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ORIGINAL ARTICLE

Eating Habits and Lifestyle Changes during COVID-19 Pandemic among Indonesian College Students: Results from Indonesia Dietary and Lifestyle Changes (IDLC) Study

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ABSTRACT

Introduction: Since the COVID-19 pandemic, students in Indonesia have been faced with challenges to their daily eating habits and lifestyle patterns. Many of them have had to adapt to new health protocols during the pandemic. This study aimed to investigate the impact of COVID-19 on eating habits and lifestyle changes among college students. **Methods:** Data was collected from 952 students using a self-administered online questionnaire using Qualtrics. Bivariate analysis was used to determine eating habits and lifestyle changes based on socio-demography and nutritional status. **Results:** : Female students had significantly lower physical activity status than male students. The students mostly ordered food by an online-delivery food system. Male students had significantly increased their smoking frequency during the COVID-19 pandemic, in comparison to before the pandemic. Female students consumed a higher quantity of immune booster foods such as multivitamin, fruits, honey, and herbal drinks compared to male students. Students had a high adherence to follow a balanced diet (64.50%). **Conclusion:** In this study, we have provided for the first-time data on eating habits and lifestyles changes and the adherence of balanced nutrition in Indonesian students during the COVID-19 pandemic.
Keywords: Lifestyle Changes, Covid-19, College Students, Eating Habits, Indonesia

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INTRODUCTION

The novel coronavirus SARS-CoV-2, responsible for the COVID-19 epidemic, was first identified in Wuhan in December 2019. The first official case was announced in the first week of March 2020 in Indonesia. The pandemic has made people more aware of their daily hygiene habits and more compliant with local health protocols to prevent further spread of the virus(1). The COVID-19 pandemic has changed the way student's live and has made social interaction difficult(2). Large-scale social restriction in Indonesia was one of the main policies to control and prevent the spread of COVID-19. As a result, adverse effects on mental health, physical exercise, and dietary habits may have resulted (3).

Eating habits and maintenance of a healthy lifestyle is a crucial indicator of maintaining immune health (4). Social restrictions made students stay at home and education was delivered remotely, imposing several challenges regarding their nutritional status. Indonesian college students tend to have poor dietary practices such as skipping breakfast, lack of consumption of fruits and vegetables, regular eating of junk food, and having a sedentary lifestyle or conducting less physical activity (5–7). This condition may be due to most of the students, living far from home and being separate from their families (8–10). This group is particularly susceptible to malnutrition, either through being underweight or overweight, if they are unable to fulfill their metabolic demands. In addition, students are prone to having insufficient funds, inadequacy of time and having less information about healthy nutrition (11). An online survey conducted during the COVID-19 outbreak in Indonesia, showed that 35.30% of students in higher education were malnourished. The factors associated

with malnutrition included students sleeping more than usual, an increase in depressive symptoms, lack of gathering with family members due to living outside (e.g. dormitory, boarding house) and living alone far from their home and working part-time (12). The purpose of this study was to investigate the impact of COVID-19 on lifestyle and eating habit changes among university students in Indonesia during the pandemic.

MATERIALS AND METHODS

Study Design

The Indonesia Dietary and Lifestyle Changes (IDLC) study was a cross-sectional survey which was conducted to identify how COVID-19 may affect eating habits and lifestyle changes among Indonesian college students. This survey was designed during the COVID-19 pandemic and was conducted during the large-scale social restrictions period from April to June 2021 in Indonesia. The online-based Qualtrics survey was administered to participants. The e-questionnaire link was spread through word-of-mouth and via social media platforms across Indonesia, so that there was a spread of data from students across Indonesia.

Subjects of this study were college students who lived in Indonesia or who currently resided in Indonesia during the data collection period. This current study collected current students enrolled into a University/College course (diploma/undergraduate/postgraduate students) who were a minimum age of 18 years old, healthy, and willing to participate in this survey as per the inclusion criteria. However, students who were recently in the first year of their study were excluded due to not having enough experience as college students and not experiencing the education system pre-pandemic.

