

Source of Sugar-sweetened Beverages Consumption Among Indonesian: A Mini Review

Asupan Minuman Berpemanis pada Orang Indonesia: Studi literatur

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Abstract: *Overweight-obesity become global health concern and sugar sweetened beverages is highlighted contributing the excessive energy intake. This mini review aims to describe the source of sugar intake from beverage among Jakarta population as capital city of Indonesia. This study was mini review of 5 articles of SSB consumption using 7-days fluid record or semi quantitative food frequency questionnaire (SQFFQ). This study obtained the information that SSBs consumption has occurred in younger age and increased in older age. SSBs consumption is dominated by milk-based drinks in children, milk-based drink and flavored beverages such as carbonated soft drinks, electrolyte drinks, sport drinks, flavored drinks (not include original fruit drinks) in adolescence, and milk-based drinks, tea and coffee-based drinks in young adults. It is necessary to educate the care giver for children and adolescents also young adults regarding the healthier beverages to prevent health impacts due to SSBs consumption.*

Keywords: sugar sweetened beverage, added sugar, adolescence, children

1. INTRODUCTION

Overweight as the excess of body fat mass is caused by a positive imbalance of energy intake and energy expenditure (34). Overweight-obesity becomes global health concern including Indonesia (37,41). Over 10 years period, Indonesia experienced increasing of overweight-obesity rate from 19.1% in 2007 to 35.4% in 2018 (16). The consequence of overweight-obesity status in further stage of life may contribute to increase the prevalence of metabolic syndrome, poor academic performance, sleep apnea, lower quality of life, premature mortality and morbidity making overweight-obesity become public health problem (1,3,5,12,24,27,36,38). In 2016, World Health Organization (WHO) reported about 15.2 million people died caused by non-communicable diseases (NCDs) (30). World Health Organization (WHO) in 2016 also reported that obesity become one of contributors in increasing non communicable diseases (NCDs) prevalence such as ischaemic heart disease (IHD) and stroke. Therefore, IHD and stroke become two leading causes of global death (30).

In US, the average of annual weight gain among adults was 0.5 to 1.0 kg from early to middle adulthood (41). In 2008, the probability of Indonesian adult to have BMI ≥ 30 kg/m² in age of 20 years was 4.8%; higher in females (6.9%) than males (2.6%) (28). Surprisingly, study in 2016 also found that overweight in early adulthood (15–24 years old) has possibility as four times to become overweight in older age where the peak age was 35–54 years old (10). Recent data stated that the excessive body weight associated

with excess energy intake, one of highlighted source is free sugar intake (38). Sugar-sweetened beverages as a major source of added sugar can be quickly consumed while having less nutrient content may lead to higher calorie intake (6,34). SSB was related to weight gain by increasing overall energy intake (15,38,40). Interesting finding by NHANES study found the intake of SSB was higher in overweight than normal weight subjects (23). Some people drink diet soda as an alternative to avoid sugar intake in regular soda, while its consumption become a concern as its contribution in increasing the occurrence of type 2 diabetes and CVD (6).

A study in 2015 among Indonesian population found 10.9% of Indonesian people aged ≥ 18 years consumed energy from free sugar in beverage exceeded the WHO recommendation (9). Although it was the lowest prevalence among countries in that study, sugar intake in SSB contributed calorie as 182 kcal/day (9). Sugar sweetened beverage (SSB) might took a part in increasing of free sugar intake, as 75.68% of energy in SSB came from sugar (11,38). In Indonesia, the highest intake of beverage came from regular sweetened beverage (74 kcal/ day) (9). Another study in 2017 found that adult male consumed more SSB than female, (34%) and (15%) respectively (25). Many studies found sugar intake consumption in difference sizes (gram, cups, etc.) which may confuse the reader to understand compare to the recommendation. Information regarding the source/type of sugar sweetened beverage which may contribute as the energy source in beverages is still lack. Therefore, it is necessary to assess the sugar intake consumption among Indonesian adults. This study aimed to describe the source of sugar intake from beverage among Indonesian adults.

