Junk Food Consumption Related to Female Adolescent Obesity

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Abstract. Research background. The prevalence of obesity status in female teenagers aged 13–15 in Bantul Regency in 2018 had seen an increase of 6.43%. The obesity status in teenagers can be caused by several factors, one of which is excessive consumption of junk food. Aim of research: This research seeks to understand the correlation between the consumption of junk food and the obesity occurrence in female adolescents in Bantul Regency during the COVID-19 pandemic. Method: This research belongs to the quantitative research with the design of case control. The sample of the research is female adolescents aged 13–18 in Bantul selected randomly using Cluster Random Sampling technique, resulting in 309 female adolescents consisting of 73 case groups and 237 control groups. The data were analyzed using correlation test Rank Spearman. Result: In case groups, it was found that the average score of junk food consumption 15.14 ± 5.61 and in control group, it was 17.02 ± 6.61. The Spearman correlation test showed that there was a significant correlation between the consumption of junk food and obesity occurrence in female adolescents in Bantul Regency $p = 0.046$ ($p < 0.05$). Conclusion: Junk food consumption was proven to have a significant correlation with obesity occurrence in female adolescents because of the prevalence of its higher consumption during the COVID-19 pandemic in Bantul.

Keywords: female_adolescents · junk_food · obesity introduction

1 Introduction

During the COVID-19 pandemic, every activity, both learning activity and working activity, is carried out on-line or work from home (WFH). A lot of activities during this period are done on-line, which causes the decrease of physical activity and the change in people's diet every day. At that time, many people rely on delivery food and ready-toeat food, which mostly is junk food. A study in India showed the prevalence of online delivery order for food in females (44.2%) in which the frequency of ordering food online before the lockdown was as much as 4.49 ± 3.75 [1].

When consuming junk food, most people do not care about its nutritional value. In the long run, it will affect people's nutritional status. This is caused by the lack of knowledge

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in the society about balanced nutrition. Some people are reluctant to prepare a healthy, balanced menu, so that they prefer to buy takeaway food without paying attention to the kind of food they buy [2].

In selecting food, people tend to be interested in food with interesting presentation without caring about its nutritional content, and most of the food they buy is junk food. Nowadays, many people consume junk food, especially adolescents. A study in Australia listed several kinds of junk food usually consumed by children aged 5–16 years old, namely French fries, chips, sweet and salty snack, donut/cookies/biscuits, candy, chocolate and ice cream/ice block. The consumption of junk food is relatively high because they often have dinner in front of the TV and buy food online more than three times a week [3]. Junk food has high caloric content, but only has little micro nutrient content such as vitamin, mineral, amino acid, and fiber [4].

Junk food intake which is not balanced by enough physical activity and low consumption of fiber will slowly build up the deposit of fat, which may trigger weight gain. This is supported by the finding of previous research conducted with proportionate stratified random sampling method on 75 respondents taken from students of class XI senior high school. The article stated that the prevalence of students with obesity was as many as 49.3%, in which 60% of them stated they often consumed junk food, and 45 students had moderate physical activity. The research concluded that the habit of consuming junk food ($p = 0{,}001$) and moderate physical activity ($p = 0{,}000$) have a significant correlation with the nutritional status of class XI students in high school in Jambi [5].

The emergence of teenager's obesity is multi-factorial in nature. Genetic factor, influence from advertisements, psychological factor, socio-economic status, diet program, age, sex, lack of physical activity, and high level of junk food consumption are the supporting factors of early obesity. Based on a survey done in an urban setting, it explained that teenage obesity reached 15.83% even it could go as high as 64% in downtown schools. Previous research done in 118 adolescents from class X and XI with proportional stratified random sampling showed that the most significant factor contributing to teenage obesity comprised of the excessive consumption of macro nutrients, such as energy intake ($p = 0{,}000$; OR = 2,97), protein intake ($p = 0{,}005$; OR = 3,49), fat intake ($p = 0{,}000$;OR = 6,57), carbohydrate intake ($p = 0{,}005$; OR = 2,00), frequent fast food consumption ($p = 0{,}000$; OR = 4,41); low physical activity ($p = 0{,}007$; OR = 3,08), extra pocket money ($p = 0{,}032$; OR = 2,38), and parental obesity history ($p = 0{,}001$; OR = 3,98) [6]. Another research showed that the habit of missing breakfast was related to the obesity of 148 adolescents aged 14–19 ($p = 0{,}027$) [7].

