

## ANALYSIS OF SUGAR, SALT AND FAT IN SNACK FOODS SOLD AT ELEMENTARY SCHOOL FOOD STALLS

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### ABSTRACT

**Background:** Snacking is common among elementary school-age children. Ironically, snacks often contain lots of sugar, salt, and fat (SSF) which mostly available at school's area and might contributed to poor dietary pattern.

**Objective:** to determine SSF's content among snack food (SF) at school food stalls and intake of SSF from the SF among school-age children.

**Methods:** This cross sectional study involved eighty-nine children age 8 to 12 at Madrasah Pembangunan elementary school in South Tangerang city that randomly selected. Street food was classified as main dish, snacks and drinks. SSF content was determined by desk analysis through conversion of raw-cooked food, edible portion, estimated of intake sugar, salt and oil absorption from actual food weighing of listed snack foods. Intake of SSF was obtained from two non-consecutives 24 hours food recalls. FoodWorks and SPSS software were used to analyze food and descriptive analysis, respectively.

**Results:** We found that almost one third of subjects experienced overweight (12.4%) and obesity (16.9%). There were 53 items of hawker foods were identified within school area and were comprised from 18 main dishes, 35 snacks and 10 drinks. Snack food contains more SSF content compared to main dishes. Salt is the highest contribution (120%) to recommended daily allowance compared to sugar and fat.

**Conclusion:** The percentage contribution of snacks in school-age children consumption needs to be highlighted as an alarming wake-up call to introduce nutrition labelling on snacks sold at school areas.

**Keywords :** snack food; sugar; salt; fat; school children

### ABSTRAK

**Latar belakang:** Ngemil merupakan hal yang umum di kalangan anak usia sekolah dasar. Ironisnya, jajanan seringkali mengandung banyak gula, garam, dan lemak (GGL) yang banyak terdapat di lingkungan sekolah dan dapat menyebabkan pola makan yang buruk.

**Tujuan:** untuk mengetahui kandungan GGL pada makanan jajanan di sekolah dan asupan GGL dari makanan jajanan pada anak sekolah.

**Metode:** Studi cross sectional ini melibatkan delapan puluh sembilan anak usia 8 hingga 12 tahun yang dipilih secara acak. Makanan jalaanan diklasifikasikan sebagai hidangan utama, makanan ringan dan minuman. Kandungan GGL ditentukan dengan analisis tabel melalui konversi makanan mentah, porsi yang dapat dimakan, perkiraan asupan gula, garam dan penyerapan minyak dari makanan aktual yang ditimbang dari makanan ringan yang terdaftar. Asupan GGL diperoleh dari dua penarikan makanan 24 jam non-berturut-turut. Perangkat lunak FoodWorks dan SPSS masing-masing digunakan untuk menganalisis makanan dan analisis deskriptif.

**Hasil:** Hasil studi mendapatkan sepertiga anak sekolah responden kami mengalami kelebihan berat badan (12.4%) dan obesitas (16.9%). Teridentifikasi 53 jenis makanan jajanan di lingkungan sekolah yang terdiri dari 18 makanan utama, 35 makanan ringan dan 10 minuman. Makanan ringan mengandung lebih banyak kandungan GGL dibandingkan dengan makanan utama. Kontribusi garam dalam makanan ringan bahkan mencapai 120% dari angka kecukupan gizi, angka ini lebih tinggi dari persentase gula dan lemak.

**Kesimpulan:** Persentase kontribusi GGL dari makanan ringan yang dikonsumsi anak sekolah perlu diawasi sebagai peringatan dini untuk memperkenalkan label gizi pada makanan jajanan yang dijual di lingkungan sekolah.

**Kata Kunci :** camilan; gula; garam; lemak; anak sekolah

### BACKGROUND

Obesity among children is becoming one of large public health burden in 21st century due to its continuous escalating number. According to Global Nutrition Report in 2018, there were 38.3 million children were obese and 26.6% of them were from

