

Students' eating styles and palatable eating motives during the COVID-19 pandemic

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ABSTRACT

This study aimed to describe students' driving factors of eating behavior, namely eating-styles and palatable-eating-motives, and to determine clusters based on both. Conducted during the COVID-19 pandemic, this cross-sectional study was carried out in response to the intervention program, the nusantara movement to reduce obesity rate (*gerakan nusantara tekan angka obesitas* (GENTAS)), launched by the Indonesian government to reduce obesity rate. Involving general population, 135 undergraduate students at a university in Bandung, Indonesia (the average age was 20.5 years, 71.9% of them were female) were selected using multi-stage-cluster-sampling. Data was collected through online questionnaires and was analyzed using SPSS 22.00 for Mac. Results indicated that participants' eating behavior was generally more characterized by uncontrolled-eating-style, and participants' eating palatable foods was more driven by the motive of reward-enhancement. This study obtained three clusters, including the cluster composed of emotional-eating-style and coping-motives, the cluster involving cognitive-restraint-eating-styles, and the cluster composed of uncontrolled-eating-style and all palatable-eating-motives. Findings about the clusters brought possibilities to develop new approach in eating behavior intervention for GENTAS' implementation among students, focusing on tailored intervention based on the cluster of the individual participant, and utilizing the available channels at the institution. An online or hybrid intervention was an introduced choice that was relevant during COVID-19 pandemic and non-COVID period.

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1. INTRODUCTION

Obesity is a condition of abnormal or excessive fat accumulation in adipose tissue that may impair health [1]–[3]. The main causes of obesity are undesirable positive energy balance and weight gain. The amount of excess fat, the distribution of fat throughout the body, and the health consequences associated with this condition vary across individuals [1]. The body mass index (BMI) is commonly used to measure or to classify obesity. BMI is an index of weight-for-height that is commonly used for classifying adults if they are obese, overweight, or underweight [1], [2]. Obesity is considered a major public health issue nowadays. The WHO survey in 2016 showed that approximately 13% of the world's adult population were obese. This result displayed that the worldwide prevalence of obesity between the year of 1975 and 2016 was nearly tripled [2]. In Indonesia, the obesity's prevalence was approximately 36.39% from the total population, in which 4.8%

male and 8.9% female in every 100,000 inhabitants were obese [4]. The Indonesian basic health research (*riset kesehatan dasar Indonesia*) reported that in the year of 2013, the prevalence of obesity in Indonesia was 21.8%. It is important to control and reduce obesity because it has several health consequences [5]. According to Ministry of Health of the Republic of Indonesia, obesity leads to a major risk factor for noncommunicable diseases including diabetes, cardiovascular diseases, osteoarthritis, and some cancers [6]. Obesity gives metabolic impacts or metabolic syndrome, such as increased blood pressure, decreased high-density lipoprotein (HDL) cholesterol, and increased triglycerides; as well as other effects such as sleep disturbance, low back pain, osteoarthritis, gallstone formation [6]. Increasing obesity has an impact on healthcare costs. It is predicted that in several years, health financing will be increasing due to the raised number of individuals with obesity. Thus, obesity does not only give impacts on physical health, but also triggers economic and social problems [6]. This condition is in line with those proposed by Goettler *et al.* [7].

Obesity is caused by several factors. The first factor is genetics. If one parent is obese, the possibility of their child suffering from obesity is 40-50%. If both parents are obese, the possibility is higher which will be up to 70-80%. The second factor is environment, which includes diet and physical activities. Both activities play a role in obesity. Drugs and hormones are the other factors that have contribution to obesity [6]. In order to control and prevent obesity, in the year of 2016, the government of Indonesia launched an intervention program, namely the nusantara movement to reduce obesity rate (*gerakan nusantara tekan angka obesitas*, GENTAS). This program focuses on regulating diet and encouraging people to be active, that includes regulation in the level of government, and its implementation in the society, community, and business context [6]. However, in 2018, Indonesian basic health research reported that the obesity's prevalence in Indonesia raised up to 21.8%, meaning that the numbers had been increasing since it was reported in 2013. This prevalence revealed that one in four Indonesian was obese [5]. This increased number of individuals with obesity shows that implementation of the intervention program that is based on nutritional and medical approaches is not sufficient. A behavioral approach should also be considered. In this case, psychological determinants of eating behavior should be understood. Individual differences in driving factors of eating behavior, such as eating styles and palatable eating motives should be further studied [8], [9].

