FOOD ENVIRONMENT OF JUNIOR HIGH SCHOOLS IN TOMOHON CITY, INDONESIA

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ABSTRACT

Introduction: In Indonesia, child obesity is increasing, and children take a substantial amount of daily calorie from food consumption at school. **Methods:** This paper describes school food environment in Tomohon City, North Sulawesi Province. We conducted on-site observation and interview with food vendors at 20 junior high schools, describing the food environment by availability and sales of foods and beverages at schools in urban and rural areas. Rice or noodle meals and deep-fried snacks were sold in all schools. **Result:** The availability and sales of industrial sweets and sugar-sweetened beverages were greater in urban than rural areas, whereas those of fruits were greater in rural areas. Oily and sugary foods and beverages are widely available and consumed by students at schools in the city of Indonesia. **Conclusion:** Such school food environments and dietary habits should be improved in the effort of halting the increasing prevalence of child obesity.

Keywords: Food environment, Junior high school, Adolescent, Obesity, Indonesia

INTRODUCTION

Obesity in children and adolescents has been increasing all over the world, but more rapidly in developing countries than in developed countries (Gupta et al., 2012; World Health Organization - Commission on Ending Childhood Obesity, 2019). In Indonesia, the prevalence of obesity among children aged 10-19 years was nearly zero in 1986 but increased to 5% within three decades (World Health Organization, 2017). Halting the increased obesity among children is an emerging challenge for public health nutrition.

School-based interventions to promote a healthier dietary intake among school-age children is one of major strategies to fight against obesity in children and adolescents (Ochola & Masibo, 2014; World Health Organization - Commission on Ending Childhood Obesity. 2017). Such interventions include healthy foods provision in cafeteria, ban on sugar sweetened beverages (SSBs) and energy-dense junk food, and drinking water provision at school, as well as reduction in taxes and prices of fruits and vegetables.

School-based interventions are a sound approach in Indonesia because the amount of dietary intake at schools is not negligible. A study in West Java of Indonesia reported that food consumption during school recess-times accounted for about half of daily energy intake among schoolchildren, and that their consumption at school of deep-fried snacks and sweets contributed to 60% of daily fat intake (Sekiyama, Roosita, & Ohtsuka, 2012). On the other hand, a recent systematic review highlighted that adolescents in Indonesia tend to consume inadequate portion of fruits and vegetables (Rachmi et al., 2020). Potentially, school food environments would have a large impact on children's dietary intake. Nevertheless, there is no regulation for the sales of foods and beverages in schools. Moreover, little is known about what are sold and consumed among children at schools. Generally, the importance of school

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food environment has not been adequately addressed in Indonesia or any other developing countries despite a rapid increase of obesity in children and adolescents.

To highlight this issue, we investigated the food environment of all junior high schools in Tomohon City of North Sulawesi Province in Indonesia, where the prevalence of obesity among adolescents is much higher than the national average (10% vs. 3% in 2013) (Ministry of Health Republic of Indonesia, 2013a, 2013b). In the present study, we described the school food environment in urban and rural areas of the city in terms of food availability and consumption.

METHODS

Study Setting

This descriptive study was conducted in Tomohon City of North Sulawesi Province, Indonesia. The district of a city is classified into urban or rural areas, based on the classification of Badan Pusat Statistics Indonesia which takes into account the district's population density, proportion of agricultural household, and access to public facilities such as school, hospital, and market (Central Bureau of Statistics, 2010). In 2017, there were 22 junior high schools with 5,822 students: four public and 10 private schools in urban areas, and eight private schools in rural areas.

Data Collection

Between July and October 2017, we conducted on-site observation and interview with food vendors at school. During a typical school day (when no special events were held), the first researcher visited food vendors to list all food and beverage brands and varieties they sold at school, and to ask them the average number of each food and beverage sold per day, and the unit price of each food and beverage. Food vendors are local residents who individually prepare foods and beverages at home or procure foods and beverages from manufacturers, and sell them at school premise during school time (Figure 1, 2).

Since food vendors did not record their daily sale, we asked them to answer an approximate number of each food and beverage sold per day. In case that food vendors were not operating on the day of interview, the first researcher visited schools twice. As a result, two food vendors could not be approached and were excluded from the study as non-regular food vendors. Information on the number of students enrolled and food vendors in the school premise was obtained from each school.

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Research Ethics Committee of the Faculty of Medicine at the University of Tsukuba in Japan (1215) and Sam Ratulangi University in Indonesia (3989/UN12/LL/2017). Written informed consent was obtained from all school administrations.

