

## Fast Food as Drivers for Overweight and Obesity among Urban School Children at Jakarta, Indonesia

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### ABSTRACT

The study aimed to analyse dominant factors associated with overweight and obesity among students in Perguruan Cikini Elementary School in Central Jakarta. A cross-sectional study was conducted between March-May 2017 with 145 participants from 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> grades. Data obtained were measurement of body weight and height, physical activity questionnaire for children, food frequency questionnaire and 24-hour food recall. Prevalence of overweight and obesity among students in Perguruan Cikini Elementary School in Central Jakarta was 41.4%. Based on logistic regression, fast food consumption was a dominant factor associated with overweight and obesity among students in Perguruan Cikini Elementary School in Central Jakarta. Students who consumed fast food >3 times/week were 2.42 times more likely to be overweight and obese compared to students who consumed fast food ≤3 times/week.

**Keywords:** fast food, obesity, overweight, school children

### INTRODUCTION

Childhood obesity has many negative short-term to long-term impact on physical health, psychological health, and social life of the children. Children who suffered from obesity are more likely to have increased risk for chronic diseases such as asthma, sleep apnea, bone and joint problems, diabetes, and blount disease (lower limb deformity due to excessive pressure from increased body weight), (Must *et al.* 2006; Freedman *et al.* 2007; CDC 2017). Children with obesity also often have to face negative stereotypes, discrimination, and social marginalization compared with peers who have normal weight, experience bullying, and have lower self-esteem. In addition, they also suffer from psychological problems such as anxiety and even depression (Griffiths *et al.* 2010; Pulgarón 2013; Geel *et al.* 2014; Sahoo *et al.* 2015). The long-term effects of obesity occurring in childhood tend to continue into adulthood and lead to adult obesity. Moreover, childhood obesity is associated with increased risk of cardio-metabolic morbidity in adulthood (Reilly & Kelly 2011; McMullen 2014; Sahoo *et al.* 2015; CDC 2017; WHO 2017).

The latest data in 2014, the prevalence of childhood obesity in children aged 6-11 years in the United States was 17.5% (Ogden *et al.* 2015; CDC 2017). In Australia, in 2014-2015, it was estimated that 27.4% of Australian aged 5-17 were overweight and obese (Australian Bureau of Statistics 2016). In Asia in 2013, the prevalence

of childhood overweight and obesity in Iraq was 22.25%, in Malaysia it was 20.8%, and in Thailand 14.35% (Ng *et al.* 2014).

In Indonesia, the prevalence of childhood obesity and overweight in children aged 5-12 years had increased from 15.9% in 2007 to 18.8% in 2013 (Health Departement of Indonesia 2007; MoH 2013). The highest prevalence was found in DKI Jakarta province which was 30.1%. In Central Jakarta, as part of the Jakarta Province, the prevalence of childhood overweight and obesity was 29.7%, higher than Kepulauan Seribu (27.3%) and East Jakarta (24.6%) (MoH 2013).

Factors related to childhood overweight and obesity have been well documented, including gender, mother's working status, dietary intake, physical activity, sleep duration, screen time, dietary habits such as breakfast, consumption of fast food, snack, sugar-sweetened beverages, vegetables, and fruits (Papandreou *et al.* 2010; Shan *et al.* 2010; Mushtaq *et al.* 2011; Matthews *et al.* 2011; Sartika 2011; Shi *et al.* 2010; Chaput *et al.* 2011; Firouzia *et al.* 2012; Badawi *et al.* 2013; Martin-Calvo *et al.* 2014; Nasreddine *et al.* 2014; Borghese *et al.* 2015; Cao *et al.* 2015; Hope 2015; Katzmarzyk *et al.* 2015; Li *et al.* 2015; Zhang *et al.* 2015; Morrissey *et al.* 2016; Thanasuwan *et al.* 2016). Other factors such as eating habits while watching TV and the frequency of eating with family can be contributors to the overweight and obesity of children (Liang *et al.* 2008; Hammons & Fiese 2011; Vik *et al.* 2013; Lee *et al.* 2015).

