



Stunting prevalence and its associated factors among children in primary school in Sidoarjo District: A secondary data analysis

Prevalensi stunting dan faktor-faktor yang berhubungan dengan stunting pada anak Sekolah Dasar di Kabupaten Sidoarjo: Analisis data sekunder

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Abstract

Stunting is one under-nutrition condition that might be caused by inadequate nutrition consumption or frequent infection. Stunting prevalence in primary school-age children (PSAC) is still high in the third world and Indonesia. This present paper aimed to study the prevalence and the associated factors such as sex, school-area, and food intakes of stunting in PSAC in Sidoarjo, 2018. This study is cross-sectional research using secondary data from baseline data of emotional demonstration projects in primary school students. Two hundred students were recruited from four schools representing urban and rural areas in Sidoarjo. Food intake was interviewed using SQ-FFQ. Children height was measured using microtoice. HAZ-score was calculated using WHO Anthro Plus software. Student t-test was done to test any differences in stunting prevalence between sex and school areas. The Chi-square test was used to check the difference in proportion for categories. Our results suggested the stunting prevalence among PSAC in Sidoarjo was 18% and was significantly greater in the rural area ($p=0,010$). School location has association with stunting ($OR=2,7$; $95\%CI\ 1,25-5,8$). In conclusion, we did not find any significant difference in food intakes, although stunted children were more likely to consume energy and carbohydrate. This condition must be considered to prevent obesity in stunted children.

Keywords: Food intake, primary school-aged children, rural, stunting, urban

Abstrak

Stunting merupakan salah satu kondisi kekurangan gizi yang dapat diakibatkan oleh konsumsi gizi yang tidak adekuat atau meningkatnya prevalensi penyakit prevalensi stunting pada anak sekolah masih cukup tinggi di negara berkembang, seperti di Indonesia. Studi ini mempelajari prevalensi stunting anak SD di Kabupaten Sidoarjo dan faktor-faktor yang berhubungan dengan stunting seperti jenis kelamin, area sekolah, dan asupan makanan. Penelitian menggunakan desain potong-lintang dengan data sekunder dari data baseline proyek Emotional Demonstration anak SD di Sidoarjo, tahun 2018. Sebanyak 200 siswa (usia 9-12 tahun) dari empat SD di Sidoarjo telah berpartisipasi. Asupan makanan didapatkan melalui interview SQ-FFQ. Tinggi badan diukur menggunakan microtoice. Skor-Z TB/U dihitung dengan menggunakan WHO Anthro Plus. *Student-t-test* digunakan untuk menguji perbedaan prevalensi stunting antara sex dan area. Uji *Chi-square* juga digunakan untuk menguji proporsi antar kategori. Hasil menunjukkan prevalensi stunting 18% pada anak SD secara keseluruhan. Prevalensi stunting di pedesaan lebih tinggi secara signifikan ($p=0,010$). Sekolah di pedesaan berhubungan dengan stunting ($OR=2,7$; $95\%CI\ 1,25-5,8$). Kesimpulan, tidak terdapat

perbedaan signifikan pada asupan makanan, namun anak stunting cenderung mengonsumsi asupan energi dan karbohidrat yang lebih tinggi. Kondisi ini perlu diperhatikan untuk mencegah obesitas pada anak stunting.

Kata Kunci: Anak usia sekolah dasar, asupan makanan, perdesaan, perkotaan, stunting

Introduction

Stunting is a condition in which children's height is more than two standard deviations below the median determined by World Health Organization (WHO) Child Growth Standards (WHO, 2014). Stunting that occurs during childhood has adverse effects on cognitive performance (Asmare et al., 2018), immune function (Bourke et al., 2016), and is negatively associated with a mathematic score in school (Haile et al., 2016). Later in adulthood, stunting was negatively associated with work productivity in men and reproductive health in women as its long-term consequences (Dewey & Begum, 2011).

Whereas stunting in under five received much attention from previous studies (Rachmi et al., 2016; Ramli et al., 2009; Utami et al., 2019) in Indonesia, only a little research focused on primary school-age children (PSAC) could be documented. PSAC is vulnerable to stunting because of poor diet (Getaneh et al., 2019), urban vs. rural areas disparities, and sex (Akram et al., 2018). Stunting in PSAC typically also results from a cumulative growth flatterer process that formerly occurs at the very early life (Getaneh et al., 2019).

It was reported that the prevalence of stunting among PSAC differs across the country and area. In India, the overall stunting prevalence in PSAC ranged from 4.47% to 19.2% (Pal & Kanungo, 2016; Pradhan et al., 2020; Yadav et al., 2016). In Ethiopia, the prevalence of stunting was even higher, ranging between 8.9% and 41.9% (Degarege et al., 2015; Mesfin et al., 2015; Tariku et al., 2018). When it takes on developed countries such as China, the stunting prevalence was lower than other countries, only 2.3% (Song et al., 2019).

In Indonesia, several works examining stunting prevalence among PSAC were established. A study conducted in Riau Province found that the stunting prevalence was 21.4% (Ernalina et al., 2018). Another large

study, which represented eight provinces in Indonesia, suggested that the prevalence of stunting among PSAC was 28% (Yasmin et al., 2019).

