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Relationship between Fast Food Consumption, Sedentary Lifestyle, and Physical Activity with Body Mass Index (BMI) among Students of Madrasah Aliyah Alkahiraat Pusat Palu Post-Covid-19 Pandemic

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ABSTRACT

The prevalence of obesity in Indonesia is 31.0%, which means that many Indonesians have obesity problems, including teenagers. Palu City is ranked tenth out of 33 provinces, with a percentage of 32.9%. Fast food consumption, sedentary lifestyle, and physical activity affect Body Mass Index (BMI). This study aims to determine the relationship between fast food consumption, sedentary lifestyle, and physical activity and the Body Mass Index (BMI) of grade X and XI students of MA Alkhairaat Pusat Palu. The research method used is quantitative with a cross-sectional study design. The study population was 246, and a sample of 159 respondents was used using a proportional random sampling technique. Data collection was conducted using FFQ, ASAQ, and physical activity questionnaires. Data were analyzed using the Chi-Square statistical test. The univariate analysis results of respondents with abnormal BMI were 64 people (40.3%), and those with normal BMI were 95 people (59.7%). Based on bivariate analysis, the results of variables that have a relationship with Body Mass Index (BMI) are fast food consumption (p = 0.000). In contrast, variables that have no relationship with Body Mass Index are sedentary lifestyle (p = 0.917), and physical activity (p = 0.256). It is expected that adolescents can adopt a healthy lifestyle under the principles of balanced nutrition.

Key Messages:

- The average respondent has a higher BMI because they frequently consume fast food, such as instant noodles, fried chicken, siomay sausage, and batagor. Respondents with a high sedentary lifestyle have a normal BMI status.
- Schools are expected to regularly monitor students' nutritional status, provide health education on nutrition, and offer reading materials specifically for adolescent health and implement a healthy canteen program.

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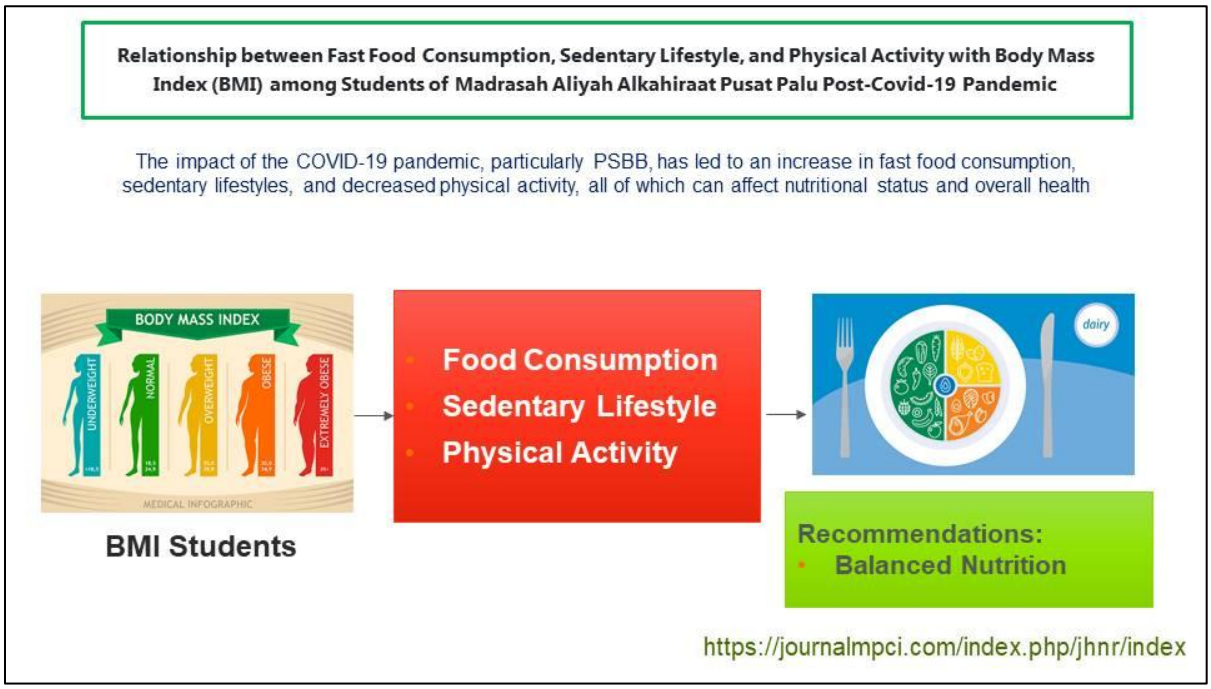
GRAPHICAL ABSTRACT