2. METHODS

This study used mini review approach which followed the logical steps by World Health Organization (WHO) to develop the guideline (29). First, the author defined the objective and purposes of the article then carried out some relevant references and data using search engine PubMed and Google Scholar. The author used some keywords such Indonesia, sugar sweetened beverage, beverages intake and 7-days fluid intake to find the relevant references about the consumption of sugar sweetened beverage among Indonesian population. The author focused on publication journals among Indonesian population using 7-days fluid record and semi-quantitative food frequency questionnaire.

3. RESULTS

There were 5 studies assessed the consumption of sugar sweetened beverages among Indonesian in various age; 3 studies used 7 days fluid record tool and 2 studies used SQFFQ. All studies were cross sectional studies and participated between 120 – 3644 subjects. Most of studies were conducted in urban area and one of the studies assessed in Maluku which categorized as rural area.

The SSBs consumption shown in Table 1. In the earlier age (pre-school children and children), the consumption of SSBs tend to less than older age (adolescents and young adult). Among pre-school children, highest consumption came from milk-based consumption while children consumed milk-based and tea-based drinks. In adolescent period, the trend of SSBs consumption is dominated with flavored beverages such as carbonated soft drinks, electrolyte drinks, sport drinks, flavored drinks (not include original fruit drinks). The frequency of SSBs consumption at least once a week, and one study found the frequency was >2 times/week in 9 out of 10 high school students. The

trend of SSB consumption in older age (young adults) was dominated by milk-based drinks (66.5%), tea-based drinks (66.5%) and coffee-based drinks (38.5%).

Table 1. Source of sugar sweetened beverages in previous studies

Author	Location	Design of study	Population	Subject	Study duration	Sampling method	Tool for assessing SSB	Finding (s)
Prawitasa ri, et.at., (2020) (32)	Jakarta (urban) and Maluku (rural)	Cross sectional	36 – 72 months old	585 subjects	3 months	Stratified random sampling	7 Day-Fluid Diary Record	<ul style="list-style-type: none"> - School children subjects in urban area mostly raised by mother than in rural area; the household cost was also higher among rural subjects than urban - Median total water consumption in urban area was 1182,9 (354,6-2991,4) mL/ day dan 1089,3 (85-2987,5) mL/day in rural area - Milk consumption was higher in urban area as 420,5 (0-1922,1) ml/day compared to consumption in rural was 196,9 (0-1582,86) ml/day - Sugar sweetened beverage intake was 3 (0 – 490.2) in urban city and 0 (0 – 350) ml/day in rural city
Laksmi, et.al. (2018) (20)	Central Java, East Java, West Java, Yogyakarta, Jabodetabek, Sumatera, Kalimantan, Sulawesi	Cross sectional survey	Children (4-9 years), adolescents (10 – 17 years), adults (18 – 65 years)	3644 subjects	1 month	Random sampling	7 days fluid record	<ul style="list-style-type: none"> - Highest participant was adult (76%), followed with adolescents (13%), and children (11%) with mean BMI and BMI for age were 23.2 ± 5.5 kg/m², 0.1 ± 1.9 SD and 1.4 ± 3.3 SD, respectively - SSBs were consumed at least once a week by 62% children, 72% adolescents and 61% of adults, with ready-to-drink tea being the most frequently consumed SSB. - Of the beverage's consumption, the highest proportion of SSB consumption was adolescents (11%), children (8%), and adults (5%). - SSB consumption were 69 (0-240) ml/day in children, 173 (0-412) ml/day in adolescents, and 85 (0-309) ml/day in adults. - The highest source of SSB consumption from ready to drink (RTD) tea and coffee, and juice-based drinks.
Wicaksari (2021) (40)	Depok, West Java	Cross sectional	Young adult aged 19-21 years old	161 subjects	4 months	Purposive sampling	7-days fluid record	<ul style="list-style-type: none"> - Median BMI was 20.6 (15.11–41.29) kg/m², while there were 24.2% overweight-obese - Median total fluid intake was 1842 (721.9–4502.9) ml/day

