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Stress, emotional eating, snack consumption, energy and fat intake, and body mass index of students during COVID-19 pandemic

Stres, emotional eating, konsumsi jajan, asupan energi dan lemak, dan indeks massa tubuh mahasiswa saat pandemi COVID-19

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Abstract

The COVID-19 pandemic limits individual activities that cause changes in lifestyle, including intake, eating behavior, and unstable emotional changes. This condition has an impact on health, one of which is an individual's nutritional status. This study aimed to analyze the correlation between stress, emotional eating, snack consumption, energy and fat intake, and body mass index of students during the COVID-19 pandemic. This was a cross-sectional study. This research was conducted from August to September 2022, with a total sample of 66 people at Universitas Esa Unggul, West Jakarta, using proportional stratified random sampling. Retrieval of stress data using the PSS questionnaire, emotional eating using the EEQ questionnaire, snack consumption frequency using FFQ, and energy and fat intake using recall 2 × 24 hours. Analyzed using Spearman's rank correlation test. The results showed a relationship between energy intake (p= 0,026), fat (p= 0,004) the BMI of students, and there was no correlation between stress (p= 0,696), emotional eating (p= 0,242), and frequency of snack consumption (p= 0,278) with student BMI during the COVID-19 pandemic. Conclusion: There was an association between energy and fat intake and BMI in the students. There was no association between stress, emotional eating (p= 0,242), and frequency of snack consumption and student BMI during the COVID-19 pandemic.

Keywords: Adolescent, body mass index, COVID-19, emotional eating, stress

Abstrak

Pandemi COVID-19 membatasi aktivitas individu yang menyebabkan terjadinya perubahan gaya hidup masyarakat,termasuk asupan, perilaku makan, dan perubahan emosi yang tidak stabil. Jika tidak diatasi, hal ini akan memberikan pengaruh pada kesehatan, salah satunya pada status gizi individu. Penelitian bertujuan untuk menganalisis hubungan stres, *emotional eating*, frekuensi konsumsi makanan jajanan, asupan energi dan lemak dengan Indeks Massa Tubuh mahasiswa. Metode penelitian kuantitiatif menggunakan desain *cross sectional*. Penelitian dilaksanakan pada bulan Agustus-September 2022 dengan jumlah responden sebanyak 66 orang di Universitas Esa Unggul, Jakarta Barat dengan metode *proportionate stratified random sampling.* Pengambilan data stres menggunakan kuesioner PSS, *emotional eating* menggunakan kuesioner EEQ, frekuensi konsumsi jajan menggunakan FFQ, asupan energi dan lemak menggunakan *Recall* 2x24 jam. Analisis data menggunakan uji korelasi *Rank Spearma*n. Hasil penelitian telah menunjukkan terdapat hubungan asupan energi (p=0,026), lemak (p=0,004) dengan IMT mahasiswa. Tidak ada hubungan stres (p=0,696), *emotional eating* (p=0,242), dan frekuensi konsumsi jajan (p=0,278) dengan IMT mahasiswa. Tidak terdapat hubungan stres, *emotional eating*, dan frekuensi konsumsi jajan dengan IMT mahasiswa pada masa pandemi COVID-19. Kesimpulan, asupan energi dan lemak memiliki hubungan dengan IMT mahasiswa. Namun, stres, *emotional eating* dan frekuensi konsumsi jajan tidak memiliki hubungan dengan IMT mahasiswa pada masa pandemi COVID-19.

Kata Kunci: COVID-19, *emotional eating*, indeks massa tubuh, remaja, stres

Introduction

Students who fall into the teenage to early adulthood age groups are prone to behavioral changes (Puspasari & Farapti, 2020). An imbalance between consumption and the recommended nutritional adequacy can trigger nutritional problems in adults. Apart from wrong nutritional behavior, many factors can change eating patterns, including consumption of snacks, environmental/peer pressure, lack of exercise time, and stress in campus life (Sirajudin et al., 2018).