The problems about nutrition in Indonesia tend to increase. This can be seen from the data of the teenager nutritional status in 2013 and 2018 ($p = 0{,}027$) [7]. The prevalence of nutritional status in Indonesia showed a drastic increase in the obesity status of adolescents aged 13–15, from 8.3% to 11.7%. The trend was also shown in adolescents aged 16–18, from 7.3% to 11.4%. In the province of Special Region of Yogyakarta, the prevalence of obesity status (IMT/U) in adolescents aged 13–15 increased by8.86% in 2018. The same thing happened to adolescents aged 16–18, increased by 4.3% in 2013. Bantul was one of four regency in the Special Region of Yogyakarta that showed the

prevalence of obesity status in female adolescents aged 13–15 with an increase of 6.42% (12,13).

Based on a result of a research in Banten in 2020, it was found that the consumption of junk food in adolescents before and during the COVID-19 pandemic had seen an increase from 57% to 74.8% [8]. In the Special Region of Yogyakarta province, it could be seen that the prevalence of the higher consumption habit for sweet food, salty food, and fatty food / cholesterol/ fritters happened more in females than in males. The percentage of the consumption of sweet food, salty food and fatty food/ fritters, which was more prevalent in females than in males, showed 42.30%, 32.40%, and 52.11% [9] respectively.

Some health problems occurred during the COVID-19 pandemic, one of them being adolescents with obesity, might become a factor which makes the body prone to get infected by the virus. Adolescents with obesity were often found consuming junk food bought on line in food delivery apps [10, 11]. Another impact found in online learning process was the feeling of anxiety and stressed felt by the students because there were too much tasks given by their teachers. Students found their rest time and their eating time irregular because they was overwhelmed by their task, which frequently caused them to spend their time from morning until late night to complete their tasks. Based on a research conducted to 74 students in high school/vocational school/Islamic high school, it stated that the students tried to enjoy music/film, play online games, lie on bed while eating/drinking their favorite meal/drink. This might have an impact on their sedentary activities in the long run, so that it might affect their weight [12].

Some researches explained that in the COVID-19 pandemic lockdown, the intensity of sleep and screen time exposure became more, while the frequency of the consumption of vegetables, fruits, and nut products became less, and the frequency of low-fiber food intake and high sucrose/caloric drink became more [13]. The change in lifestyle and diet in the pandemic becomes something worth noticing so that it will not cause disruption in health, especially for students. This can be achieved by giving proper and intensive nutrition education in every school. Educating about the importance of balanced nutrition to 1334 adolescents aged 1016 was statistically significant to prove that it improved a healthier diet and lifestyle. The impact of the education before and after the COVID-19 pandemic was as follows: the change of the proportion of water consumption which was more than 3 glasses per day from 41% to 47.9% ($p = 0{,}0020$); the consumption of vegetable 3–4 portion per day ($p = 0{,}0004$); the frequency of the consumption of fruits 3 times per day($p < 0{,}0001$); the improvement of the proportion of watching TV more than 2 h per day from 78.3% to 88.4% ($p < 0{,}0001$) [14]. Based on the backgrounds mentioned, the researchers felt that it was important to analyze the correlation between the consumption of junk food and the obesity occurrence in female students in Bantul during the COVID-19 pandemic.

2 Methods

This research is an analytical observational research with the approach of case-control. The research was conducted in from December 2021 to January 2022 in junior and senior high schools in Bantul. This research had been granted an ethical authorization by the ethic committee of University of Aisyiyah Yogyakarta with the code No.1978/KEP-UNISA/III/2022. Before taking the nutritional status, there had been validity test and

reliability test for the questionnaire titled Junk Food Intake Measure, and there had been a calibration of digital scales, microtoise in the laboratory of calibration and testing of PT Adi Multi Kalibrasi UAD.