INTRODUCTION

The World Health Organization (WHO) announced the discovery of the Corona Virus Disease (COVID-19) caused by the SARS-CoV-2 virus (Severe Acute Respiratory Syndrome Coronavirus 2). The first positive case of Covid-19 in Indonesia was detected on March 2, 2020. By April 9, the pandemic had spread to all provinces. Cases continued to increase, including in Indonesia. The primary focus in this situation is the prevention and management of COVID-19. The Central Sulawesi government implemented various prevention and management measures at Madrasah Aliyah Alkhairaat Pusat Palu to curb the spread of COVID-19, appealing to students to always maintain cleanliness, consume healthy and nutritious food, maintain a minimum distance of 1 meter, engage in physical activities such as exercising for at least 30 minutes per day, get enough rest, and comply with large-scale social restrictions (PSBB). The impact of the COVID-19 pandemic, particularly PSBB, has led to an increase in fast food consumption, sedentary lifestyles, and decreased physical activity, all of which can affect nutritional status and overall health(1).

Prevalence data on risky food consumption habits (≥1 time per day) in Central Sulawesi among individuals aged 15–19 years, sweet food and sweet drink consumption rates were 39.85% and 48.91%, respectively. The consumption of salty foods was 12.17%, the consumption of nutritious/cholesterol/fried foods was 39.08%, and the consumption of foods containing artificial flavorings was 82.3%. The consumption of instant noodles and other instant foods is 17.73%, the proportion of those who do not consume fruits/vegetables per day in a week is 11.6%, and the proportion of physical activity is 45.23%. Consumption of sweet foods and sweet drinks in Palu City for ages ≥ 3 years (≥ 1 time per day) is 46.01% and 55.41%, consumption of salty foods is 12.46%, consumption of motorized/cholesterol/fried foods is 44.44%, consumption of foods containing artificial flavorings is 81.53%, not consuming fruit/vegetables per day in a week is 11.52%, and the proportion of physical activity is 41.39%(2). The high percentage of risky food consumption and the proportion of physical activity can cause health problems and affect nutritional status or obesity. Central obesity sufferers for ages ≤ 15 years by province in 2018, Central Sulawesi ranked tenth out of 33 provinces with a percentage of 32.9%.

In 2020, the Kamonji Health Center located in the West Palu sub-district, Siranindi Village, Central Sulawesi, recorded the 3rd highest obesity cases of 28.3%, after Tawaeli and Kawatuna, where in the

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same year, the frequency of cases occurred every month, the highest case occurred in September, at 35.4%. The prevalence of obesity cases at the Kamonji Health Center was 28.3% (Palu City Health Office, 2021). In addition to consuming unhealthy foods, a sedentary lifestyle is also one of the habits of teenagers who do not engage in much physical activity; technological advances with various forms of convenience have caused a decrease in physical activity and an increase in a sedentary lifestyle, which results in obesity(3). The sedentary lifestyle rate has increased from 26.1% in 2013 to 33.5% in 2018(4). Teenagers with a sedentary lifestyle of less than 5 hours per day are less likely to be obese than teenagers with a sedentary lifestyle of 5 or more hours per day(5).