Excess nutritional status is one of the factors that occur as a result of poor eating patterns. In fact, more adults have experienced more weight loss since the COVID-19 pandemic or the last two decades (UNICEF Indonesia, 2021). The Centers for Disease Control and Prevention (CDC) in 2020 that there was an increase in body weight of approximately 22% in adulthood (Setyaningrum, 2020).

Students experienced considerable stress in one age group (Wijayanti et al., 2019). The average stress level of the Indonesian students during distance learning was 55,1%. Online learning (on the network) requires students to adapt and be more active in independent learning, so that lectures can run smoothly (Fauziyyah et al., 2021). Not all students were able to adapt quickly to these conditions. For some students, this has an impact on their mental condition (Jannah & Santoso, 2021).

When someone is stressed, they can experience changes in appetite or even loss of appetite, depending on how the body reacts to the stress experienced. Abstinence from eating was more likely to be carried out by students whose nutritional status was overweight or obese. Under these conditions, they consume more food with high energy and fat content. On the other hand, students with thin nutritional status reduce their energy intake more (Rahmadiyati et al., 2022).

Apart from stress, the COVID-19 pandemic can cause negative emotions in students, such as irritability, sadness, anger, anxiety, fatigue, a lack of enthusiasm, and other unstable emotions (Mulyana et al., 2020). In research by Sessiani & Hartanti (2021), half (53%) of the adults feel like eating when they feel bored. Unpleasant or negative emotions, such as boredom or anxiety, can trigger eating behavior, turning to food for distraction, or seeking solace while eating. This is known as emotional eating. Emotional eating can appear because it is difficult to distinguish between true hunger and other emotional consequences (Angesti & Manikam, 2020). Some people tend to choose foods high in calories, sugar, and fat when they experience negative emotions (Sessiani & Hartanti, 2021).

Online food delivery services are in great demand during the COVID-19 pandemic; therefore, people prefer to try a wider variety of food because they are easier to order via online services (Sessiani & Hartanti, 2021). Almost the majority (43,75%) of students specializing in nutrition in Samarinda have an increased frequency of snack consumption, which is related to weight gain (Noviasty & Susanti, 2020).

According to Mustakim et al., (2021), the increasing consumption of snacks during the COVID-19 pandemic, coupled with a lot of free time and less physical activity, causes people to overeat, especially if snacks become a distraction or substitute for mealtimes. Other research has shown that snacks have an influence on the incidence of overnutrition. Respondents who consume sweet drinks more than four times per week are at risk of overnutrition (Kusumawati & Listiana, 2022).

The students' energy and fat intakes were determined by their daily intake. They often prefer foods high in energy and fat, savory, and sweet, while ignoring the food sources of fiber. In addition, a lack of physical activity causes an imbalance in incoming and outgoing energy, so that stored energy turns into fat in the body and causes obesity (Pritasari et al., 2017). Referring to these various studies, researchers are interested in conducting a more comprehensive analysis of nutritional status, especially among students during the COVID-19 pandemic.

The results of a preliminary study conducted by measuring the height and weight of 40 students at Esa Unggul University showed that the majority (28%) were obese I, 25% were normal, 20% were obese II, 18% were overnourished, and the remaining 10% were undernourished. Based on literature and preliminary studies, the aim of this research was to analyze the relationship between stress, emotional eating, frequency of consumption of snacks, and energy and fat intake with students' Body Mass Index during the COVID-19 pandemic.

Methods

This study used a quantitative cross-sectional design. The independent variables studied were stress, emotional eating, frequency of snack

consumption, energy intake, and fat, whereas the dependent variable was Body Mass Index (BMI).

The research was conducted with students in semesters 2, 4, 6, and 8 at Esa Unggul University, West Jakarta. This study was conducted between March and September 2022. Based on the correlation hypothesis test formula, the number of respondents was 66, who were selected using the proportionate stratified random sampling technique. The inclusion criteria in this study were 18-25 years old, active regular students registered at Esa Unggul University, taking long-distance lectures, and being able to communicate well. Exclusion criteria included students who were sick during the research, final-year students who were no longer taking courses, and those who did not participate in research activities from start to finish.