Source of Sugar-sweetened Beverages Consumption Among Indonesian Population: A Mini Review

Author	Location	Design of study	Population	Subject	Study duration	Sampling method	Tool for assessing SSB	Finding (s)
								<p>and dominated by plain water as 1556.2 ± 657.9 ml/day. SSB contributed as 217.4 (0 – 1580.6) ml/day.</p> <ul style="list-style-type: none"> - The three highest consumption of SSB came from sugar-sweetened milk-based (66.5%), tea drinks (66.5%), and sugar-sweetened coffee drinks (38.5%); while the lowest consumption was electrolyte drinks (8.1%) - SSB intake contributed added sugar as 23.4 grams (almost 2 tablespoons) and calorie as 126 kcal/ day (7.5% of total energy intake) - 11.8% of subjects consumed sugar out of Indonesian Dietary Guideline
Dzakiyyah, Indana Bintan (2016) (13)	East Jakarta	Cross sectional	High school students	168 samples	5 months	Quota sampling	Semi quantitative food frequency questionnaire (SQFFQ)	The average of SSBs consumption was 245.77 ± 208.4 mL/day, where tea/coffee intake was 152.7 ± 164.1 ml/day, Fruit-flavored drinks was 77.1 ± 129.1 ml/day, Flavored drinks was (without fruit juice) 65.7 ± 141.9 ml/day, sport drinks was 56.9 ± 95.1 ml/day, caloric carbonated drinks was 42.2 ± 63.9 ml/day, and energy drinks was 10.0 ± 51.3 ml/day
Sari, et.al. (2022) (35)	Jakarta	Cross sectional	High school students	120 subjects	8 months	Quota sampling	Semi quantitative food frequency questionnaire (SQFFQ)	<ul style="list-style-type: none"> - Of the total, 9 out of 10 consumed SSBs >2 times/week. - There is a significant relationship between pocket money, advertising, media exposure, and the availability of SSBs at home with SSBs consumption, while no significant relationship between gender, self-efficacy, frequency of online food delivery, consumption of fast food, and the influence of friends with the consumption of SSBs

SSB=sugar sweetened beverages

4. DISCUSSION

Sugar sweetened beverages

This study conducted mini review of the consumption of sugar sweetened beverages in Indonesian population. Sugar is one of food components that naturally occurring in the food or can be added during food/ beverage processing, preparation or at the table (15). Sugar is also known as free sugar, total sugar, extrinsic sugar, intrinsic sugar, high-fructose corn syrup (HFCS) (15,38,39). Recently, sugar intake on beverages becomes a global concern as its impact on increasing health problem prevalence since causing addiction (4,8,38). The 2002 Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases defined free sugar “as all types of monosaccharides and disaccharides which are added to food/ beverage in manufacture, during preparation/ processing or by the consumer; and sugars naturally occurring in honey, syrups and fruit juices”. Recently, sugar sweetened beverage has become a global concern due to its contribution in increasing excess energy intake from sugar content in SS (38). WHO reported sugar in SSB contribute to energy intake as 75.68% (11). The SSB has sweet taste due to the sugar content (added or naturally) in the beverage, which influence individual’s food/ beverage preferences (14). There are some types of sugar sweetened beverages, they are sugar-sweetened milk/ fermented milk, sugar-sweetened coffee, sugar-sweetened tea, non-100% juice, chocolate drink, fruit flavoured drink, non-carbonated drink, carbonated drink, electrolyte drink, and others (9,32). Indonesian National Agency of Drug and Food Control divided beverage in regulation No. 21 in 2016 (26).

SSB consumption in children and adolescents

Of the total fluid intake, review of Prawitasari’s study found that in general the fluid intake of 1-3 years and 4-6 years old subjects were still lower than the fluid intake recommendation (32). Additionally, SSBs is took a part of the fluid intake among 1-6 years old children. Although, the highest SSBs is dominated by milk-based drinks, the habit of consuming SSBs need to be managed. Because, food choice among pre-school children may influenced by the parents/caregivers (32). In Prawitasari, et.al. (2020), most of pre-school children in urban area were raised by their mother compared to rural area, hence the food-beverages consumption was being protected among those who were raised by their mother (32). It may also influence the food-beverage choice among pre-school children which mostly came from milk-based beverages rather than the older age (32). While, adolescents is the period of transition between children and adulthood making this age has already a concern about their health and as they grow, they spend more time with their peer align with their independence level to choose their food-beverages (7). The dominant factor related to SSBs consumption in students was the availability of SSBs at home (35).