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Based on the preliminary study, the prevalence of the overweight and obese children in Perguruan Cikini Elementary School, one of the private elementary schools of Central Jakarta in 2017 was 35.29%, which was higher than both the national prevalence (18.8%) and Jakarta prevalence (30.1%) (Kemenkes RI 2013). Perguruan Cikini Elementary School is a private school with high socioeconomic status and located in the downtown of Central Jakarta. Hence, exposures to factors related to childhood overweight and obesity such as having low physical activity, excess intake of fast food, and sugar-sweetened beverages were higher. Therefore, further studies about childhood overweight and obesity is needed.

## METHODS

### Design, location, and time

This cross-sectional study was conducted in one private elementary school, Perguruan Cikini Elementary School, located in Menteng Sub-District, Central Jakarta, Indonesia from March to May 2017. The school was chosen purposively. This study was approved by Ethical Committee of Research and Community Service, Faculty of Public Health Universitas Indonesia No.101/UN2.F10/PPM.00.02/2017.

### Sampling

Population of this study was all students of Perguruan Cikini Elementary School class of 2017 (342 students). The inclusion criteria for study participants were: student from 3rd, 4th, 5th-grade, and active status in the 2016/2017 academic year. The minimum sampling quota was 142 students calculated using hypothesis test for two population proportion (Lemeshow *et al.* 1990). Based on the calculation, the final recruited subjects for analysis in this study has been sufficient. The final total subject was 145 students.

### Data collection

Student's anthropometry data obtained through measurement of body weight and height. The body weight was measured using CAMRY type EB9003 digital body weight scale with 0.1 kg precision, and the height measured using microtoise with 0.1 cm precision. Self-administered questionnaires was utilized to obtain information on gender, mother's working status, physical activity, sleep duration, screen time, breakfast habits, eating habits while watching television, and frequency of eating with family. Data of macronutrients (energy, fat, protein, and carbohydrates) intake, consumption of fast food, sugar-sweetened beverages, snacks, vegetables,

and fruits were acquired from 24-hour Food Recall and food Frequency Questionnaire (FFQ) interviews. Secondary data for this study such as the school description and student data (including student's name, class, and age based on date, month and year of birth) were obtained from the school.

### Data analysis

**Childhood overweight and obesity.** Childhood overweight and obesity were obtained through the calculation of body mass index by age (BMI-for-age). The data for body weight and height of the students were processed using WHO AnthroPlus software version 1.0.4 of 2011 by adding the age of the students (using the data of child's birth date and the date of data collected) as well as gender. After conversion using BMI-for-age index then the Z-score was obtained (WHO 2007). In order to determine the category of childhood overweight and obesity, the value of the Z-Score was grouped into overweight and obese if it was  $>1SD$  and not overweight and obese if  $\leq 1SD$ .

**Gender and mother's working status.** The data on the child's gender were grouped into two, namely boys and girls. Moreover the data on the employment status of the mother were categorized into working and not working.

**Intake of energy, fat, protein, and carbohydrates.** The energy, fat, protein, and carbohydrate intake was obtained from the 24-hour food recall interview. Data from the interview was processed using Nutrisurvey software. Then the data of energy intake, fat, protein, and carbohydrate per day were grouped into excess and adequate.

**Physical activity, sleep duration, screen time.** Data obtained from questionnaires. All the components of the questionnaire had been tested for validity and reliability indicating that all question were valid and reliable because  $r$  count and Alpha is bigger than  $r$  table ( $r$  count  $> 0.3388$ ); ( $r$  Alpha  $> 0.3388$ ). The data from modified Physical Activity for Children (PAQ-C) in the physical activity questionnaire were summed for each answer score. Then it was grouped into less if it was  $\leq$  mean and adequate if the value is bigger than mean. Sleep duration data were obtained from the total duration of sleep a day in hours. Then the value was categorized as not recommended ( $< 10$  hours/day and  $> 11$  hours/day) and as recommended (10-11 hours/day). The data of screen time (duration of watching television and playing computer game/gadget/PlayStation) was obtained from questionnaire answer about the duration of time spent on watching TV and playing computer/gadget/PlayStation games in hours. Then the total duration was categorized not ac-

according to recommendation ( $>2$  hours/day) and according to recommendation ( $\leq 2$  hours/day) which then analyzed.