Eating styles describe the individual's eating behavior in general, and explains differences in eating behavior as a response to obesogenic environments [10]. Eating styles are innate in nature, inherited from parents to their children, and relatively unchangeable [11]. There are three kinds of eating style with their own etiology [10], [11], including uncontrolled eating, cognitive restraint, and emotional eating. Individuals with uncontrolled eating style tend to lose control in eating in a situation when they are hungry or when they see external food cues such as palatable food, even when they are not physiologically hungry [10], [11]. This loss of control over food intake is accompanied by subjective feeling of hunger [11]. Cognitive restraint is an eating style in which individuals use cognitive control in restraining their food intake. Specifically, it is a conscious restriction of food in order that the individuals could control or could lose weight [11]. Emotional eating style refers to a style in which the tendency of overeating is in response to internal negative emotional factors such as fear and anxiety. Individuals with this eating style use eating as a way of coping with psychological distress. The increased food intake occurs because they have an inability to resist emotional cues [11].

Palatable eating motives describe individual reasons or motives to eat highly palatable foods [12]. There are genetic and physiological markers underlying individual differences in palatable food intake that might ultimately lead to some resistant or prone to obesity [13]. These motives are related to hedonic eating or purely reward-driven eating, which means eating in the absence of hunger or metabolic need. Hedonic eating is in contrast of homeostatic eating, which is eating that is driven by physiological deprivation involving an immediate need for energy as well as the (positive and negative) reinforcement that accompanies homeostatic intake [14]. Hedonic eating is satisfied by the intake of highly palatable foods, namely the foods that tend to be dense in calories as they typically contain sugar, salt, and higher fat that make them delicious. Palatable eating motives include the following four motives, which are coping motive, reward enhancement motive, social motive, and conformity motive [12]. Eating for individuals with primarily coping motive is to forget about their problems and worries, as well as to feel better when they are experiencing negative situations and moods. Eating for individuals with primarily reward enhancement motive is to experience pleasure and to have exciting experiences of the food itself. Eating for individuals with primarily social motives involves increasing enjoyment of parties and other gatherings. Eating for individuals with primarily conformity motive is to fit in with others, that is to give in to pressures from friends or family [15].

The current study was performed in response to GENTAS, an intervention program launched by Indonesian government in the year of 2016 to reduce obesity rate. Even though GENTAS had been implemented, results of Indonesian Basic Health Research in the year of 2018 reported that the prevalence of obesity in Indonesia had been increasing since it was reported in 2013. The current study was also conducted as a follow-up to the recommendations of [8] and [9], that individual differences in driving factors of eating

behavior such as eating styles and palatable eating motives should be considered in carrying out interventions. The current study was carried out among students [5], and it was conducted in the condition of COVID-19 pandemic. Previous findings reported that eating behavior of students during COVID-19 pandemic was different as compared to their eating behavior at the time before COVID-19 pandemic [9]. It was explained that those changes might occur because the students during COVID-19 pandemic faced an uncertain situation, where they did not know exactly when the situation would end. Eating for students in this condition was driven mainly by coping motive. Another explanation focused on the implementation of health protocols in the time of COVID-19 pandemic that enforced students to study at home. This situation made changes in students' behavior, including their eating behavior [16]. In this light, staying with their family at home might trigger social and conformity eating motives, because they were continuously exposed to foods in social media. These findings might lead to higher possibilities to become obese, so that a preventive program should be considered. For this purpose, a description of students' eating behavior should be first explored and obtained.

The current study aimed to describe the driving factors of students' eating behavior in the condition of COVID-19 pandemic, namely eating styles and palatable eating motives, and to determine the clusters based on the eating's driving factors. Results of this current study will contribute to the previous findings on palatable eating motives [8] and eating styles [17]. The results of this study could be beneficial for the development process of an intervention for eating behavior among students, as an implementation of GENTAS, an intervention program to reduce obesity rate launched by the Indonesian government.

2. METHOD

2.1. Participants and sampling method

The current cross-sectional study involved participants from general population, which was undergraduate students at a university in Bandung, Indonesia. They were selected utilizing multi-stage-cluster sampling with the following steps. In the first step, the cluster was applied based on a group of sciences in the university, which were the faculties of natural sciences and the faculties of social sciences. In the second step, the cluster was used to select a faculty in each group of sciences. The selected faculties in this second step were the faculty of A representing the faculty of natural sciences and the faculty of B representing the faculty of social sciences. The third step went after the second step, that was to determine the unit of analysis. The sample consisted of 2,734 persons (consisted of 713 students from the faculty of A and 2021 students from the faculty of B). Employing a 5% margin of error and a 95% confidence level [18], the required sample size was 135 participants. The participants consisted of 35 students from the faculty of A and 100 students from the faculty of B.

