjects were 6–14 years old. However, the results of this study were similar to those from a study of primary school students in Tehran, Iran, in which the average energy intake of the stunted children was 2,104 calories (74% of the RDA) and of the non-stunted children was 2,178 calories (101% of the RDA) ($p=0.46$) [13]. Moreover, 53.2% of the children had energy consumptions < 80% (Table 1).

From the food record, it could be seen that the respondents consumed the same food every day (repeated), with no real variations in the types of food. Moreover, the school cafeteria food did not have a high nutritional content. Energy consumption comes from the carbohydrates, fats, and proteins in food (Kemenkes RI, 2013) and the ideal intake should contain enough energy and all of the essential nutrients [11]. The energy distribution in the dietary balance of a child's diet is 50% carbohydrates, 35% fat, and 15% protein [10]. If the energy consumption is low, the energy reserves will be exhausted, and tissue deterioration will be marked by weight loss and stunting [11].

Table 3 shows that there were differences in the protein intakes between the stunted and non-stunted students. For the stunted children, the protein intake was 46.2 g or 73.6% of the RDA, which was lower by 5.9 g when compared with the non-stunted children (52.1 g, 93% of the RDA). This difference was statistically significant ($p=0.00$). The results of this research are similar to those of primary school students in Tehran, Iran, in 2013, in which the average protein consumption in the stunted children was 75 g and in the non-stunted children was 79 g [13]. Moreover, 59.2% of the children had protein consumptions < 80% (Table 1).

Low energy and protein intakes and the incidence of infection are factors that cause stunting [6]. Based on the food record, it was clear that the non stunted children consumed more animal protein (especially eggs) and vegetables than the stunted children. Protein is needed for body and brain development, growth, immunity, and muscle development. However, a lack of protein will increase susceptibility to disease and growth disorders in children [16].

5. CONCLUSIONS

1. In total, 108 of the study subjects (36.1%) suffered from stunting, among which 15.7% were overweight and 10.2% were underweight.
2. There was no significant difference in the average energy intakes between the stunted and non-stunted children.
3. There was a significant difference in the average protein intakes between the stunted and non-stunted children.
4. A low protein intake was one risk factor for stunting in the primary school aged children. Therefore, early detection is needed to reduce the incidence of stunting, mainly during the first 1,000 days of life.

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