



Stress Level to Dietary Habits among Adolescent in Indonesia during COVID 19 Outbreak: A Nationwide Survey

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Abstract

BACKGROUND: To suppress the COVID-19 transmissions, almost all activities related to physical and social activities between individuals are restricted. Activity restrictions such as lockdowns or physical-social distancing can trigger an elevation in stress.

AIM: This study aimed to determine the correlation between stress levels and food habits among adolescents in Indonesia.

METHODS: This cross-sectional study was conducted through an online questionnaire involving 5924 adolescents in all regions in Indonesia using the snowball sampling technique.

RESULTS: The survey showed that most adolescents experienced high stress (55.6%). During the COVID-19 outbreak, they seemed rarely consumed or had an intake frequency of fewer than 3 times a day on carbohydrates (89.1%), animal protein (87.5%), vegetable protein (88.9%), vegetables (84.8%), fruit (90.6%), and snacks (86.3%). Statistically, their stress level did not significantly correlate to the consumption of those carbohydrates, animal protein, vegetable protein, vegetables, and fruit ($p > 0.05$), except for snacks ($p < 0.002$) at $\alpha = 0.05$. Thus, the high-stress level was 1.267 times more at risk of snacking habit more often (more than 3 times a day) among adolescents in Indonesia during the COVID-19 outbreak.

CONCLUSION: Stress level did not significantly correlate to the consumption of those carbohydrates, animal protein, vegetable protein, vegetables, and fruit. However, stress levels did not significantly correlate to snacks consumption.

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Introduction

Since the end of 2019, COVID-19 disease has affected almost all aspects worldwide. Life is also changed, especially lifestyles that being home-based activities. It is recommended for each individual to reduce the level of mobility and carry out social-physical distancing. This should reduce the rate of COVID-19 infection, which continues to increase in the world. This disease has a high infectious value. In August, the government confirmed 160,165 cases in Indonesia, causing 19,6944 deaths, with recovered 115,409 patients of 34 provinces [1]. Research that has been carried out shows that there are physiological effects of the COVID-19 pandemic, mainly due to implementing lockdown, such as the emergence of

depression, anxiety to stress in rural populations in India [2]; in pregnant, giving birth, and breastfeeding women in Italy [3]; and on the educational atmosphere in India [4].

To reduce the transmission rate, almost all physical and social activities between individuals were eliminated, and all activities were centered in each home, likewise with education. All educational activities are carried out online. Several studies related to physiology show that lockdown leads to monotonous activities that are carried out continuously in the same place for a long time and will affect physiological conditions [5], [6]. The same thing will undoubtedly happen to adolescents during the COVID-19 pandemic. All teaching and learning activities are currently carried out online for an extended period; in Indonesia itself, it has been implemented since the beginning of 2020.

This allows for anxiety to arise, thus increasing the level of stress. The study results show that activity restrictions such as lockdowns or physical-social distancing affect workers and university students experiencing anxiety at moderate to severe levels [7], [8].

Adolescents are a stage of life transitioning from children to adults, at which time they generally have the status of high school and university students. They are known to have unstable conditions, and this fluctuating emotional level will affect mental health. Various studies show mental disorders, including stress, depression, and anxiety, among adolescents in Indonesia [9]. During the COVID-19 outbreak, adolescents were also affected by restrictions on social activities and studying at home. It is estimated that this situation will affect the level of stress in adolescents, affecting their dietary habits. This study aimed to determine the correlation between stress levels and food habits among adolescents in Indonesia during the COVID-19 outbreak.

Methods

It was a cross-sectional study, conducted in August 2020, through an online questionnaire, with the Google Form application through social media such as WhatsApp, Facebook, and Instagram. This study involved about 5924 adolescents from 34 provinces in Indonesia, using the snowball sampling technique. This research obtained ethical approval by the Health Research Ethics Committee of Poltekkes Mataram, Ministry of Health, No. LB.01.03/1.1/2208/2020. Student stress levels were measured using a questionnaire developed by [10], which had tested the validity and reliability of the Cronbach Alpha = 0.75. The student's food habit was obtained by using a food frequency questionnaire. Data analysis using Microsoft office 2010 and SPSS version 25 for Windows by the Chi-square test to analyze the correlation between stress levels and food habits. Chi-square test results $p < 0.05$ showed a significant difference.

Results

This study categorized respondents by age, gender, residence, and stress level of 5924 adolescents from all regions in Indonesia.