Asian countries.<sup>1</sup> As a developing country, Indonesia's obesity prevalence among children age 5 to 12 years old is increasing by 4% in 2013 to be 9.2% in 2018 according to National Health Research (Riskesdas).<sup>2</sup> One of the risk factors for obesity is the consumption of foods high sugar, salt and fat (SSF)

food.<sup>3,4</sup> Ready-to-eat and beverages that school children consume is usually called street food (SF). Indonesian Food and Drug Agency (BPOM) (2013) defined SF as food that bought outside the house.<sup>5</sup> Previous research revealed that Indonesian school children frequently consume high sugar SF (68.5%), high fat SF (67.1%) and high salt SF (56.2%). Snacks with a high content SSF is considered to be the most unhealthy snack food accessible at the school. Sweets, flowers sugar, bottled drinks, chocolate bars, donuts, and marshmallows are examples of high-sugar treats. Meanwhile, salty snacks such manufactured packaged chips, krakers, salty pastries, salted popcorn, and canned foods are popular. And high-fat snacks like sausages, solid cheeses, chicken skins, and fast food <sup>6</sup>. Latest research shows the average of SSF consumption among school age children is over than the maximum recommended allowance according to Health Ministry Rules (Permenkes) No. 30 year 2013, which 164% for sugar, 137% for salt and 129% for fat.<sup>7</sup>

According to our preliminary study at Madrasah Pembangunan UIN Jakarta, there was 20.45% obese children. We also observed SF at school canteen contain high energy, fat and carbohydrate and low vitamin, mineral and fibre such as chicken rice, meatball soup, chicken noodle, fried noodle, fried cassava flour (cilor), boiled cassava flour (cimol), crepes, french fries, sweetened ice tea, thai tea (milk ice tea), and UHT milk. We interviewed 30 school age children, all of them said they consume SF even though 9 of them said they bring lunch box from their homes. Therefore, we would like to investigate further on SSF in SF Madrasah Ibtidaiyah Pembangunan UIN Jakarta Tahun 2019.

## **METHODS**

This cross-sectional study was carried out at Madrasah Pembangunan elementary school in Tangerang Selatan. This study involved a total of 89 students aged 8-12 years old that randomly selected from total population of 655. We interviewed food sellers at school canteen to obtain recipe for the food and cooking method and we estimated the oil absorption or additional salt and sugar from Ministry of Health Guidelines in Oil and Salt Absorption Estimation (2014). We used food recall 24 hours for 2 days in non- consecutive days to collect food consumption data. Then we weighed the food using digital food weight (Mini I-2000, China, 0.1 gram precision). Sociodemographic data were collected from school database, which reveal profile and school general description, school children attendance list and anthropometry data (weigh and

height). The health community centre staff conduct the nutritional status measurement every school entrance periods thus anthropometry data (number of overweight and obese school-age children) were obtained from the school report.

SSF analysis from SF were extracted from software FoodWorks, it is a software that developed to analyse nutrients including SSF and recipe database modification.<sup>8</sup> We typed in the food amount in grams as per the software protocol. However, FoodWorks database does not provide SF in Indones. Consequently, researcher conducted calculation based on raw-to-cook conversion, edible food amount. Food data from 24 hours recalls were use to estimate added salt and sugar. While amount of cooking oil (absorpted) was estimated with oil absorption factor that calculated based on weight per ingredient in gram within one portion of SF.<sup>9,10</sup> Meanwhile, foods that weren't available in the FoodWorks database were substituted with food that was adjusted to local food characteristics as suggested by the manual book. Therefore, the value of SSF contents obtained is an estimation and may be higher or lower than the actual SSF content. School children's SSF intake variable was categorized based on the cutoff points set by the Ministry of Health Regulation Year 2013 about daily SSF intake limits, which are 5 g of sugar, 5 g of salt, and 67 g of fat.<sup>11</sup> Upon cleaning, SSF were presented as main dishes, snack, and drinks according to BPOM<sup>5</sup>. Main dishes are food that give a full sensation, typically a mixed food with a portion that resemble main course such as breakfast meal. Snack is defined any food that is consumed out main meal. Any liquid food, package or non package that serve to satisfy thirst or accompany solid food are included into drinks. Since there are many items for each category which is too long to be presented, only selected food items with high content of SSF are presented. Furthermore, percentile SSF distribution, SSF intake among overweight school children and SF SSF contribution to total SSF intake are also presented . The study was approved by the ethical approval from Health Sciences Faculty, UIN Syarif Hidayatullah

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## **RESULTS**

The population in this study were 4th, 5th, and 6th graders who were no longer obligated to bring lunch to school, resulting in more frequent snacking. The school canteen holds a 'healthy canteen' status. It is a status standardized from Ministry of Health for school canteen in Indonesia. However, most snacks in food-stalls were high in energy; fat; and carbohydrates and low in vitamins;

minerals; and fiber, such as fried chicken and rice; chicken porridge; meatball soup; fried noodles; fried rice; rice and turmeric chicken broth soup (soto); various other snacks and sweetened drinks.