Given the above situation, this present paper aimed to measure the prevalence of stunting in PSAC, in which the national data in Indonesia is still scarce. We chose Sidoarjo district as a location because, according to the Basic Health Survey 2018, the stunting prevalence of under-five in Sidoarjo was almost similar to the overall province's (MoH RI, 2018b). Thus, we expect the same condition to apply for PSAC and represent a picture of stunting prevalence in East Java Province. Furthermore, we would examine the association between food intake, sex, and school area on stunting prevalence.

Method

This study is cross-sectional research using secondary data from baseline data of emotional demonstration projects in primary school students.

We conducted secondary data analyses derived from the baseline data of the Emo-Demo project carried out by the Nutrition Laboratory Technical Implementation Unit of East Java Provincial Health Office in February 2018. This project was an annual project funded by the East Java Provincial Government Budgeting or APBD to improve the school-aged children knowledge and awareness regarding breakfast importance, snack preference, and sanitation by using the emotional demonstration (Emo-Demo) method developed by GAIN (Videricka et al., 2020).

The project was conducted in Sidoarjo District, East Java Province. One hundred students were representing primary government schools in each rural and urban area in Sidoarjo. Two public schools in Wonoayu (rural area) and two other public schools in Sukodono (urban area) were selected according to Dinas Kesehatan Sidoarjo appointment. Each school consisted of

50 respondents. Students from 4th until 5th grade (aged 9-12 years old) were included. The inclusion criteria were healthy during the data collection, and their parents signed an informed consent form. Altogether 200 respondents have participated.

Food intakes (energy and macronutrients) were interviewed by trained enumerators, a technical dietitian, using a semi-quantitative food frequency questionnaire (SQ-FFQ). The food intakes' energy, carbohydrate, protein, and fat contents were computed using Nutrisurvey software. The size of the food portion was estimated into household portions. Food picture books were used to help the respondents estimate the food portion and to reduce bias. The Ministry of Health previously developed the picture book, Republic of Indonesia.

The height of students was measured using a microtoice. WHO Anthro Plus calculated Height-to-age Z-score (HAZ) score. Children were categorized into three categories: 1) normal if HAZ score ≥ -2 SD; 2) stunted if HAZ score < -2 SD, and 3) severely stunted if the score was < -3 SD.

Both height and food intake data were presented descriptively in mean \pm standard deviation (SD). We used an independent student t-test to check the differences in energy and macronutrient intakes between stunted and non-stunted groups. Chi-square test, including odds ratios (OR), was calculated to test whether stunted children proportion was different by sex and school area. P-value of $< 0,05$ was regarded as significant. All statistics were done using SPSS software.

Results and Discussion

The respondents analyzed in this present study were 9-12 years old (mean = 11 years old). Respondents were 101 males and 99 females. Overall, the prevalence of stunting among our respondents was 18% (see table 1). A 4% of the respondent was severely stunted. The mean HAZ-score was reported as $-0,91 (\pm 1,03)$.

Table 1. Respondent distribution into normal, stunting, and severely stunted

Category of HAZ	Number of respondents (n)	
	n	%
Normal	164	82
Stunted	28	14
Severely stunted	8	4

Next, we did chi-square to test the association between stunting proportion on sex and school areas. As depicted in table 2, male children had a lower relative risk for being stunted compared to female children (OR= 0,85), although the proportion was not significantly different (p-value $> 0,05$). Furthermore, we observed that stunting was more common in children from rural areas than in urban areas, and the difference was significant (p-value $< 0,010$). We suggested that students in the rural had almost triple the risk to be stunted compared to PSAC in an urban area (OR= 2,7).

Table 2. Stunting prevalence among primary school children according to sex and school area

Variables		Stunted		Total	Odds Ratio (95%)	P-value
		Yes (%)	No (%)			
Sex	Male	17 (8,0)	84 (42,0)	101	0,85 (0,41 - 1,76)	0,664
	Female	19 (10,0)	80 (40,0)	99		
School area	Rural	25 (12,0)	75 (38,0)	100	2,7 (1,25 - 5,8)	0,010*
	Urban	11 (6,0)	89 (44,0)	100		
Total		36 (28,0)	164 (82,0)	200		

*P-value was derived from the student t-test. P-value is significant at $< 0,05$

We then analyzed the food intakes, including energy, protein, fat, and carbohydrate intakes, according to stunted and non-stunted groups, to see whether there was any significant difference in food intakes. As shown in table 3, our results showed

slightly and non-significant higher energy intake (1.705 kcal vs. 1.688 kcal) and carbohydrate intake (240 grams vs 233 grams) in the stunted children. The protein and fat intakes are almost similar in both groups.