Data Collection

Qualtrics is an online survey tool widely used in academic research (13). This online platform was easily accessible and anyone could access the e-questionnaire link through any device with an internet connection. The link to access the survey provided a brief narration of the survey's objectives and background of the study. The study information sheet was spread through social media networks such as Twitter, Facebook, Instagram, WhatsApp, Line, and paid Instagram promotion services were used to reach the Indonesian students population. University to university networks was also applied, to gain additional students willing to participate in the IDLC Survey.

nitially, 1,600 subjects were recruited into the study. However, the number of subjects which was ready to be analyzed decreased due to incomplete completion of the data survey, unwilling to continue the study, and trouble with internet connections. This reduced the total sample size to 952 subjects. At the end of the data collection, we tried to follow up with subjects who had incomplete data. Several approaches including sending emails, calling or sending messages to their social media accounts or text messages, were carried out to increase the number of subjects participating in the survey. Written ethical approval was granted by the Ethics Committee of Alma Ata University (KE/AAVI/10537/EC/2021). This study protocol was conducted according to the guidelines laid down by the Declaration Helsinki, and all procedures involving the study subjects were kept confidential and only used for the study purpose.

IDLC-COVID 19 Questionnaires

This study consisted of a questionnaire that was divided into three categories: personal data (including socio-demographic questions, location or place of residence, level of education, nutritional status including body weight, height, and body mass index), lifestyle changes (including physical activity frequency, immune booster foods trend), and a balanced nutrition adherence score. The national guidelines of balanced nutrition recommendations was assessed with a self-administered questionnaire from the previous study (14). The Balanced nutrition adherence section consisted of five questions which was based on the four pillars of balanced nutrition including eating a variety of foods, applying good health hygiene, regularly exercising, and monitoring body weight regularly (15). Subjects who scored less than 50% or more than 51% in the balanced nutrition adherence section were categorized as adhere and not-adhere, respectively.

The lifestyle questionnaire included physical activity, smoking status, sleep quality, and online grocery shopping behavior. We asked subjects about what they do in the present and compared this to before the COVID-19 pandemic. The questionnaire in this study was modified from an Italian survey conducted by Di Renzo et al., (2). A physical activity questionnaire was developed based on the International Physical Activity Questionnaire Short Form (IPAQ-SF). The IPAQ-SF was self-administered to all subjects using the standardized instructions in the IPAQ. Data was cleaned according to the IPAQ scoring protocol (16,17).

Anthropometric measurement was assessed through self-report by the subject's, due to the online survey being unable to get the exact number-based measurement of height and weight. This study categorized BMI status based on Asian populations as follows: <18.5, 18.5-25, 25.1-27, and >27 for underweight, normal weight, overweight, and severe overweight, respectively (18).

We identified the variation of immune booster foods consumed by students, based on the literature during pandemic(19). Students were asked if they consumed more or less Herbal drinks and other nutrient rich foods during the pandemic. Herbal drinks such as 'Jamu' in Indonesia, often used as a remedy consists of blended

natural ingredients such as rice, ginger, palm sugar, seeds, barks, and flowers. In total, six kinds of foods and drinks were identified to boost immune system such as honey, herbal foods/drinks, milk, multivitamin supplement, fruits, and vegetables (20).

Data Analysis

Data was presented as number and percentage (%) for categorical variables or median / mean and standard deviation (SD) for continuous variables. Chi square test was employed to assess the association between categorical variables while McNemar analysis was used to investigate the difference between categorical variables pre and during the COVID-19. We tested between socio-demography variables, eating habits and lifestyle variables. A 5% significance level with Odd Ratio (OR) and 95% Confidence Interval (CI) was used to determine the relationship and statistical significance. Statistical analyses were performed using SPSS version 20.0 (IBM Corp, Armonk, NY).