The target of population in this research was all female adolescents studying in Bantul Regency. The sample of this research was female adolescents in junior and senior high school, aged 13–18, in Bantul. The technique to gather the sample was Cluster Random Sampling, which resulted in 309 female adolescents, comprising 73 case group and 236 control group.

In this research, the respondents in the samples were students with IMT/U > + 1 SD that had been given a permission from the parents by signing up informed consent form. Female students that had not attended the research until the end, were in routine medication, and were suffering from chronic illness belonged to the category of exclusion. Students fulfilling the criteria were directly taken to their anthropometry measurement and were asked to provide answer to the questions in the JFIM questionnaire with a validity test of 0.72 and reliability test of 0.92. The occurrence of obesity in female adolescents is defined as a nutritional status which is caused by the imbalance between nutritional intake from food and nutritional need of the body. The measurement of body weight and body height used digital scales and microtoise in female adolescents which was illustrated in the determination of IMT for adolescent age group using the IMT/U indicator.

The data were analyzed using statistic software and AnthroPlus application by WHO. Uni-variate analysis was employed to illustrate the characteristics of the subjects, such as age, mother's occupation and latest education. Before running the hypothesis test, all of the variables were taken to normality and linearity test using Shapiro-Wilk test, of which the result showed irregular distribution of data. Bi-variate analysis was conducted with the Rank Spearman correlation test.

3 Result

This research was conducted in junior and senior high schools in Bantul, the Special Region of Yogyakarta province, with the total respondents of 309 female students. Based on Table 1, the characteristics of the respondents were divided into two groups, in which in the case group of female adolescents aged 13–15 as many as 38 students, and aged 1618 as many as 35 students. The control group consisted of 106 female adolescents aged 13–15 and 130 aged 16–18. The frequency of mother's occupation in both groups was mostly unemployed or as housewives with the number of 33 people (45%) and 128 (54%) respectively. The latest education of the mothers in the case and control group was mostly the graduate of senior high school/vocational high school as many as 38 people (52%) and 117 people (50%) respectively.

Table 2 illustrated that the average score of junk food consumption both in case group and in control group was relatively high. It means that the consumption of junk food in female adolescents in Bantul Regency was proven to increase during the COVID-19 pandemic.

Based on Table 3, it is known from the Rank Spearman correlation test result that the correlation between junk food consumption and obesity occurrence in female adolescents

Table 1. The Distribution of Respondent Characteristics Based on Groups

Variable	Case		Control	
	n	*%*	*n*	*%*
Age				
13 - 15	38	52	106	45
16 - 18	35	48	130	55
Mother's occupation				
Unemployed/ Housewife	33	45	128	54
Civil servant/ Military/ Police	17	23	13	6
Entrepreneur /Priest	7	10	36	15
Entrepreneur	6	8	20	9
Teacher/ Lecturer	4	6	10	4
Labour/Driver/Employee/ Farmer	6	8	29	12
Mother's latest education				
Uneducated/ Elementary School	2	3	18	8
Junior High School	7	10	39	16
Senior High School/ Vocational	38	52	117	50
Bachelor's/ Master's	26	35	62	26

Table 2. THE AVERAGE SCORE OF JUNK FOOD CONSUMPTION IN FEMALE ADOLESCENTS IN BANTUL

	Group
	Case Control
Junk Food Consumption	15.14 ± 5.61b 7.02 ± 6.61a

a = The Average og High Score if > 16,6.
b = The average of low score if < 16,6

Table 3. THE CORRELATION BETWEEN JUNK FOOD CONSUMPTION AND OBESITY OCCURENCE

	Group	
	P Value	***r***
Junk Food Consumption	0,,460*	0,1136

*=Meaningful Correlaton (p<0,05).
r=Correlation strength

in Bantul Regency showed p value = 0.0460 ($p < 0.05$), which means there is a significant correlation towards obesity occurrence with the very weak correlation strength as much as 0.1136, and there is a positive correlation.