Data on characteristics, stress, and emotional eating were collected using a questionnaire filled in by the respondents themselves. Stress data were obtained using the Perceived Stress Scale (PSS) questionnaire, with scores ranging from to 0-40. The stress categories include mild stress (0-13), moderate stress (14-26), and severe stress (27-40) (Cohen, 1994). Emotional eating data were obtained using the Emotional Eater Questionnaire (EEQ) Questionnaire. Data on the frequency of snack consumption via the Food Frequency Questionnaire (FFQ) form, as well as data on energy and fat intake via the 2x24 hour Recall form using a food photo book tool that is carried out on one weekday and one weekend. Consumption data were then processed using NutriSurvey software. Body mass index (BMI) data were obtained by measuring body weight using a digital scale and height with a microtoise.

Univariate analysis was used to determine the characteristics of the respondents (gender, semester level, and residence status), distribution of stress frequency, emotional eating, and nutritional status. Stress levels are divided into light, moderate, and severe (Cohen, 1994). Emotional eating is divided into non-emotional, low emotional, emotional, and high emotional eating (Garaulet, 2012). Nutritional status was grouped as underweight, normal, overweight, obesity I, and obesity II (WHO, 2004).

From the results of the normality test carried out on the independent and dependent variables using Kolmogorov-Smirnov, it was found that the variables of stress, emotional eating, and fat intake were normally distributed. Meanwhile, the frequencies of snack consumption, energy intake, and BMI were not normally distributed. The relationship between stress, emotional eating, frequency of snack consumption, energy, and fat intake and students' Body Mass Index was analyzed using Spearman's rank with a significance level of $p \leq 0,05$.

This research passed the ethical review No.0923-02.043/DPKE-KEP/FINAL-EA/UEU/II/2023 by the Esa Unggul University Research Ethics Commission.

Result and Discussion

Respondent Characteristics

All respondents in this study were Esa Unggul University students who were included in the early adulthood category, with a total of 66 participants. According to *The Society for Adolescent Health and Medicine Young* (2017), The age range for early adulthood is between 18-25 years old, which is characterized by experimental and exploratory activities.

In Table 1, it is known that the majority of respondents in this study were 6th semester students (27,3%) and lived with their parents (66,7%).

Table 1. Frequency distribution of respondent characteristics

Characteristics	n	%
Gender		
Man	11	16,7
Woman	55	83,3
Semester level		
Semester 2	17	25,8
Semester 4	17	25,8
Semester 6	18	27,2
Semester 8	14	21,2
Residence status		
Parent	44	66,7
Guardian	6	9,1
Boarding house	16	24,2

Stress

The research results in Tables 2 and 3 show that the majority of student stress percentages (86,4%) fall into the moderate stress category with an average score of 19,14 ± 4,68. Stressors for students can arise from their academic

activities, especially external demands, based on their own expectations. Apart from that, in various places where students live, there are various pressures that can come from parents and living environments that do not support studying (Untan, 2017).

Stress is a state of pressure caused by a mismatch between circumstances and expectations, which triggers the body's reaction to a demand or challenge (Barseli, 2017). The effect of stress on health is both direct, namely affecting the body's physique and systems, and indirect, namely, influencing individual behavior with the impact of triggering disease or worsening previous conditions (Manurung, 2016).

Students as early adults are in a transition period from teenage to adulthood. Many adjustments occur during this period, which can cause psychological stress (Fitriana *et al*., 2022).

Table 2. Frequency distribution of stress, emotional eating, and nutritional status

Variable	n	%
Stress		
Mild stress	5	7,6
Moderate stress	57	86,3
Severe stress	4	6,1
Emotional eating		
Non-emotional eaters	10	15,2
Low emotional eater	21	31,8
Emotional eaters	32	48,5
High emotional eater	2	4,5
Nutritional status		
Underweight	6	9,1
Normal	31	47
Overweight	8	12,1
Obesity I	12	18,2
Obesity II	9	13,6

Emotional Eating

Most of the students (48,5%) were emotional eaters with an average score of 10,77 ± 5,11. They stated that when they felt negative emotions, they diverted them in various ways, including listening to music, snacking/eating, watching movies, playing games, traveling, and meeting friends. Those with emotional eating had eating patterns that tended to be high in sugar and fat or called "comfort foods' (Mustakim et al., 2021). The emotional discomfort that a person generally feels when under pressure can trigger diversion efforts by seeking momentary pleasure to minimize or avoid this feeling of discomfort (Trimawati & Wakhid, 2018).