Based on the results of a preliminary study conducted on 10 students of Madrasah Aliyah (MA) Alkhairaat Pusat Palu after the Covid-19 Pandemic, it was found that 7 out of 10 students (70%) experienced overnutrition, with five students being overweight and two others classified as obese. Overall, students' fast-food consumption frequency is classified as frequent >3 times a week. In addition, the students' Sedentary Lifestyle is classified as high, exceeding the specified time (>2 hours a day). Physical activity is classified as light with a PAL value <2.00. Therefore, the researcher conducted a study analyzing the relationship between fast food consumption, sedentary lifestyle, and physical activity with the Body Mass Index (BMI) of grade X and XI students of Madrasah Aliyah Alkhairaat Pusat Palu after the Covid-19 Pandemic.

METHODS

This research is a quantitative study with a cross-sectional research design. It focuses on classes X and XA and was conducted for 1 week, from January 9 to 15 2023, in the X and XI classrooms of Madrasah Aliyah Alkairat Pusat Palu. The population in this study consisted of all students in grades X and XI of MA Alkairat Pusat Palu, totaling 246. The sampling was determined by inclusion and exclusion criteria. The inclusion criteria are students of class X and XI MIA MA Alkhairat Pusat Palu, aged 16-18 years, and willing to be respondents. The exclusion criteria included students who were unwilling to participate, absent during the research, outside the age range of 16–18 years and students who use wheelchairs and cannot measure height and weight. The sample was taken using the Slovin formula resulting in a total of 159 respondents. The formula was used to determine the proportional random sampling method, which ensures random sampling with appropriate proportions in each class from X to XI as the number of students in each class varies. After that, further sampling was carried out using the simple random sampling technique. This process was conducted by drawing lots, where each student had an equal opportunity to be selected as a respondent, ensuring that the results randomly represented the population.

Data collection was carried out by distributing questionnaires, including the Food Frequency Questionnaire (FFQ), Adolescent Sedentary Activity Questionnaire (ASAQ), physical activity questionnaire (PAL), and nutritional status measurement sheets. *Food Frequency Questionnaire* (FFQ), used to assess respondents' eating patterns by identifying the types of food they often consume and their frequency. This questionnaire consists of several lists of food types categorized by daily, weekly, and monthly consumption. The Adolescent Sedentary Activity Questionnaire (ASAQ) is used to determine sedentary behavior for one week, consisting of 9 types of sedentary activities recorded using a reporting system that measures hours or minutes spent in sedentary activities. The Physical Activity Questionnaire (PAL) assesses physical activity by dividing activities specifically and the duration of activities for 24 hours (in minutes). In addition to filling out the questionnaire, nutritional status measurements are also carried out, the tools used in measuring nutritional status are height (microtoice), and digital scales for weight measurement, namely, with BMI/U BB (kg)/TB2 (m), then continued by finding the Z-score = BMI value, reference standard median value/reference standard deviation value. The duration of data collection was carried out for 1 week. The potential for recall bias in the reported questionnaire is a deviations from accuracy when filling out the questionnaire, in overcoming this, the researcher conducted a recall during questionnaire completion.

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RESULTS

Table 1. Respondent Characteristics

Characteristics	n	%
Age (Years Old)		
16	100	62.9
17	54	34.0
18	5	3.1
Gender		
Female	103	64.8
Male	82	32.2
Total	159	100

Based on Table 1., it is known that most respondents are 16 years old (62.9%)" (more concise and accurate percentage correction while the smallest proportion is 18 years old (3.1%). The description of gender characteristics shows that most respondents are female (64.8%), while males make up 32.2%.

Table 2. Relationship Between Consumption of Fast Food, Sedentary Lifestyle, and Physical Activity on Body Mass Index (BMI)

Variable	Body Mass Index (BMI)				N	%	p-value
	Normal		Not Normal				
	n	%	n	%			
Fast food consumption							
Not often	80	84.2	13	20.3	93	58.5	0.000
Often	15	15.8	51	79.7	66	41.5	
Sedentary Lifestyle							
Low	7	7.4	5	7.8	12	7.5	1.000
High	88	92.6	59	92.2	147	92.5	
Physical Activity							
High	7	7.4	2	3.1	9	5.7	0.315
Low	88	92.6	62	96.9	150	94.3	
Total	**95**	**59.7**	**64**	**40.3**	**159**	**100**	