4 Analysis

Adolescent age group becomes a group that is prone to physical changes, and sometimes has unhealthy diet. Adolescent age group is considered having a tendency to suffer from obesity because in that age, the body is going through a change in the composition of body fat and in the decrease of insulin sensitivity during the puberty. The growth period and maturing period are also marked by the change of appetite, physical activity, sedentary behavior, and psychological health, in which female adolescents tend to have a higher risk of developing depression or self-worth issue. Adolescents are proven to frequently consume fast food/ burger as much as 39%, where female adolescents aged 13 have 19.56 kg/m2 in BMI, and in age 14, the BMI might reach 19.98 kg/m2 [15].

There are many factors about why adolescents take a liking to fast food. Among them are their personal indulgence, its reasonable price, interesting choices of menu, and from the taste and restaurant which are designed to appeal to adolescents [16]. A survey conducted in Jeddah reflected those things, where the prevalence of obesity was as much as 24% in female adolescents aged 13–18. This was caused by the habit of people consuming diet rich in sodium and high in fat content [17].

The result of this research concerning the educational background of the parents which mostly were senior high school/vocational school graduates and concerning the background of mother's occupation which mostly was housewives might have caused the malnutrition in the children. This can be explained by understanding that during the COVID-19 pandemic, the role of the family was very important in terms of the change in the diet and outdoor physical activity, which indirectly impacted on the nutritional status of the children [18]. The result of the study conducted in 709 adolescents proved that mothers with low level of awareness to their children's nutritional status, happening to the mothers with low level of education/ knowledge, posed a risk in having obese adolescents 2.36 times as many as to the mothers with better awareness (AOR = 2.36, 95% CI 1.44–3.86) [19].

The kinds of junk food primarily consumed by female students in Bantul during the COVID-19 pandemic comprised of fried meatballs, candy, ice cream, fries, salty snacks, sweet cookies, fritters, fried chicken, burger, trendy drinks, street food, and instant noodle. Junk food itself is categorized into four groups, namely salty food, sweet food, sugar-laden drink, and fast food. In a study conducted to Iranian adolescents, it was found that junk food significantly correlated with blood pressure and anthropometric changes. The consumption of sweet food was significantly influencing the change of adolescents' anthropometry, while the consumption of salty food was significantly affecting the changes in height, waistline and the ratio between waist and hip. The consumption of junk food poses 0.75 times more risk in the development of general obesity (OR:0,75; 95% CI:0,65–0,87) and 0.81 times more risk of developing abdominal obesity compared to adolescents consuming less of sweet food per day (OR:0,81; 95% CI:0,72–0,92) [4].

Female adolescents were chosen in this research because they have more risk of developing obesity since 7 years old, especially when one or both of the parents develop

obesity [20]. Based on the correlation test Rank Spearman, it was shown that there was a significant correlation between the consumption of junk food and the obesity occurrence in female adolescents with p value = 0.0460 ($\alpha < 0.05$) and there is a positive correlation. The research proved that the average junk food consumption score in female adolescents in Bantul Regency had increased sharply during the COVID-19 pandemic, with an average reaching 16.6. The score is regarded as high because in the previous research using the same questionnaire, the result stated that the score of the frequency of junk food consumption reaching 9–25 belonged to the category of "high" [3].

This research is in line with the study conducted by Budiarti in 2021. According to the study, from 166 students of junior high school in Surabaya, it was found that the Junk Food Intake Measure score belonged to the high category, with 46 students having second grade of obesity (27.7%), 92 students having first grade of obesity (55.4%) and 2 students having obesity (1.2%). All of the students were noted to frequently consume junk food. The research also proved that the consumption of junk food had a significant effect on nutrition ($p = 0.037$). The analyses of the study demonstrated that there were many adolescents consuming junk food because there were a lot of food stalls selling junk food such as fried chicken, fries, and sugar-laden drink. Another factor found in Surabaya was the condition which made parents opt to choose fast food or junk food for prestige reasons and for practical reason so that it could save time.