Table 1 shows that the majority of respondents were aged 10 years old, over half of the

respondents were female, and approximately one-third of respondents had overnutrition (overweight and obese). A total of 53 hawker foods were identified (not presented), consisting of 18 main dishes, 35 snacks, and 10 drinks.

**Table 1. Distribution of Study Respondents' Characteristics**

Characteristic	n (89)	%
Age (year)		
9	10	11.2
10	37	41.6
11	26	29.2
12	16	18
Sex		
Male	44	49.4
Female	45	50.6
Nutrition Status		
Normal	63	70.8
Overweight	11	12.4
Obese	15	16.9

Table 2 through Table 4 respectively present 7 food items in each category that contains the highest sugar, salt, or fat contents based on their full portions, 100 grams, and frequency of consumption

during the past month. In Table 2, it can be seen that food items in the snack category contain over 10-fold sugar content compared to main dishes in the same 100 grams.

**Table 2. Sugar Contents in School Children's Food at Madrasah Ibtidaiyah UIN Jakarta 2019**

No	Name of Food	Weight per Portion (g)	Sugar Contents (g)		Frequency of Consumption/week
			Per Portion	Per 100	
<b>Main Dishes</b>					
	Instant porridge	45	2	4	1
	Fried noodles	163	5.05	3.09	7
	Sushi	29	0.79	2.77	1
	Spaghetti	116	2.95	2.54	3
	Complete chicken skewers	226	4.37	2.09	9
	Coconut milk rice	193	3.33	1.94	14
	Fried rice	103	1.49	1.72	25
<b>Snacks</b>					
	Chocolate biscuits	17	5	40	5
	Chocolate crepes	56	17.62	31.7	1
	Chocolate-cheese crepes	61	17.66	29.14	4
	Fried bananas	84	18.88	22.53	2
	Toasted sandwiches	50	10.19	20.39	7
	Vanilla wafers	19	5	20	2
	Grilled bananas	125	22.77	18.22	3
<b>Drinks</b>					
	Blended milk	75	24.46	32.61	5
	Powdered grape drink	11	10	12	6
	Grape flavored ice cup	58	10	12	3
	Fruit flavored tea	250	24	12	2
	Thai tea	120	17.49	11.55	5
	Fruit flavored yogurt	300	31	10	2
	Chocolate milk	200	19	10	7
<b>Others</b>					
	Catering Menu	287	2.59	0.9	4

Table 3 illustrates that all food items in the snack category generally contain higher salt content

compared to different categories. Crunchy noodles, sushi, and isotonic drinks contain the highest salt

content in each category, also followed by heightened sodium content.

Similarly, it is illustrated in Table 4 that the food in the snack category contain two-fold more fat

content than the snacks in the main dishes category. Table 5 shows that food contribute to the overconsumption of salt (based on daily limits) in over one-third of school children.

**Table 3. Highest Salt Contents in Snacks in School Children's Foods at Madrasah Ibtidaiyah UIN Jakarta 2019**

No	Name of Food	Weight per Portion (g)	Salt Contents (g)				Frequency of Consumption/week
			Per Portion (g)		Per 100 g		
			Sodium (mg)	Salt	Sodium (mg)	Salt	
<b>Main Dishes</b>							
	Sushi	29	513.19	1.3	1800	4.58	1
	Instant porridge	45	880	2.24	1680	4.27	1
	Burgers	73	669.63	1.7	917.3	2.33	5
	Fried noodles	163	1235.9	3.14	757.8	1.93	7
	Coconut milk rice	193	1331.87	3.39	690.58	1.75	14
	Meatball soup	183	984.85	2.27	488.88	1.24	18
	Chicken noodles and meatballs	307	1385.37	3.52	450.62	1.15	7
<b>Snacks</b>							
	Crunchy noodles	34	634.4	1.61	1865.89	4.74	3
	Crispy mushrooms	42	764.92	1.94	1821.24	4.63	1
	Shumai	158	886.4	2.25	1600.96	4.01	14
	Fried egg pancake	42	627.28	1.59	1479.43	3.76	11
	Taiwanese fried chicken	87	1282.15	3.26	1470.36	3.74	2
	Dimsum	123	1529.27	3.89	1164.9	2.96	8
	Soaked rice crackers	185	1805.85	4.59	1142.95	2.91	3
<b>Drinks</b>							
	Isotonic drinks	250	120	0.3	60	0.15	2
	Fruit flavored yogurt	300	180	0.46	60	0.15	2
	Powdered orange drink	11	30	0.08	40	0.1	6
	Fruit flavored tea	250	55	0.14	25	0.06	2
	Blended milk	75	18.4	0.05	24.5	0.06	5
	Chocolate milk	200	45	0.11	22	0.06	7
	Thai tea	120	9.55	0.02	8	0.02	5
<b>Others</b>							
	Catering Menu	287	506	1.29	176.3	0.45	4