Table 2. presents the relationship between fast food consumption, sedentary lifestyle, physical activity, and body mass index (BMI) among the study participants. The results indicate a significant association between frequent fast-food consumption and higher BMI ($p<0.001$), suggesting that individuals who consume fast food more often are more likely to have an unhealthy weight. However, no significant correlations were found between sedentary lifestyle or physical activity and BMI ($p>0.05$). These findings imply that while fast food intake is a crucial factor influencing BMI in this population, factors such as sedentary behavior and physical activity may not be as strongly associated with weight status in this particular context.

DISCUSSION

Relationship Between Fast Food Consumption and Body Mass Index (BMI)

The results of this study indicate that fast food consumption has a relationship with the Body Mass Index (BMI) of grade X and XI students of MA Alkhairaat Pusat Palu after the Covid-19 pandemic, with a p-value of 0.00 (<0.005). The analysis shows that respondents who do not often consume fast food have a normal BMI of 80 (84.2%), more than respondents with an abnormal BMI of 13 (20.3%). The researcher assumes that the large number of respondents with a normal BMI is due to their attention to their diet when outside of school. Respondents with an abnormal BMI prefer high-calorie foods such as fast food. This finding is following the results of the FFQ questionnaire, which found that among the 27 types of fast food most often consumed, the most common was instant noodles, with 139 respondents (87%). The second most common was fried chicken, with 137 respondents (86.1%), followed by siomay (84.2%), sausages with 133 respondents (84%), and finally, batagor with 130 respondents (81.7%). According to Saleh AJ (2020) (6), several factors influence a person's decision to consume fast food,

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including location, pocket money, and serving time. Additionally, according to him (7), peer encouragement and knowledge also influence fast food consumption.

However, the research results are not in line with those of Saufani IA (2022) (8), which reported a p-value of 0.233. In this case, 54% of respondents frequently consume fast food, with 48.1% having a normal BMI and 11.1% having an abnormal BMI. Saufani's theory states that nutritional status does not affect fast food consumption, as other factors such as income, food availability, education, and socio-cultural aspects influence nutritional status. In addition, other inconsistent research comes from Suryani IS (2020) (9), with a p-value of 0.867. This is because fast food consumption is not the primary component of the subject's diet. Additionally, the type of fast food consumed may not necessarily provide a high energy intake or significantly affect nutritional status.

Relationship Between Sedentary Lifestyle and Body Mass Index (BMI)

Research results show that a sedentary lifestyle has no relationship with the Body Mass Index (BMI) of students in grades X and XI of MA Alkairaat Pusat Palu with a p-value of 1,000 (<0.005). This is because the analysis reveals that respondents with high sedentary lifestyle behavior are more likely to have a normal BMI status of 88 (92.6%) compared to respondents with an abnormal BMI status of 59 (92.2%). However, the results of the analysis show a positive direction: the higher the sedentary behavior, the higher the potential increase in BMI. Several factors contribute to a sedentary lifestyle, including using the internet, playing video games, and watching TV; based on the results of the analysis, the highest sedentary activity recorded was watching videos/DVDs (playing gadgets) for an average of 14.49 hours, equivalent to 277.55 minutes.