RESULT

Participants

On the 21th of May 2021, IDLC survey data collection finished and the collected data was analyzed. There were a total of 1609 subjects who participated in the study. However, 657 subjects were excluded due to incomplete completion of the survey, unwilling to continue the survey, and having internet connection problem. In total 952 participants were included in this study for further analysis. This study included 76.4% of students from the West region of Indonesia. Subjects were in the age category between 18 and 25 years old (90%) and the mean age was 21±4.2 years (18-53 years old). Most of the students were bachelor students (67.4%), female (71.6%), and with normal BMI status (64.1%) (Table I). This study showed that students in post-graduate levels may have low physical activity and low adherence of balanced nutrition guidelines compared to undergraduate students. Most of all students raised their concern on the trends of eating the immune booster foods (54%-80%). Male students had significantly increased their smoking frequency during the COVID-19 pandemic, in comparison to before the pandemic.

Table I: Subject's characteristics and anthropometrics

	n	%	Mean	SD
Age (years)			21.66	4.2
Age groups (years)				
18-25	857	90		
26-45	77	8.1		
46-65	18	1.9		
Gender				
Male	270	28.4		
Female	682	71.6		
Location				
West region	727	76.4		
Central region	190	20.0		
East region	35	3.7		
Education level				
Diploma	240	25.2		
Bachelor	642	67.4		
Post graduate	70	7.4		
BMI (kg/m^2)			22.21	4.1
BMI status				
Underweight	155	16.3		
Normal	610	64.1		
Overweight	79	8.3		
Severe overweight	108	11.3		

Values are expressed as mean and standard deviation for continuous variables or as number and percentage (%) for categorical variables
BMI, body mass index

The adherence to a balanced diet showed that Indonesian students, mostly, obey to a balanced nutritional diet. More than 60% of participants who ate a balanced diet, applied good and health hygiene, regularly exercised, and regularly monitored their body weight during pandemic COVID-19. However, we had no data to compare dietary habits of Indonesian students before and during the pandemic. It was found that most of the category immune booster foods in this study was high in all categories including multivitamin (63.3%), fruits (68.4%), vegetables (79.9%), honey (54.4%), milk 57.6%), and herbal drink (57.2%), respectively. The Indonesian student physical activity status showed that more students still regularly maintain a balanced diet, whilst having moderate to high physical activity levels during the COVID-19 pandemic (in total, 85.3%) (Table II).

Table II: Subject's eating habits and physical activity status

	n (%)	Male	Female	P value	OR (95% CI)
Adherence to the balanced nutrition					
Disobedient	338 (35.5)	95 (36.5)	243 (35.6)	0.94	0.98 (0.6-0.7)
Obedient	614 (64.5)	175 (63.5)	439 (64.4)		
Trend immune booster foods					
Multivitamin					
Increase eating	362 (63.3)	101 (64.7)	261 (62.7)	0.70	1.09 (0.7-1.6)
Decrease eating	210 (36.7)	55 (35.3)	155 (37.3)		
Fruits					
Increase eating	486 (68.4)	116 (62.4)	370 (70.5)	0.04	1.1 (0.9-1.2)
Decrease eating	225 (31.6)	70 (37.6)	155 (29.5)		
Vegetables					
Increase eating	583 (79.9)	156 (80.4)	427 (79.7)	0.92	1.05 (0.7-1.6)
Decrease eating	147 (20.1)	38 (19.6)	109 (20.3)		
Honey					
Increase eating	253 (54.4)	63 (49.2)	190 (56.4)	0.18	1.34 (0.9-2.0)
Decrease eating	212 (45.6)	65 (50.8)	147 43.6)		
Milk					
Increase eating	345 (57.6)	102 (63.7)	243 (55.4)	0.04	1.42 (0.9-2.0)
Decrease eating	254 (42.4)	58 (36.3)	196 (44.6)		
Herbal drinks					
Increase eating	253 (57.2)	30 (38.5)	98 (39.7)	0.89	0.95 (0.6-1.6)
Decrease eating	189 (42.8)	48 (61.5)	149 (60.3)		
Physical activity status					
Low	140 (14.7)	29 (10.7)	111 (16.3)	<0.01	-
Moderate	422 (44.3)	110 (40.7)	312 (45.8)		
High	390 (41.0)	131 (48.6)	259 (37.9)		

Values are expressed as number and percentage (%).