**Table 4. Highest Fat Contents in Snacks in School Children's Food at Madrasah Ibtidaiyah UIN Jakarta 2019**

No	Name of Food	Weight per Portion (g)	Fat Content (g)						Frequency of Consumption/week
			Per Portion (g) Ltot	Per 100 g					
				SF	TF	MUFA	PUFA	TotF	
<b>Main Dishes</b>									
	Fried rice	103	13.8	1.8	0.3	5.35	5.26	13.4	25
	Sushi	29	3.6	2	0.1	5.75	4.34	12.8	1
	Coconut milk rice	193	24.4	2.3	0.2	5.36	4.15	12.6	14
	Fried noodles	163	18.4	1.8	0.2	4.3	4.35	11.3	7
	Complete chicken skewers	226	22	1.9	0.1	1.64	5.58	9.8	9
	Chicken soup	188	18	4	0.1	1.79	3.15	9.6	9
	Beef soup	178	16.4	4.1	0.1	1.65	2.86	9.2	1
<b>Snacks</b>									
	Potato chips	20	6	-	-	-	-	30	6
	Chocolate biscuits	17	4	-	-	-	-	28	5
	Fried sausages	42	10.6	8.8	1	4.4	9.9	25.4	15
	Fried bananas	84	20.6	5	0.5	8.7	9	24.5	2
	Flour fried tempe	48	11.4	2.9	0.5	11.8	7.4	23.6	5
	Vanilla wafers	19	4	-	-	-	-	22.5	2
	Sasuaes								
	Wrapped in noodles	115	23.5	5.2	0.7	5.7	7.9	20.4	2
<b>Drinks</b>									
	Blended milk	75	2.08	1.8	0.1	0.09	0.68	2.77	5
	Chocolate milk	200	4	-	-	-	-	2	7
	Thai tea	120	0.47	0.8	0	0.05	0.35	1.36	5
	Grape flavored ice cup	58	0.06	-	-	-	-	1	3
	Fruit flavored yogurt	300	15	-	-	-	-	0.3	2
	Frozen drink	15	0.13	-	-	-	-	0.13	1
	Sweet iced tea	167	0	-	-	-	-	0	99
<b>Others</b>									
	Catering Menu	287	25.1	0.8	0.1	2.1	2.39	5.81	4

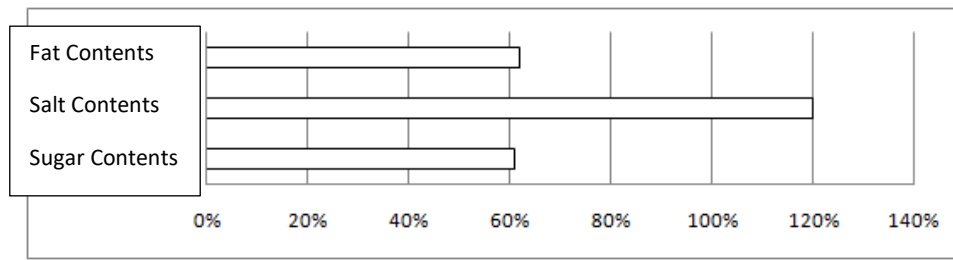
Abbreviation: SF, Saturated Fat; TF, Trans Fat; TotF, Total Fat; MUFA, Monounsaturated Fatty Acids; PUFA, Polyunsaturated Fatty Acids

**Table 5. Sugar, Salt, and Fat Contents in School Children's Food**

Contents	n	%
Sugar		21.3 ± 13.3*
Excess (≥50 g/day)	2	2.2
Normal (<50 g/day)	87	97.8
Salt		4.5 ± 3.47*
Excess (≥5 g/day)	27	30.3
Normal (<5 g/day)	62	69.7
Fat		24.3 ± 12.9*
Excess (≥67 g/day)	2	2.2
Normal (<67 g/day)	87	97.8
Total	89	100