A survey conducted in India on 344 students proved that 30% of them were unaware of the dangerous effect of the consumption of junk food, such as the nutritional value of the food, the quality of the food, the chemical substance content in the food and their long-term effect to the health of the students. Based on a web survey result, the prevalence of Indian students choosing junk food as their breakfast was as many as 18%, and their liking to junk food because of its delicious and savory flavor was as many as 68%. Adolescents choosing junk food because of their lifestyle change were as many as 49 people, because of the influence of various advertisements in social media / TV were as many as 25 people, because of its practical and time saving reason were as many as 35 people, and because of its taste were as many as 235 people.

The study conducted to senior high school students in Yogyakarta was proven parallel to this research in the respect of the frequency of fast food consumption which posed 2.469 times more risk with obesity occurrence in significant level $p = 0.006$ ($p < 0.05$). Obesity status of the mothers also has a higher chance (OR = 3.78; CI: 1.89–7.56) with $p = 0.000$ rather than obesity status of the father towards the occurrence of overweight/obesity in their children (OR = 2.78; CI: 1.415.46) with $p = 0.0003$. Based on the multi-variate analysis, the factors that hold a meaningful correlation in adolescents are high intake of fast food and frequently missing breakfast (OR = 5.24; CI: 2.56–10.71), in which the chance of developing obesity becomes higher. Obesity in adolescents can be decreased in its prevalence by several means, one of which is by giving education to adolescents about the danger of fast food for their health. In a study in India, it was proven that giving education by distributing modules to adolescents below 20 years old contributed to a significant result towards obesity occurrence with the average post-test result 12.31 ± 3.21 (CI: 11.6–12.97) ($p < 0.05$).

Excessive consumption of junk food in adolescents could pose adverse health risks and caused degenerative illnesses such as type-2 diabetes mellitus, hypertension, cancer, heart disease, and even stroke. Some researches illustrated that sodium-rich food can increase the production of saliva and enzyme secretion. Unhealthy/ bad fats and sodium content can disturb the balance of sodium and potassium inside the body, which will trigger hypertension. A research conducted in four major cities in China (Beijing, Shanghai, Nanjing, and Zi'an) also gave a light on the increase of fast food consumption in children age group as much as 12% per year (OR = 1.12; CI: 1.02–1.23). The obesity status of mothers also had positive correlation to the children's obesity (central obesity) with OR = 1.12; CI: 1.07–1.17 and posed a risk of hypertension 1.09 times as much (OR = 1.09; CI: 1.03–1.15).

A cohort study conducted for five years on Chinese respondents living in Singapore demonstrated that the habit of consuming fast food more than twice a week could increase the risk of contracting type II diabetes mellitus with a chance of 1.27 times (95% CI:1.03–1.54) and contracting coronary heart disease with a chance of 1.56 times (95% CI: 1.18–2.06) compared to the people who seldom consumed fast food. Although it is still unclear how COVID-19 virus can affect obesity and diabetes, it is known that the infection of COVID-19 virus can increase IR and obesity, worsen the condition of people with type-II diabetes, or trigger a new onset of diabetes. This research is also in line with a research conducted by Ambariyati in 2017 because the result showed that there was a positive correlation between the consumption of junk food and obesity, which means that the more frequent the consumption of junk food is, the more likely the occurrence of obesity is. Various ready-to-eat junk food products are easily accessible because they can fulfill the need of fast food that can reduce cooking time. If this situation continues, there will be a developing dependency to consuming fast food, which will lead to physical imbalance and the occurrence of various non-infectious diseases. A study conducted in India on 300 adolescents aged 10–19 proved that there is a strong correlation between the consumption of junk food and the change of Body Mass Index (BMI) ($p = 0.001$). The average consumption of junk food in overweight adolescents is 23.8 ± 9.56, while in obese adolescents is 24.8 ± 8.71 (16).

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