The characteristics of the respondents involved in this study can be seen in Table 1. The respondents were evenly distributed between the groups 19 years and <19 years based on the age group. Most respondents were female, about 85.7%. Then, it was also known that

Table 1: Characteristics of respondents

Characteristics	Total respondent (n)	Percentage
Age (y.o)		
≥19	2799	47.2
<19	3125	52.8
Gender		
Male	845	14.3
Female	5079	85.7
Residence (Indonesian region)		
Java	2014	34.0
Sumatra	1887	31.9
Nusa Tenggara Islands	727	12.3
Sulawesi	727	12.3
Kalimantan	444	7.5
Papua	75	1.3
Maluku	50	0.8
Stress level		
Low	2645	44.6
High	3279	55.4

they came from Sumatra (31.9%), Java (34.0%), Nusa Tenggara Islands (12.3%), Sulawesi (12.3%), Kalimantan (7.5%), Papua (1.3%), and Maluku (0.8). The number of respondents of each area had a representative trend regarding the population, except for Nusa Tenggara Island. Indonesia's highest population is on the island of Java, followed by Sumatra, Sulawesi, Kalimantan, Nusa Tenggara, Papua, and Maluku. Based on stress levels, they generally experienced high stress (55.4%).

Table 2 shows that most adolescents during the COVID-19 outbreak rarely consumed macronutrients or had a frequency of fewer than 3 times a day on carbohydrates (89.1%), animal protein (87.5%), and vegetable protein (88.9%). The same trend also occurred to the vegetables and fruit consumption, which <3 times a day (84.8% and 90.6%). In addition, 86.3% of adolescents also rarely ate snacks during this pandemic.

Table 2: Food habit of adolescent during COVID-19 outbreak

Food habit	Total respondent (n)	Percentage
Carbohydrate		
Rarely (<3 times a day)	5278	89.1
Often (≥3 times a day)	646	10.9
Animal protein		
Rarely (<3 times a day)	5181	87.5
Often (≥3 times a day)	743	12.5
Vegetable protein		
Rarely (<3 times a day)	5267	88.9
Often (≥3 times a day)	657	11.1
Vegetable		
Rarely (<3 times a day)	5021	84.8
Often (≥3 times a day)	903	15.2
Fruit		
Rarely (<3 times a day)	5368	90.6
Often (≥3 times a day)	556	9.4
Snack		
Rarely (<3 times a day)	5112	86.3
Often (≥3 times a day)	812	13.7

Table 3 shows that the respondents' stress level statistically did not significantly correlate with consuming macronutrients such as carbohydrates, animal protein, and vegetable protein ($p > 0.05$). The same situation was also identified in the stress level on vegetable and fruit consumption, which was statistically not significantly correlated ($p > 0.05$). However, the stress level among adolescents significantly correlated to the consumption of snacks, namely $p = 0.002$ ($\alpha = 0.05$). Then, adolescents with high levels of stress were associated with more frequent snack consumption. High-stress levels seemed 1,267 times more at risk of having a more frequent snack eating pattern (over 3 times a day).

Table 3: The correlation between stress levels and food habit

Stress level	Food habit				P*	OR
	Rarely		Often			
	n	%	n	%		
Carbohydrate consumption						
Low stress	2351	88.9	294	11.1	0.645	0.962
High stress	2927	89.3	352	10.7		(0.816–1.133)
Animal protein consumption						
Low stress	2320	87.7	325	12.3	0.608	1.043
High stress	2861	87.3	418	12.7		(0.893–1.218)
Vegetable protein consumption						
Low stress	2344	88.6	301	11.4	0.533	0.948
High stress	2923	89.1	356	10.9		(0.806–1.116)
Vegetable consumption						
Low stress	2236	84.5	409	15.5	0.689	0.970
High stress	2785	84.9	494	15.1		(0.841–1.118)
Fruit consumption						
Low stress	2389	90.7	247	9.3	0.929	1.010
High stress	2970	90.6	309	9.4		(0.847–1.204)
Snack consumption						
Low stress	2323	87.8	322	12.2	0.002	1.267
High stress	2789	85.1	812	14.9		(1.090–1.474)

* $\alpha = 0.05$.

Discussion

Stress is an essential factor in developing addiction, relapse and can contribute to an increased risk of obesity and other metabolic diseases. Uncontrolled stress changes eating patterns that can trigger neurobiological adaptations that increase compulsive behavior. This relationship is influenced by the hypothalamic-pituitary-adrenal axis, glucose metabolism, insulin sensitivity, and other appetite-related hormones and hypothalamic neuropeptides [11].