**Eating habits.** The frequency of children consuming fast food (food that can be ordered, purchased and received in the minimum possible time, coming from foreign countries or local with the same type of foreign fast food that sold under certain trademarks) in the last one month. The frequency of consuming sugar-sweetened beverages in the last one month, for example; soft drinks, fruit-flavored drinks, flavored tea, other flavored drinks and energy drinks or sports drinks. The frequency of children eating snack foods or confectionery or high-salt (savory snack) or high-caloric snacks at school and home in the last one month, for example; candy, snack balls, chips, chocolate, wafers, etc. The frequency of children eating vegetables and fruits in the last one month. The data on fast food, sugar-sweetened beverages, snack foods, vegetables, and fruits consumption habits were obtained from the Food Frequency Questionnaire (FFQ). The list of foodstuffs in the FFQ was available in the vicinity of the study area. The results of the FFQ are then converted to frequencies within a week and day. The data about breakfast habits, eating habits when watching television, and eating with the family were obtained from the questionnaire and then categorized according to prior studies (Hammons & Fiese 2011; Arora *et al.* 2012; Vik *et al.* 2013).

The data were analyzed using univariate, bivariate, and multivariate analysis. Univariate analysis was used to find out the description of each of the variables studied: gender, mother's working status, intake of energy, fat, protein and carbohydrate, physical activity, sleep duration, screen time, breakfast habits, consumption of fast food, snack, sugar-sweetened beverages, vegetables and fruits, eating habits while watching TV and frequency of eating with family. Bivariate analysis was used to see the relationship between childhood overweight and obesity with child's gender, mother's working status, intake of energy, fat, protein and carbohydrate, physical activity, sleep duration, screen time, breakfast habits, consumption of fast food, snack, sugar-sweetened beverages, vegetables and fruits, eating habits while watching TV and frequency of eating with family.

Multivariate analysis was performed through multiple logistic regression test prediction model. Modelling was conducted by eliminating the variables that had  $p$ -value  $>0.05$  gradually regarding the change of Odd Ratio (not more than 10%). There were 9 times modelling from the first model up to the final model (Table 2).

Variables that were included in the multivariate end model were fast food consumption, gender, sugar-sweetened beverages consumption, screen time, energy intake, and fat intake.

## RESULTS AND DISCUSSION

### Overweight/obesity

Overweight and obesity in this study was defined by the classification of nutritional status of BMI-for-age when Z-score  $>+1SD$ . The results indicated that the proportion of overweight and obesity occurring in Perguruan Cikini Elementary School in 2017 amounted to 41.4%. These results are 11.7% higher than the prevalence of overweight and obesity in Central Jakarta (Kemenkes RI 2013). Based on the data of Basic Health Research 2013, the prevalence of overweight and obesity in Perguruan Cikini Elementary School in 2017 was more than double of the national prevalence of overweight and obesity of children aged 5-12 years in Indonesia (Table 1) (Kemenkes RI 2013). Subject distribution based on nutritional status can be seen in Table 1.

### The association between energy intake and fat intake with overweight

Chi-square test results showed a significant relationship between energy intake and fat intake with the prevalence of overweight/obesity in Perguruan Cikini Elementary School students ( $p < 0.05$ ) (data not shown). Likewise, a study in Indonesia showed that there was a relationship between energy intakes with the risk of childhood obesity in children aged 5-12 years (Sartika 2011). Another study in Bogor also showed differences in intake of energy and fat among normal nutritional status and overweight children (Heryati & Setiawan 2014). The association of energy intake with overweight and fat intake with overweight among Perguruan Cikini Elementary

Table 1. Subjects distribution based on nutritional status

Nutritional status	n (145)	%
Severe thinnes	1	0.7
Thinness	6	4.1
Normal	78	53.8
Overweight	23	15.9
Obesity	37	25.5
Total overweight/obesity	60	41.4
Total not overweight/obesity	85	58.6

School students in 2017 became non-significant with the addition of gender, screen time, consumption of fast food, and sugar-sweetened beverages into the model (Table 2). However, the odd ratio remained higher. Children with higher energy intake had a 1.59 times higher risk to be overweight/obesity compared with children with adequate energy intake. Children who had higher than recommended fat intake was 1.51 times more likely to be overweight/obese. Research in Greece showed higher energy intake in obese children than normal children in which most of the energy consumption came from fat (Papan-dreou *et al.* 2008).