Table 3. Energy and macronutrient intakes among stunted and non-stunted children

Energy and macronutrient intakes	Stunted status			P-value
	Yes (Mean \pm SD)	No (Mean \pm SD)	Δ Mean \pm SD	
Energy (kcal)	1.705 \pm 455	1.688 \pm 485	17 \pm 30	0,864
Protein (g)	55 \pm 18	56 \pm 21	1 \pm 3	0,805
Fat (g)	59 \pm 18	60 \pm 19	1 \pm 1	0,772
Carbohydrate (g)	240 \pm 82	233 \pm 74	7 \pm 8	0,655

*P-value was derived from student t-test

Stunting remains a major public health problem that still occurs in Indonesia. Stunting could lead to adverse health and cognitive and work performance consequences later in life (Asmare et al., 2018; Bourke et al., 2016; Dewey & Begum, 2011; Haile et al., 2016). Studies also confirmed that stunting was associated with mortality (McDonald et al., 2013). By considering the burden of, WHO then endorsed a classification of stunting prevalence into four quartiles, namely 1) low (<20%), 2) medium (20-39%), 3) high (30-39%), and 4) very high (\geq 40%) (Onis et al., 2018).

While stunting among under-five children in Indonesia reached 19,3% in 2018 (MoH RI, 2018a), little is known regarding stunting prevalence among Indonesian primary school-age children (PSAC). This present study showed that the overall prevalence of stunting was 18% among PSAC in Sidoarjo District. This prevalence was similar to other studies obtained from Nigeria (n= 245, aged 10-14 years), which was 19,6% (Senbanjo et al., 2011), in Egypt (n= 396, aged 10-11 years), which was 17,9% (El-fatah & Abu-elenin, 2019), and in Aceh Indonesia (n= 201, aged 9-12 years) which was 20,4% (Dimiati & Hajar, 2019), but was lower compared to a study conducted in Riau (n=299, aged 5-14 years) where the prevalence was 28% (Ernalina et al., 2018). The discrepancy between our result and the study in Riau might be due to the different range of age, in which it used a more comprehensive age range than us. When referring to the prevalence threshold of stunting, our study indicated that the stunting prevalence in PSAC in Sidoarjo was categorized into the low quartile.

Studies have focused on the relationship between sex on stunting within PSAC, although the results were inconsistent. While several studies confirmed that stunting was more prevalent in male students than females (Batool et al., 2012; Ghaida Yasmin, 2014), another study reported the reversed result (Lestari et al., 2018),

and others showed no major difference (Bogale et al., 2018; Mesfin et al., 2015). In this present study, we confirmed that sex had no association with stunting in PSAC.

Interestingly, we reported that children from the rural school were at heightened risk to be stunted. This present result was in line with other studies conducted in Egypt (El-fatah & Abu-elenin, 2019), Nigeria (Oninla et al., 2007), and Indonesia (Yasmin et al., 2019; Al Rahmad et al., 2020). This evidence might be due to the higher prevalence of intestinal parasites in a rural population that could cause infection and disturb the linear growth. In addition, there might be a gap in social-economic status and feeding practices between rural and urban communities that could affect food purchasing and limit some nutritious foods such as animal protein (Khuwaja et al., 2005). Unfortunately, we did not measure those possible causes in this report. Therefore, we recommended future works to confirm this.

UNICEF (1990) conceptual framework of malnutrition mentioned diet as one factor influencing malnutrition (UNICEF, 1997). In this current study, we could not see any statistical difference in energy intake and macronutrient intakes between stunted and non-stunted PSAC groups. The amount of energy and carbohydrate intakes were slightly higher in the stunted group. This finding did not meet our expectations.

It is interesting to note that we found a study whose result was similar to ours. The previous research worked in PSAC in Brazil and found that stunted children tend to overeat compared to non-stunted. The results showed that energy intake in stunted children was higher (p= 0,120). Moreover, when they calculated the energy intake per kg body weight, statistics showed a significant difference between groups. Stunted children had significantly greater energy intake per kg body weight than the non-stunted group

(Hoffman et al., 2000). A possible explanation is present for the effect of stunting on energy and carbohydrate intakes regulation. Malnutrition in early life was associated with an impairment in fat oxidation. When fat oxidation is impaired, carbohydrate oxidation will increase, causing a depletion in carbohydrate stores and increased hunger (Hoffman et al., 2000; Sawaya et al., 2004). This phenomenon should be considered since overeating or hyperphagia was common in stunted children and could increase obesity in stunted children as a consequence.

Another possible explanation regarding our result was the previous cumulative growth impairment occurring in the early life that resulted in stunting conditions in the PSAC. This growth impairment still existed in the school-age and resulted in stunting conditions. This stunting condition would worsen at an older age and lead into short adulthood later in life (Getaneh et al., 2019).

The disadvantage of this present study was the use of secondary data collection. The selections of schools and students might be based on convenience. Thus, it is important to note that the respondents in this present paper might not represent school-aged children in Sidoarjo.

Conclusion

In conclusion, we demonstrated that the stunting prevalence among PSAC in Sidoarjo was still in the low quartile. Schooling in the rural area showed to be the only factor associated with stunting in children. Overeating in stunted children was observed and must be considered carefully to prevent the other obese-stunted condition.

Our findings suggested that school-aged children in a rural areas should receive more attention to improve their nutritional status.

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