Analyses

First, foods and beverages were grouped into eight categories that were predefined on the basis of cooking methods and ingredients: rice or noodle dishes, deep-fried snacks, fruits, industrial sweets, processed meats, water, SSBs, and milk (Table 1). Based on this information, we identified the number of schools in urban and rural areas where each category of food and beverage was available. Then, we calculated the number of foods and beverages in each category sold per day per 100 students in urban and rural areas. The denominator of this calculation was the total number of students of all schools whether or not each category of food and beverage was sold at schools, to examine whether the availability of foods and beverages reflected students' consumption of these foods and beverages. Finally, we calculated the daily sale of each category in each school (the number of each food and beverage sold was multiplied by the unit price of each food and beverage, which was summed in each category). Based on this information, we

calculated the proportion of the daily sale of each category in each school, and we identified the median and range of the proportion for each category among all schools. In the analyses, we excluded two private schools because the canteen was shared by the students of primary, junior high and high schools in the same vicinity.

Figure 1. Food vendors at junior high schools in Tomohon City

Table 1. Food and beverages categories

Category	Example
Rice or noodle dishes	
Fried rice dish	Fried rice or coconut milk steamed rice with entrees (meats, eggs, fish, or tofu)
Rice meals with deep-fried dish	White rice with entrees (meats, eggs, fish without vegetables)
Rice meals with vegetable	White rice with entrees (meats, eggs, fish with vegetable dish)
Noodle a la carte	Noodles and instant noodles without entrees
Noodle with deep-fried dish	Noodles with entrees (meats, eggs, fish without vegetables)
Porridge with vegetable	Local vegetable porridge with cassava and pumpkin (*Bubur Manado*/*Tinutuan*/*Miedal*)
Deep-fried snacks	
Deep-fried snacks	Homemade fried tofu with rice vermicelli and vegetables, fried cassavas, etc.
Deep-fried fruits or fruit chips	Homemade fried bananas, banana chips, etc.
Chips and crackers	Industrial potato chips, rice crackers
Fruits	Raw fruits, papaya spicy salad (*gohu*), papaya spicy ice (*es pepaya tono*), fruit juices
Industrial sweets	

Category	Example
Chocolate and sweets	Chocolates, biscuits, cookies, cakes, puddings, etc.
Bakery	Sweet breads, doughnuts other industrial bakeries
Candies	Candies and lollipops
Ice creams	Ice creams
Processed meats	
Meatballs and sausages	Chicken nuggets, meatballs, sausages, and egg rolls
Hamburgers and hotdogs	Hamburgers, hotdogs, and sandwiches with meat
Water	Unsweetened drinking water
Sugar sweetened beverages	
Sweetened beverages	Sweet tea, coffee, powdered beverages, ices and beverages
Traditional beverages	Local beverages or ices with coconut milk or green beans
Milk	Whole milk, condensed milk, powdered milk, other dairy products

RESULTS

Among the 20 schools, 12 were located in urban area with a total of 4,422 students, ranging from 38 to 1,188 students to 206. Industrial sweets and SSBs were more available in urban than rural areas, whereas fruits were more available in rural than urban areas. Accordingly, sales of industrial sweets and SSBs were greater in urban than rural areas, whereas sales of fruits were greater in rural than urban areas. For example, the daily sale of industrial sweets was 72 per 100 students in urban areas, while it was only 8 per 100 students in rural areas. Despite their similar availability, deep-fried snacks and processed meats were sold more in rural than urban areas (148 vs. 58 purchases and 17 vs. 5 purchases per 100 students, respectively), whereas the sales of rice or noodle dish and water were equal in urban and rural areas.

Table 3 shows the median and the range of the proportion of the daily sales in each school by food and beverage categories among 20 schools. The proportion varies among the schools. The range of the proportion was very wide for deep-fried snacks, from 2% to 78% (i.e., 78% of the total sales were derived from selling deep-fried snacks in one school, whereas deep-fried snacks accounted for only 2% of the total sales in another). The minimum proportion was 16% for rice or noodle dish, while it was between 0% and 7% for other food and beverage categories. It means that selling rice or noodle dish may be vital for food vendors in all schools. In contrast, the median and the range of proportion of industrial sweets and SSBs was 19% (7% to 25%) and 10% (4% to 40%), respectively.