Emotional eating is an emotional response that focuses on overcoming, reducing, managing, and preventing emotional stress (Gryzela and Ariana 2021). Eating triggered by negative emotions is what makes emotional eating an eating behavior that risks not meeting a person's nutritional needs (Sukianto et al., 2020). Additionally, emotional eating has an important impact on physical and psychological health, such as improving nutritional status, the emergence of eating disorders (binge eating and bulimia nervosa), and depression (Angesti & Manikam, 2020).

Table 3. Variable average frequency distribution

Variable	Mean ± SD*	Median ± SE**
Stress	19,14 ± 4,68	
Emotional Eating	10,77 ± 5,11	
Frequency of Snack Consumption		190,0 ± 13,502
Energy Intake (kcal)		2077 ± 83
Fat Intake (g)	86,6 ± 34,1	
Body Mass Index (kg/m2)		22,7 ± 0,73

Note: *SD = Standard deviation
**SE = Standard Error

Frequency of Snack Consumption

In this study, it was discovered that all the students consumed snacks. Based on Table 3, the median value obtained was 222,42 ± 109,69. The snacks that are most widely consumed are packaged drinks, such as tea and coffee, instant noodles, French fries, seblak, cilor, cimol, macaroni, and fried foods, which have unbalanced nutritional content, such as high levels of sugar, fat, flour, and salt. Snacks are often not much different from junk food, fast food, and street food. The food consumed outside the main meal times is called snack food (Dini, 2017).

According to Shepherd & Sparks (1999) in Hilma et al. (2022), the three factors in food selection are personal, biological, and socio-economic factors. In this research, the personal factors in choosing snacks by students were that they were served quickly and tasted good. Some students also eat snacks to please themselves. The biological factor is feeling hungry, and consuming snacks can provide a feeling of fullness, even if only temporarily. Socio-economic factors are urgent and easy to reach.

Although the respondents in this study were mostly health students, research by McArthur et al. (2021) explained that although health students have a higher level of knowledge regarding healthy snacks, this is not as consistent as expected. It is known that a higher frequency and frequent consumption of unhealthy snacks occur in the majority of health students compared to non-health students.

Eating frequency affects fat and glucose metabolism. When someone eats several times a day in small portions, their energy intake tends to be low, such as one meal, rather than eating large portions and eating frequently. Frequent consumption of snacks and foods high in fat (particularly saturated fat) increases visceral fat. Snacks are a type of food that can increase body fat storage (Untan, 2017).

Energy Intake

The research results showed that the average energy intake of students was 2077 ± 83 kcal (Table 3). This illustrates that students' energy intake was still low below daily requirements, referring to the 2019 AKG. Energy intake is needed by the body, which comes from food, to balance a person's energy expenditure. (Mukhlisa et al., 2018).

Some students do not live with their parents but board them, so they are limited in preparing food. Although students are known to eat more than two or three main meals a day, the food portions are so small that they do not meet their daily needs. The energy that comes from food must be balanced according to a person's needs. If it is not fulfilled, the body experiences a negative balance (Departemen Gizi dan Kesehatan Masyarakat, 2010).

Fat Intake

The results showed that the average fat intake was 86,6 ± 34,1 g (Table 3). This illustrates that students' fat intake was above daily requirements, referring to the 2019 AKG. The interview results showed that students consumed more fried foods, such as tofu, tempeh, fish, and chicken. Some students also liked to eat stir-fried vegetables. Other foods that people like to consume include soto, meatballs, fried rice, and curry. Apart from the main meals, students also consumed snacks that were high in fat.