#### **Association of sugar-sweetened beverages consumption with overweight/obesity**

Chi-square test results showed a significant relationship between the consumption of sugar-sweetened beverages with the prevalence of overweight/obesity ( $p < 0.05$ ) (data not shown). The bivariate results of this study are in line with the studies in Greece, Spain, and China that showed the consumption of sugar-sweetened beverages positively associated with higher risk of childhood overweight/obesity (Papan-dreou *et al.* 2010; Martin-Calvo *et al.* 2014; Zhang *et al.* 2016). Research done by Keller and Torre (2015) also showed a correlation between the consumption of sugar-sweetened beverages with childhood obesity. A systematic review and meta-analysis by Malik *et al.* (2013) also proved that sugar-sweetened beverages consumption is associated with increased child body weight.

Sugar-sweetened beverages are often available in large portions that contribute to energy density. The energy produced from sugar-sweetened beverages has low nutritional value (Martin-Calvo *et al.* 2014). Energy consumed in liquid form does not produce the same satiety sensation as energy from solid foods (Pan & Hu 2011). It causes the consumption of sugar-sweetened beverages cannot compensate for the subsequent intake (Mourao *et al.* 2007; Pan & Hu 2011). Conversely, the total energy intake becomes increased which can trigger a positive energy balance. Thus sugar-sweetened beverages that were publicly sold in vending machines and the school canteen also encouraged a rise of consumption of sugar-sweetened beverages at Perguruan Cikini Elementary School.

In this study, this association did not remain statistically significant with the addition of gender, energy intake, fat intake, screen time, consumption of fast food into the model (Table 2). This study also found that students who consumed sugar-sweetened beverages  $< 1$  times/

week were more likely to be overweight/obese. This can be possible because students with consumption of sugar-sweetened beverages  $< 1$  times/week have lower physical activity (63.6%) rather than students with consumption of sugar-sweetened beverages 1-4 times/week (59.6%) (data not shown). Moreover, students who consumed sugar-sweetened beverages  $< 1$  times/week had higher excess fat intake (40.9%) than students who consumed sugar-sweetened beverages 1-4 times/week (32.7%) (data not shown).

#### **Association between gender and overweight/obesity**

Gender was significantly associated with overweight among Perguruan Cikini Elementary School students in 2017 ( $p < 0.05$ ). It showed that boys had 2.25 times higher risk for overweight/obese than girls (adjusted OR 2.25; 95% CI 1.07-4.75). In line with an American study in 2010 showed that overweight/obese boys were significantly higher than among overweight/obese girls (Ogden *et al.* 2012). Several studies in Pakistan, Iran, and China have reported that the prevalence of obesity in boys is higher than girls (Hajian-Tilaki *et al.* 2011; Mushtaq 2011; Song *et al.* 2013). In addition, other studies in China and Spain also reported that childhood overweight and obesity was higher in boys than in girls (Santiago *et al.* 2013; Cao *et al.* 2015).

#### **Fast food as the dominant factor of overweight/obesity**

Results from multivariate analysis using logistic regression test with modelling stage showed that fast food consumption (such as fried chicken, burger, hotdog, sandwich, pizza) was the dominant factor related to overweight/obesity among Perguruan Cikini Elementary School students in 2017, after adjustment by gender, screen time, sugar-sweetened beverages consumption, energy intake and fat intake. Students who consumed fast food  $> 3$  times/week had 2.42 times higher risk for overweight/obesity compared with students who consumed fast food  $\leq 3$  times/week (adjusted OR 2.42; 95% CI 1.14-5.12). This finding was in line with other studies in China and Taiwan which reported that fast food consumption was associated with childhood overweight and obesity (Chang & Nayga 2009; Shan *et al.* 2010). Likewise, a study in Pakistan also proved the relationship between fast food consumption and the risk of childhood overweight and obesity (Mushtaq *et al.* 2011). It showed the consumption of fast food associated with childhood overweight and obesity, once controlled by gender and socioeconomic status. Fast food consump-