Table 2. Foods and beverages sold at 12 and eight junior high schools in urban and rural areas of Tomohon City, respectively

Food and beverage category	Number of schools offering		Number of foods and beverages sold daily (per 100 students)	
	Urban (per 12 schools)	Rural (per 8 schools)	Urban	Rural
Rice or noodle dish	12	8	36	36
Deep-fried snacks	12	8	58	148
Fruits	5	6	3	36
Industrial sweets	8	2	72	8
Processed meats	4	3	5	17
Water	11	7	21	21
Sugar-sweetened beverages	10	3	27	19
Milks	3	0	1	0

Figure 2. Foods and drinks sold at junior high schools in Tomohon City

DISCUSSION

In Tomohon City, calorie dense diets such as deep-fried snacks, and sweetened foods and beverages are widely sold in the premise of junior high schools, and many students take such diets while they are at schools. Rice and noodle dishes are also widely sold and consumed, but these dishes are mostly served with deep-fried foods and rarely with vegetables. Availability of these foods and beverages appeared to be different between urban and rural areas, and this seems to have a certain influence on students' dietary intake, especially industrial sweets and fruits. Industrial sweets were more available and consumed in urban areas than rural areas, whereas fruits were more available and consumed in rural areas than urban areas. Indeed, students cannot take nutritious foods at schools where such foods are not available, which might be attributable to the low consumption of fruits and vegetables among adolescents in Indonesia (Rachmi et al., 2020), Our findings support the importance of improving the school food environment in promoting healthy diets among children.

Table 3. Median and range of the proportion of the daily sales in each school by food and beverage categories among 12 and 8 schools in urban and rural areas of Tomohon City, respectively

Food and beverage category	Urban		Rural	
	Median	Range	Median	Range
Rice or noodle dish	36%	(28% — 77%)	30%	(16% — 76%)
Deep-fried snacks	20%	(2% — 45%)	42%	(8% — 78%)
Fruits	2%	(1% — 6%)	9%	(6% — 21%)
Industrial sweets	20%	(8% — 25%)	12%	(7% — 16%)
Processed meats	4%	(1% — 12%)	10%	(10% — 15%)
Water	5%	(1% — 12%)	6%	(0% — 14%)
Sugar-sweetened beverages	16%	(4% — 40%)	8%	(7% — 10%)
Milks	2%	(1% — 3%)	—	—

Tomohon culinary is a typically fat-rich Indonesian culinary due to its common deep-frying cooking method with palm oil for both dishes and snacks. Both deep-fried dishes and snacks were available in all schools in the city. Rice dishes provided at school are mostly served with deep-fried meat or fish, or fried egg. Plain rice may be replaced by Indonesian typical stir-fried rice or *nasi kuning* (rice steamed with turmeric and coconut milk). Noodle dishes are mostly instant noodles served plainly or sometimes with fried egg. Both rice and noodle dishes are seldomly served with vegetables.

Difference in foods and beverages sold in urban and rural schools may be due to the access to food and beverage manufacturers and the school size. In urban schools, bottled soft drinks and industrial sweets such as chocolates, biscuits, and ice creams are more available and various than in rural schools. In urban areas, some soft drink companies even lease refrigerators to schools to sell their SSB products. On the other hand, because of limited access to food and beverage manufacturers in rural areas, vendors tend to offer home-made

foods and drinks. This is feasible for a smaller number of students in rural schools.

Regulation of unhealthy diet rich in oil and sugar is necessary to improve food environment at school (Ochola & Masibo, 2014; World Health Organization - Commission on Ending Childhood Obesity, 2017). This somewhat means to alter the traditional Indonesian culinary. Upon the consideration of Indonesian food culture, providing school meals incorporating traditional menu but in the right portions might be a viable option to promote a healthier food environment at school. To nurture healthy diet habit among students, school meal provision may be combined with nutrition education (French et al., 2003; Ministry of Education, 2013).

There are several considerations or challenges when implementing school meal provision. First, income loss of food vendors should be prevented (French et al., 2003). If food vendors could be somehow involved in school meal provision, their income may be maintained. Second, it is essential that students and their parents accept school meal provision in terms of the menu and price of this service. An opt-out option may be provided, but school meal provision would not be sustainable if many choose this option. Third, appropriate nutritional standard and hygiene protocol should be developed and complied for healthy and safe meal provision (Micha et al., 2018). This requires proper supervision and regular monitoring (Sekiyama et al., 2018).

There were several limitations of this study. First, we only described the availability and consumption of foods and beverages at school. School food environments could be described better if information such as the serving size and calorie of foods and beverages were available. Second, we could not obtain information on net profit of the sales, so we could not discuss to what extent the restriction of certain food and beverage sales might affect food vendors. Moreover, the daily sale was not based on the sales records but recalled by food vendors, so it was a rough estimate and might have been underreported because of their reluctance to reveal their sales. Third, the findings of this study may not be generalizable to other regions of Indonesia with more Muslim population. Since the majority of population in Tomohon City is Christian, there is no diet restriction such as pork prohibition and fasting (*Ramadhan*) among Muslims.

CONCLUSION

In conclusion, calorie dense diets and sweetened foods and beverages are widely available at junior high schools in Tomohon City, and many students take these diets while they are at schools. Such school food environments and dietary habits should be improved in the effort of halting the increasing prevalence of obesity among children and adolescents in Indonesia.

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