Fat is an important nutrient for maintaining energy balance and body weight, thereby helping to maintain long-term health and preventing chronic diseases related to nutrition (Pritasari & Damayanti, 2017). In the long term, excessive fat consumption can affect a person's body mass index. High-fat foods are in great demand because they taste delicious, so people tend to consume too much food. Fat is one of the largest contributors of calories. Therefore, if excess fat is consumed, it is stored as an energy reserve (Telisa et al., 2020).

Body Mass Index

The results showed that the average BMI of students was 22,7 ± 0,73 kg/m2. This illustrates that the majority of students have a normal nutritional status, according to the WHO 2004. Body Mass Index (BMI) is a measure of the condition of the body based on the balance between incoming and outgoing food intake (Candra, 2020).

The Relationship between Stress, Emotional Eating, Frequency of Snack Consumption, Energy Intake, and Fat with Body Mass Index

The relationship between stress, emotional eating, frequency of snack consumption, energy and fat intake, and BMI is shown in Table 4. There were no relationships between stress, emotional eating, frequency of snack consumption, and BMI. There is a relationship between energy intake, fat intake, and BMI.

Table 4. Results of correlation analysis of independent variables and Body Mass Index (BMI)

Independent Variable	Body Mass Index	
	p-value	r-calculated
Stress	0,696	-0,049
Emotional Eating	0,242	0,146
Frequency of Snack Consumption	0,278	-0,135
Energy Intake (kcal)	0,026	0,274
Fat intake (g)	0,004	0,349

Based on the results of bivariate analysis, there was no significant relationship between stress and BMI (p=0,696). There is no relationship between stress and BMI because stress can affect nutritional status in both directions. People tend to eat more or less than once. This is in line with research conducted by Rizanty and Srimiati (2021) on final-year nutrition students who are young adults. The stress experienced by students does not always have a negative impact, because stress can also have a positive impact on a person, or it is also called eustress.

Most students in this study experienced moderate levels of stress. Hidayah et al. (2020) showed that many students experienced stress during the COVID-19 pandemic. Coping mechanisms play an important role when students face stress. Students consider internal and external stressors to be reasonable threats, so they are still able to overcome these stressors. Students in this study considered internal and external stressors to be threats within reasonable limits, so they could still be overcome. Students can manage their stress with positive activities, such as exercising, watching films, resting, and traveling with friends and family. Hidayah et al. (2020) showed that nursing students had a coping strategy in the form of self-control during the COVID-19 pandemic. This shows that students have good self-control because they are not easily influenced by stressful situations.

Based on the results of the analysis, no relationship was found between emotional eating and BMI (p=0,242). Students with high emotional eating scores have unhealthy eating habits. Qualitative studies cited by Gita et al. (2022) found that when experiencing certain emotions, there was an increase in emotional eating among respondents, but when these emotions disappeared the next day, they felt guilty and reduced their food intake. Under these conditions, excessive food intake cannot be defined clearly.

On research Angesti & Manikam (2020) The results also found that emotional eating had no relationship with nutritional status in final year students. The stressors that trigger emotional eating are not strong enough to change eating behavior. Another study by Sukianto et al. (2020) also found that emotional eating had no relationship with the nutritional status of educational administration employees in UPN Veteran Jakarta (p=0,543).

As shown in Table 4, there was no relationship between frequency of snack consumption and BMI (p=0,278). Based on the results of the interviews, during the COVID-19 pandemic, students apparently consumed food that they prepared themselves more often than street food. Most students consumed snacks less than twice daily. A person can miss their main meal due to consuming snacks, so their nutritional intake is not met. According to Emilia et al. (2020), snacks must contain fewer calories than main meals, so one should not feel full eating snacks because snacks are only intended to make one feel less hungry.

Dwijayanti et al. (2021) explained that the frequency of snack consumption affects the balance of incoming calorie intake. Even though the number of snacks tends to be less than that of the main meals, they can add more calories. Students who often consume snacks are known to experience deficiencies in micronutrients that slow down growth, such as calcium and vitamin A. Snacks in large quantities and low in micronutrients can worsen nutritional status; therefore, they should be reduced and replaced with energy-dense foods.