SSB consumption in young adults

Young adulthood is also known as vulnerable period as transition from adolescents to adulthood and start to leave the home for going to university (21,31). This study reviewed one study by Wicaksari (2021) which found SSB intake as 217.4 (0 – 1580.6) ml/day which contain 23.4 grams of sugar and contributed to 126 kcal/day (7.5% of total energy intake) (40). This number almost reach the recommendation from Ministry of Health of Indonesia which restricts sugar intake no more than 50 grams/day (18). The prevalence of subjects who consumed more than 50 grams/day

was 11.8% which means that every 10 young adults there will be 1 person consumed more than 50 grams of sugar only from beverages (18). Another sugar restriction by American Heart Association (AHA) should be less than 110 kcal/day for women and 150 kcal/day for men, and WHO restricts should be less than 10% of total energy intake (TEI) (2,19,38). It means that the SSB consumption in young adult age is relatively high. Safitri et.al. (2021) investigated the calorie content of boba milk drink and found that 1 cup of boba milk drinks has sugar content higher than Indonesian Nutrition Guideline. Comparison of calorie content in boba drinks in every 16 oz showed Boba Milk Tea has 352 kcal, carbonated drink has 205 kcal, energy drink has 226 kcal, instant tea beverage has 178 kcal, coffee frappe has 493 kcal, and instant fruit juice has 226 kcal. This calorie content analysis was only assessed on the water content without additional topping and pearl (33).

Health impact of SSB consumption

This mini review found interesting result that SSB intake has been occurred even young age and increased with advancing age. Impacts of SSB was evidenced in some previous studies such as obesity, diabetes mellitus, cancer, cardiovascular diseases, fatty liver, gout, and dental caries (22). Thus, habit of consuming SSB especially more than the recommendation will affect individuals' future stage of life such promoting weight gain through various mechanisms due to incomplete compensation for liquid calories by food intake reductions at subsequent meals, hyperinsulinemia which initiated by the rapid absorption of sugar and also through neural pathways of food addiction (22). In addition, SSBs promote weight gain independently through a high glycemic load and the metabolic effects of excess fructose in the liver (22). Other evidence from cohort studies also supports a link between SSB intake and risk of the metabolic syndrome, a precursor for cardiometabolic diseases. A review of observational studies and trials among children found consistent evidence that cardiometabolic risk increases as intake of SSBs increases, with strong evidence noted for risk of increased adiposity and dyslipidemia. Based on 12 studies (one cohort, two case-control and nine cross-sectional), Chen and colleagues found that each one serving per day increase in SSB intake was associated with a 39% higher risk of NAFLD (95% CI 29–50%) (22). Study done by Yulia (2014) found that over-nutrition problem is caused by 'less healthy' patterns such consuming SSB. To overcome this problem, educating people on nutritional values is necessary to improve individuals' diet including type and portion (17). For relevant stakeholders, it is necessary stakeholders to provide education about the impact of excessive consumption of SSBs to students and facilities to refill mineral water, motivate students to bring drinking bottles to increase plain water consumption and advise parents to provide less SSBs at home to limit their children of SSBs exposures (35).

5. CONCLUSION

SSBs consumption is dominated by milk-based drinks in children, milk-based drink and flavored beverages such as carbonated soft drinks, electrolyte drinks, sport drinks, flavored drinks (not include original fruit drinks) in adolescence, and milk-based drinks, tea and coffee-based drinks in young adults.

ACKNOWLEDGEMENT

The authors declare that there were no conflicts of interest in this study.

ACKNOWLEDGEMENT

This study has no funding support from any funding agency.

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