We compared the smoking, sleeping, and shopping habits status of Indonesian students during the pandemic and before the pandemic. This was not an actual comparison, as they had to remember their lifestyle before the COVID-19 pandemic. The comparison within variables found what habits were changed during and followed the large-scale social restrictions between April-June 2021. This study was the first to determine the student's eating habits and lifestyle changes in Indonesia during the COVID-19 pandemic.

Data from the Basic Health Survey in Indonesia also known as the Riskesdas Study, highlighted that the proportion of Indonesian people with a healthy diet was low (21). Before the COVID-19 pandemic, an unhealthy food consumption survey made among university students, found that students mostly preferred

Table III: Smoking, sleep, and shopping habits before and during pandemic COVID-19

	Before Pandemic COVID-19	During Pandemic COVID-19	P value
Smoking status			
<5 cigarettes/day	37 (3.9)	42 (4.4)	
5-10 cigarettes/day	27 (2.8)	22 (2.3)	
>10 cigarettes/day	15 (1.6)	16 (1.7)	0.302[a]
No smoking	873 (91.7)	872 (91.6)	
Sleep habits			
<7 hours/night	338 (35.5)	311 (32.7)	
7-9 hours/night	549 (57.7)	537 (56.4)	0.018[b]
>9 hours/night	65 (6.8)	104 (10.9)	
Groceries shopping			
Not going outside	202 (21.2)	212 (22.3)	
Online shopping	41 (4.3)	116 (12.2)	<0.001[c]
Modern market	212 (22.3)	222 (23.3)	
Traditional market	497 (52.2)	402 (42.2)	

Values are expressed as number and percentage (n(%)).
[a]McNemar test was created with binomial categories as yes or no smoking status.
[b]McNemar test was created with binomial categories as sleep with <8 hours/night or ≥8 hours/night status.
[c]McNemar test was created with binomial categories as shopping online of offline status.

the COVID-19 pandemic. Students had no significant difference between before and during the COVID-19 pandemic on smoking status, while the numbers of students not smoking were mainly female students (71.6%). This big gap happened possibly due to the majority of the sample being female students. However, we found that sleep and grocery shopping habitats had a significant difference between before and during the COVID-19 pandemic ($p<0.05$ for all comparisons) (Table III).

DISCUSSION

The web IDLC Survey provides a snapshot of the eating habits and lifestyle changes during the COVID-19 pandemic in Indonesian university students. Students from all around Indonesia who participated in the survey were adhering to the 'study from home' policy

to eat fried foods followed by sweetened food, grilled foods and foods containing preservatives. These patterns were discovered not only in an urban setting, but also in a rural setting (6). This finding suggests that student dietary patterns are still not following the balanced nutrition guidelines suggested by the Ministry of Health. The unhealthy and imbalanced eating habits will lead to an increase in obesity risk among students.(22) A study observed in Indonesia had more than 200 students and found that 32.4% students were obese (23). This poor dietary lifestyle may predispose several health problems, including anemia, cancer, obesity, high blood pressure, cardiovascular disease, and diabetes (24,25).

We found that most students comply with balanced diet guidelines. This evidence may reflect that during the COVID-19 pandemic, people give more attention to their health status and immune health by eating healthier than before. However, these changes may have been due to students being influenced by their families. Due to social restrictions and being able to study from home, many students were able to live with their family rather than staying in their dormitory or boarding house at University (26). This condition may have other positive effects such as during this time of stress, the family food environment and living with the most loved ones could lead to changes in healthy behaviors (27). Another previous survey revealed that one-third young people were likely to have depressive symptoms and experienced mental health problems such as having suicidal thoughts, self-harm, anxiety, sleep problems, hopelessness, exhaustion and sadness during the pandemic (12).