The results of this study are in line with research by Ubadillah M (2019) (10), which shows that there is no relationship between sedentary activities and BMI with a p-value of 0.682. The study stated that sedentary activities are not only carried out by students with abnormal BMI status, but sedentary activities are also carried out by students with normal BMI, this is caused by the factor that when mealtime arrives, these students prefer to play games, chat and watch television, rather than choosing to eat. This statement was expressed through interview resultsResearchers on respondents where when they come home from school respondents spend more time using gadgets, and when at school respondents also sit more often studying, telling stories, and playing with friends. In addition, MA Alkhairaat central Palu also implements a boarding school system, where the boarding school system focuses more on memorizing the Qur'an, Hadith, and sitting to study, which may affect the high and low sedentary lifestyle of respondents. With this, researchers assume that the sedentary lifestyle at MA Alkhairaat central Palu after the Covid-19 pandemic is quite high. According to the Susanti & Nurhayati (2019), high sedentary activity occurs because on average children spend a lot of time watching TV, playing gadgets, driving and using computers, and even less consuming high-calorie foods, so that sedentary activities have no relationship with students' nutritional status. According to Fradillah's theory (2022), what caused there to be no relationship in this study was based on genetic factors, type of child (p-value = 0.041), socio-economic mother's job (p-value = 0.025), physical activity (p-value = 0.015) and also food intake (p-value = 0.035) The better the adolescent's diet, the nutritional status is within normal limits and vice versa.

However, this research is not in line with the study conducted by Amrynia SU (2022) (12) with a p-value of 0.029, which found a p-value of 0.029, indicating a relationship between a sedentary lifestyle and the incidence of overnutrition in adolescents. The use of mobile phones can lead to a decrease in physical activity due to the availability of various features or applications that provide easy access to online services, delivery services, food and beverage purchasing services, and supermarket shopping. Similar findings were reported by Sandi Saputra (2019) (13), which states that there is no relationship between a sedentary lifestyle and the incidence of overnutrition.

This research is inconsistent with the study conducted bVB Adrias DF (2018) (14), which reported a p-value of 0.00, indicating a relationship between a sedentary lifestyle and overnutrition in adolescents. This occurred because, during the Covid-19 pandemic, many adolescents spent their leisure time playing online games for more than five hours a day.

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Relationship Between Physical Activity and Student Body Mass Index (BMI)

The results of the study showed that physical activity had no relationship with the Body Mass Index (BMI) of students in grades X and XI of MA Alkairaat Pusat Palu with a p-value of 0.351 (<0.005). This is because the analysis showed that respondents who had light physical activity were predominantly in the normal BMI category, 88 (92.6%), compared to respondents with abnormal BMI status, 62 (96.9%). In this study, the researcher assumed that the normal BMI of respondents with light physical activity was due to some respondents paid attention to their eating patterns while at home, and while those with an abnormal BMI also engaged in light physical activity. Additionally, internal factors such as low self-efficacy and perceived barriers to physical activity being greater than the perceived benefits also contributed (15). According to Kumla AM (2019) (16), a good dietary pattern can contribute to good nutritional status. Insufficient nutrient intake can affect a person's weight, and vice versa (17).

The results of this study are in line with research conducted by Ovita AN (2019) (18), which found no relationship between physical activity and BMI with a p-value of 0.068. Physical activity is not the only factor that can affect a person's nutritional status, there are direct factors that can affect nutritional status, namely food intake and infectious diseases(19). However, this research is not in line with the study conducted by Dzahabiyyah RM (2019) (20), which reported a p-value of 0.00, indicating that there is a relationship between physical activity and the BMI of Probolinggo students, other inconsistent research comes from Roring NM (2020) (21), with a p-value of 0.003. The results of the study stated that most subjects with a family history of obesity experienced overweight nutritional status, combined with excessive eating patterns. Consuming food excessively can cause obesity. According to Azizah (2014) (22) physical activity measured using the Physical Activity Level (PAL) differs from the results found in this study, the reason for the high level of light physical activity is due to the large number of teenagers now who prefer to drive rather than walk, even though the distance between school and home is close. Regular physical activity supports good nutrition.

This research is not in line with the study conducted by Hartini DA (2022) (17), with a p-value of 0.047, indicating a relationship between physical activity and the nutritional status of adolescents after a disaster. This is because many adolescents assist others with work after school, and many walk to school due to the relatively short distance between their homes and the school.

CONCLUSION

The findings revealed a significant positive correlation between fast food consumption and BMI (p-value < 0.001). However, no significant relationship was found between sedentary lifestyle, physical activity, and BMI (p-value > 0.05). These results suggest that excessive fast-food consumption is a primary factor contributing to increased BMI in the studied population.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest

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