Table 2. Multivariate analysis risk factors of overweight/obesity factors in Perguruan Cikini Elementary School Central Jakarta year 2017

Variables	First modeling		Final modeling		
	p	OR (95% CI)	p	OR (95% CI)	
Gender	Boys (0)	0.054	2.11 (0.99-4.53)	0.033	2.25 (1.07-4.75)
	Girls (1)				
Energy intake	Excess (0)	0.462	1.45 (0.54-3.89)	0.298	1.59 (0.66-3.80)
	Adequate (1)				
Fat intake	Excess (0)	0.496	1.36 (0.56-3.27)	0.348	1.51 (0.64-3.56)
	Adequate (1)				
Protein intake	Excess (0)	0.690	1.21 (0.48-3.08)		
	Adequate(1)				
Screen time	Not recommended (0)	0.224	1.70 (0.72-3.97)	0.177	1.77 (0.77-4.05)
	Recommended (1)				
Breakfast habits	Not Routinely (0)	0.208	1.63 (0.76-3.50)		
	Routinely (1)				
Fast food consumption	>3 times/week (0)	0.041	2.25 (1.03-4.89)	0.021	2.42 (1.14-5.12)
	≤3 times/week (1)				
Sugar-sweetened beverages consumption	>4 times/week (0)	0.574	0.72 (0.23-2.26)	0.577	0.74 (0.25-2.15)*
	1-4 times/week (1)	0.058	0.30 (0.09-1.04)	0.059	0.33 (0.10-1.04)**
	<1 times/week (2)				
Vegetables and fruits consumption	<7 times/week (0)	0.093	1.93 (0.90-4.14)		
	≥7 times/week (1)				
Eating with family frequency	<3 times/week (0)	0.441	1.40 (0.60-3.26)		
	≥3 times/week (1)				

\*OR between the overweight/obese and non-overweight/obese groups, for consumption >4 times/week and <1 times/week

\*\*OR between the overweight/obese and non-overweight/obese groups, for consumption 1-4 times/week and <1 times/week  
CI: Confidence Interval

tion was higher in boys and in urban areas with high socioeconomic status (Mushtaq *et al.* 2011). Study of Nasreddine (2014) also showed that fast food consumption associated with increased risk of obesity in children aged 6-11 years. These results were in accordance to other studies that demonstrated an increase in frequency of fast food consumption was associated with increased in BMI (Duffey *et al.* 2007; Braithwaite *et al.* 2014).

The expansion of fast food outlets is growing very fast, including in Jakarta (fast food originating from foreign or local countries with the same type as foreign fast food with certain trademarks). Around the location of this study, several outlets of fast food were found. In relation to the data regarding the working status of the mothers, children with working parents tend to eat fast food because of time constraints (Ang *et al.* 2013).

Fast food is favoured by children because of the characteristics that are practical, delicious and satiating. The delicious flavour caused by increased primordial palatability due to the high sugar, fat, and salt content. Another characteristics of fast food is, it tends to have high energy density, saturated fat content and high trans fats, low fiber content and micronutrients, high glycaemic load, and huge portions (Rosenheck 2008). Frequent fast food consumption without balance energy expenditure through increased physical activity, it creates a positive energy balance and ultimately results in an increased risk of overweight/obesity.

## CONCLUSION

As many as 41,4% of students in Perguruan Cikini Elementary School students were overweight and obese according to BMI-for-age. The

consumption of fast food (adjusted OR=2.42, p=0.021) is a dominant factor that associated to the overweight/obesity occurrence among the students after controlled by gender, sugar-sweetened beverages consumption, screen time, energy intake and fat intake.

Based on the high rate of overweight/obesity and related factors in Perguruan Cikini Elementary School in 2017, the school is suggested to monitor the nutritional status of the students regularly and educate both the students and parents of the students in the form of counselling about balanced nutrition to reduce fast food intake and increase physical activity. School can also engage additional physical activity besides sports subject. Monitoring and evaluation can be conducted extensively to the foods and beverages sold in the canteen or vending machines available in school. Further research is needed to explore more complete independent variables that have not been covered in this study (such as parents and genetic), use a higher number of subjects on a variety of socioeconomic status, and conduct different study design which can demonstrate causality relationship.

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