Lifestyle changes due to the COVID-19 pandemic are inevitable. We have to adapt in the new normal era, where the home, work, and school environments have merged together in response to health protocol policies. Lifestyle transitions from before the pandemic to a new normal must be followed by a healthy lifestyle and a return to healthier eating habits (26). Another impact of this new normal concept included the increase of sedentary behavior, as students were required to study from home and attend virtual classes for hours. An online survey among Indonesia students showed that they had an increase in sedentary behavior during the pandemic (10.4 hours) compared to before pandemic (8.6 hours) (28). This high sedentary behavior triggered by most individuals adhering to social distancing and strict quarantine rules have limited their movement (29). Long duration of sleep habits in the pandemic may also add to the sedentary behavior duration. This study also showed that students have a significant difference in sleep habits before and during the COVID-19 pandemic. Students were engaged in a longer sleep duration compared to before the pandemic. However, Indonesian students who participated in this survey showed to be more physically active than before the pandemic. According to the World Health Organization (WHO), increased time spent in sedentary activity and lack of regular physical activity are globally the fourth highest risk factor of mortality, with overweight and obesity being the third leading risk factor of mortality in middle and high-income countries (30). Students need to improve their physical activity due to its cruciality in disease prevention, especially during the pandemic as well as to improve positive mood states because poorer mood states may trigger unhealthy eating habits.(31)

The trend to eat immune booster foods has increased since the pandemic. This study reported that most students increased eating foods typically known as immune booster foods including fruits, vegetables, honey, multivitamin supplement, milk, and herbal drinks. The pandemic had an impact on the consumption pattern of foods, which led to healthier lifestyle changes to help prevent COVID-19(32). People around the world were also trying to have healthy lifestyle during the COVID-19 pandemic, as well as students, especially when they are aware of the beneficial impact of lifestyle changes and science behind it(11,31). Students preferences were shifting from bakery items and meat based foods to fruits and vegetables(33). Another lifestyle change in Indonesian students was the increase in online groceries shopping during the pandemic. This mode of service had a positive impact regarding the reduced risk of COVID-19 spread using contact-free delivery and e-wallet payments (34).

This present study had several strengths such as including a high number of students thatcame from three regions across Indonesia (West, Central, and East of Indonesia). Furthermore, this was the first survey in Indonesia which was conducted among university student to identify about their dietary and lifestyle changes during the COVID-19 pandemic. There was a significant difference between before and during the pandemic for lifestyle changes including sleep and grocery shopping habits. Student's physical activity and consumption of immune booster foods increased during pandemic. Female students consumed significantly higher quantities of multivitamin, honey, herbal drinks and fruits, and were less physically active compared to male students in Indonesia. Post-graduate students were shown to adhere to lower physical activity levels and had a low adherence of balanced nutrition guidelines, which was suggested as a national recommendation. The majority of all students have raised their concern on the trend of eating the immune booster foods. There was an increase in the frequency of smoking in male students during the pandemic, compared to before. However, this study's main limitation, was that all subjects self-reported body measurements within the online survey which could have led to an underestimation or overestimation of weight and height (35). Furthermore, this research utilized a purposeful sample of participants. Participants who had particularly strong and/or negative lifestyle / eating habit changes during the COVID-19 pandemic

may have been more likely to join the study. The participants included in this study were not intended to be a random or representative sample of all college students in Indonesia. Consequently, the findings of this study cannot be generalized to all academic institutions within Indonesia; however, they can and should be used as the basis for additional investigations into improving lifestyle and eating habitats during uncertain times.

CONCLUSION

In this study, we have provided for the first-time data of Indonesian students regarding their eating habits, lifestyles changes, and the adherence to balanced nutrition during the COVID-19 pandemic. The majority of all students have raised concern on the trends of eating the immune booster foods, students were also shown to have a greater adherence to balanced nutrition recommendations, were more physically active than before pandemic, were more likely to purchase grocery shopping online to reduce COVID-19 spread, and had improved sleep habits.

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