As shown in Table 4, there was a significant relationship between the energy intake variable and BMI (p=0,026, r=0,274), indicating that the higher the energy intake, the higher the BMI value. Rizanty & Srimiati (2021) also found a relationship between energy intake and BMI in final-year students. Based on the 2019 AKG, the daily energy requirements for men aged 16-18 years and 19-29 years are 2650 kcal each, whereas for women aged 16-18 years and 19-29 years each is 2100 kcal. kcal and 2250 kcal. The average energy intake of students was 2077 kcal, which is still less than the 2019 AKG recommendation. This insufficient energy intake occurs because of insufficient meal portions and a low meal frequency (Rizanty & Srimiati, 2021). The opportunity for energy intake can be met if a person's eating frequency is high. Malnutrition is related to eating habits due to insufficient food quantity and very low nutritional quality (Fakri & Jananda, 2021).

Low energy intake is related to food intake, which does not meet students' needs. Every individual has a different metabolism. In addition to metabolic processes, energy in the body is also obtained from food consumption. (Arisman, 2010 dalam Fakri & Jananda, 2021). If energy intake is inadequate, the BMI value will decrease. In this case, the body continues to use energy reserves stored in the liver and muscles. Energy intake that meets needs plays an important role in the needs and development of students as early adults.

In the next analysis, there was a relationship between fat intake and BMI (p=0,004, r=0,349), indicating that the higher the fat intake, the higher the BMI value. Febytia & Dainy (2023) also found a significant

relationship between fat intake and the nutritional status of students. From the results of the 24 hour recall, it was found that the majority of students consumed fried food, resulting in an increase in fat intake.

Based on the 2019 AKG, the daily fat requirement for men aged 16-18 years and 19-29 years is 85 g and 75 g respectively, while for women aged 16-18 years and 19-29 years respectively are 70 g and 65 g respectively. The average value of fat intake of respondents in this study was 86,6 g, which means that fat intake exceeded the 2019 AKG recommendation.

Data from 2x24 hour food recall interviews showed that students consumed foods such as seblak, fried rice, meatball soup, chicken noodles, nasi padang, martabak, and chicken satay. The side dishes consumed by students during the main meal included fried chicken, fried chicken, fried fish, and omelettes/ceplok. The main requirement for fat was obtained from side dishes. Consuming foods that contain the required amount of fat can contribute to the formation of energy in the body. Research during the COVID-19 pandemic by Rahmatismi et al., (2022) shows that the fat intake of most students in Gorontalo comes from fried foods. Consuming excessive foods that are high in fat can have a negative impact on a person's health.

Approximately 5% of body fat is stored in intramuscular tissue, whereas the rest is found in the abdominal organs (45%) and subcutaneous tissue (under the skin). The fat consumption should not exceed 30%. When foods containing fat are digested in the digestive tract, the fat is absorbed into the body. Fat burning is used to produce energy when required. As an energy source, fat is stored in adipose tissue, while the rest is stored as body fat. In the long term, excessive fat intake can affect BMI (Almatsier, 2013). Another study by Khoerunisa & Istianah (2021) showed a significant relationship between fat intake and nutritional status, which is in line with this research.

This research has limitations, including the fact that the snack consumption variable only looks at the frequency, so it does not describe snack consumption in general. In addition, we did not see a correlation between stress and emotional eating.

Conclusion

During the COVID-19 pandemic, there have been several behavioral changes that can affect the BMI of students. Energy and fat intake were significantly associated with BMI. However, the results showed that there was no significant relationship between stress, emotional eating, and frequency of snack consumption and BMI in students.

It is hoped that students will be able to consume food that meets their nutritional needs and is in accordance with balanced nutrition in everyday life. In addition, it is very important to try to manage stress and negative emotions well and to be wise in choosing snacks by reducing the consumption of fried and high-sugar foods. In addition, an active role is needed from the university in monitoring the psychological and health conditions of students to form active, productive, and high-achieving students.

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