Source: Primary Data; \*mean ± standard deviation

Collectively, Figure 1 shows the salt intake from snacks in the majority of school children exceeds the recommended daily allowance (120%)



**Figure 1. Contribution of sugar, fat, and salt in food snacks compared to recommended daily allowance**

## DISCUSSION

The main finding of this study is that sugar, salt, and fat contents in the snack category are higher than in the other categories. Sugar contents that are 10-fold higher in snacks followed by frequent consumption by school children increase their risk of being overweight or obese. Food and sweetened beverages produced by factories or food stalls are a source of added sugar with the potential to increase sugar intake.<sup>12</sup> Consumption of factory-produced food or ultra-processed food is also correlated to increases in BMI which may lead to being overweight or obese.<sup>13</sup> Other than that, increased sugar intake is also related to dental caries in children.<sup>14</sup> Dental caries induces pain, restlessness, and even functional limitations, which may decrease school children's performance at school<sup>15</sup> and negative emotions like loneliness and aggressive behaviors<sup>16</sup>.

Salt content, alongside sugar content, has a higher average in snacks such as crunchy noodles that contain 4.7 grams of salt (approximately one teaspoon or 5 grams) compared to other categories, which is concerning. Crunchy noodles are egg noodles that are fried and given various seasoning powders. A study shows that the highest contributor of sodium intake in Indonesians is sourced from spices, including salt and other condiments that are added to dishes.<sup>17</sup> For every increase of 1 gram of salt per day, the risk of being overweight and obese increases by 28%.<sup>18</sup>

The second rank highest fat dish are fried rice and burger. Those foods processed by frying, stir-fry or mix processed, however they also one of snacks mostly bought by school children. It was estimated 6.25 g saturated oil from palm oil used to cook fried rice which effect higher percentage of saturated oil in the dish.<sup>19</sup> The highest salt snack is potato chips which slightly different to packaged potato chips sold in convenient stores. In the canteen, the potato chips sold were small-scale factory products which derived from the main ingredient, that is potato, thinly sliced and double crispy fried, then poured in various flavours. In addition to salt, potato chips were estimated contain 30 g total fat. The danger of side effect from fat hydrogenation which is trans fat was unavoidable and increase

double lypodensity level in human blood<sup>20</sup> similar to saturated fat.<sup>21</sup>

Sweetened drink is one of highest product that bought by school children. One of sweetened drink, namely blended milk, or popularly known as milkshake, it has alarming sugar and fat amount, that is 32.61 g and 2.7 g respectively. The sugar amount compiled from sugar and sweet condensed milk while fat derives from powdered milk and sweet condensed milk. Added sugar can increase calorie intake and risk of non communicable diseases.<sup>15</sup> Other study among school children aged 5 to 12 years old showed high sugar drink consumption more than 3 times per week can increase risk of overweight to 10 times compare those who consume less than 3 times per week.<sup>4</sup> Evidence from systematic review of 26 studies<sup>22</sup> revealed that high fat consumption among children increase fat body percentage and risk of cardiovascular during adolescence. WHO recommended fat intake should not exceeded 30% of total calorie intake, thus decrease risk of non communicable diseases.<sup>23</sup> Our findings revealed that almost one third of subjects experienced overweight (12.4%) and obesity (16.9%). This anthropometry indicator shows possible link to their SSF intake. Most of high SSF found in food stalls indicates that lack of healthy canteens awareness. Due to typical street foods were found in food stalls. Street foods are high in fat, carbohydrates and thus they are energetic in nature.<sup>24</sup> Despite four school children have lunch from catering but the rests of them more prefer to buy foods from school canteen. Subjects in this study were balanced number between male and female but other study showed that female are more prone to increase snacks consumption.<sup>25</sup> There are multiple factors such as influence from social media and peers also lack of nutrient-dense snacks from parents.

## CONCLUSION

It is known that more than one third of school children consume high salt from street-food snacks. Despite some schools have canteen, dishes and snacks available at school canteen should be reviewed to meet healthy food indicator, including consider the amount of sugar, salt and fat. The contribution of high SSF not only to impact health

among school-age children at present but also for their future particularly related to the higher risk of non communicable diseases. Researchers suggest this study can provide SSF information on dishes, snacks and drinks available at school canteen thus school might be able to apply the information into canteen providers. Therefore, they might be able to reduce SSF in dishes, snacks and drinks. The information about SSF can be delivered directly to school-age children as well. The school-age children need to understand and able to choose less SSF food

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