When there is stress or an increase in stress levels, there will be changes in appetite. Research by Kim and Kim (2011) shows that most respondents will experience an increase in appetite so that it is possible to induce obesity [12]. However, in this study, it was found that during the COVID-19 outbreak, adolescents in Indonesia seemed to have a low appetite (<3 times a day) in the consumption of carbohydrates, protein, vegetables, fruit, and snack.

In the era of COVID-19, countries in the world implemented lockdowns to reduce the transmission of this infectious disease. This situation will undoubtedly affect the socio-economic community, such as layoffs, closing shops, and stopping many business activities, making it difficult for the community's economy. This also happened in Indonesia as one of the developing countries affected by the pandemic. Socio-economic conditions decline, which is suspected as one cause of a low adolescent diet (<3 times a day). People limit their daily food consumption due to limited family income. Thus, the increased stress on adolescents in Indonesia during the lockdown in the pandemic era limits food habits and then is not correlated with eating patterns, except for snacks. For this reason, this study gives different results compared to previous studies, which found a tendency to increase emotional eating behavior, which induces daily intake, and a significant correlation results in an increase in stress on dietary habits [13], [14], [15].

Carbohydrates are the primary source of energy obtained from food such as cereals and tubers. Consumption of high carbohydrate sources will result in obesity, such as carbohydrates can affect physiological and psychological responses caused by stress [16]. Consumption of carbohydrates in adolescents does not have a significant relationship with stress. However, a contradictory finding by Lemmens *et al.* (2011) showed that high stress was associated with high consumption of carbohydrate sources compared to protein consumption [17]. People with high stress are associated with increased high carbohydrate consumption in humans, which is influenced by the alpha wave indicator with the Uchida Kraepelin test. After a stressful situation, there was a significant increase in alpha waves at 11–20 min in glucose, 11–20 min, and 21–30 min in fructose, as well as 0–10 min in sucrose.

Protein is an important macronutrient that humans need. This study shows that stress levels did not significantly correlate with both vegetable and animal protein consumption. This is different from the previous study conducted by Cheng and Kamil, 2020 which showed that the level of consumption of adolescent students when stressed was associated with lower consumption of protein sources than those who were not stressed [18]. This is also corroborated by the results of the same study by Barker *et al.* 2015 which shows that adolescent students who have high levels of stress have lower protein intake. When experiencing hyperphagia, adolescents tend to have low energy and nutritional intake [19].

Vegetables and fruit are a source of vitamins and minerals and as a source of natural antioxidants. Vegetables and fruits have a high nutritional content which is very important consumed which is beneficial in mental health. A high intake of fruits and vegetables, such as berries, oranges, and green leafy vegetables, is beneficial in promoting higher levels of optimism and self-efficacy and reducing levels of psychological distress, ambiguity, and cancer fatalism, protecting against depressive symptoms [20], [21]. Vegetables and fruit are useful in controlling stress; this is proven in a previous study conducted by Nguyen *et al.* 2017 which showed that consuming fruits and vegetables can reduce a person's psychological stress [22]. This study shows that high-stress levels were not significantly related to adolescent food habits during the COVID-19 outbreak. They tended to consume low fruit and vegetables <3 times a day. This is following previous research, which showed that high levels of stress affect a person's consumption of vegetables and fruits. Someone who experiences high stress is known that they tend to reduce the portion of fruits and vegetables [23].

Snacking is an energy-dense and nutrient-poor food that accounts for one-third of daily energy intake [24], [25], [26]. Snacking is a cause for concern because it can lead to additional energy intake and

poor nutritional quality. Snacking can be defined as any meal outside of the main meal, regardless of consumed amount or type [25], [27]. In general, snacks contain more carbohydrates, which are influenced by the main ingredients, namely sources of carbohydrates such as flour and sugar [28]. Based on the results of this study, it was shown that adolescents with high levels of anxiety were 1.267 times more likely to have a more frequent snack consumption diet than those with low stress. This follows previous studies conducted by Khan *et al.* (2020) and Sadler *et al.* (2021), that people who tend to be high-stress are associated with the consumption of snacks or drinks [29], [30]. Another study conducted by Choi 2020 showed that high stress in college students was associated with high levels of fast food consumption [11].

Conclusion

During the COVID-19 outbreak, adolescents in Indonesia tended to experience increased stress, categorized as high stress. They had a food habit of fewer than 3 times a day or were categorized as rarely in consuming carbohydrates, protein, vegetables, fruit, and snacks. Furthermore, adolescents' high-stress levels during a pandemic were not correlated with dietary habits, except for snack consumption patterns.

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