The potential participants were invited by the authors to participate in the study through Line or WhatsApp application, and those who were willing to participate replied to the invitation through the applications. One day before data collection the participants received information about the study, and before the session began, they gave their consent via Google form. Their participation was completely free, and they could withdraw their participation at any time during the data collection. The data collection was conducted using Google form in the period of September-October 2020 where restrictions was applied by the Indonesian government because of the condition of COVID-19 pandemic and COVID-19 vaccines were not yet provided.

2.2. Instruments

The current descriptive study used two self-report questionnaires, which were the three-factor eating questionnaire (TFEQ-R18) and the palatable eating motives scale (PEMS), as well as demographic data sheet. Demographic data obtained in this study included age, BMI, the conditions related to eating behavior, food-related expenses, and physical activities. Concerning BMI, due to the condition of COVID-19 pandemic with all the restrictions, the authors were unable to measure the weight and height of the participants directly. Each participant had to measure their own weight (in kg) and height (in meters). The authors provided them with instructions to measure, such as removing shoes or another footwear. The participants then reported the results to the authors. BMI was calculated by the authors with the formula: $(\text{weight in kg}/\text{height in meters})^2$. The participants were then classified into one of the following BMI categories, including underweight (BMI=6-18), healthy weight (BMI=18-24.9), overweight (BMI=25.0-29.9), obese (BMI=30.0-39.9), and severely obese (BMI \geq 40) [12].

2.2.1. The three-factor eating questionnaire

TFEQ was used in this study to examine eating style of the participants. The current study used the TFEQ-R18 [19]. This questionnaire was developed to assess the cognitive and behavioral components concerning eating in obesity population [19] as well as in general population [20]. This self-report questionnaire had 18 items and consisted of three subscales, including uncontrolled, cognitive restraint, and

emotional. TFEQ-R18 provides scores for uncontrolled eating (tendency to eat more than usual due to a loss of control over intake accompanied by subjective feeling of hunger), cognitive restraint (conscious restriction of food to control or lose weight), and emotional eating (inability to resist emotional cues). Uncontrolled eating consisted of 9 items (e.g., Sometimes when I start eating, I just can't seem to stop), Cognitive restraint consisted of six items (e.g., I consciously hold back at meals in order not to gain weight), Emotional eating consisted of three items (e.g., When I feel blue, I often overeat). The participants were requested to respond to the items on a 4-point Likert-type rating scale (1: definitely true, 2: mostly true, 3: mostly false, and 4: definitely false) [19]. Previous studies demonstrated that TFEQ-R18 had adequate internal consistency, with Cronbach's alpha coefficients of the questionnaire for the obesity population was 0.70 [19], and for general population were 0.872 (uncontrolled eating), 0.818 (cognitive restraint), and 0.884 (emotional eating) [20]. The current study used the Indonesian version of TFEQ-R18 [21], with the Cronbach's alpha coefficients for general population were 0.85 (uncontrolled eating), 0.75 (cognitive restraint), and 0.87 (emotional eating) 0.73 [21].

2.2.2. The palatable eating motives scale

The PEMS was used in this study to examine the eating motivation of the participants. PEMS was developed to identify the individuals' specific reasons to consume highly palatable foods and drinks [12]. It is a self-report questionnaire that covers four subscales or "motives", namely coping, reward enhancement, social, and conformity motives. Coping motive corresponds to consuming tasty meals to deal with negative emotions (e.g., to help with or forget about problems, a bad mood, depression, nervousness, or worry). Reward enhancement motive pertains to consuming tasty food or beverages to enhance positive emotions or experiences or for their intrinsically rewarding qualities, which are unrelated to social situations (e.g., because it is fun or because one likes the feeling, or it feels pleasant, exciting, or even "high-like"). Social motives involve eating tasty food or beverages for social reasons (e.g., to be more sociable, to enjoy a party, to enjoy gatherings, or celebrations with friends). Conformity motive is related to consuming tasty meals because of external pressures to do so (e.g., because friends want us to, to avoid harassment, to "fit in", to be liked, or to not feel left out). The participants were requested to give their answers to 20 items on 5-point Likert-type rating scale ranging from 1 (never/almost never) to 5 (always/almost always). The measures of internal consistency have been previously reported for each of these subscales. Reported by [12], [22], [23], the Cronbach's alpha coefficients of the questionnaire were 0.91 [12], 0.92 [22], 0.917 [23] for coping, 0.83 [12], 0.82 [22], 0.804 [23] for reward enhancement, 0.87 [12], 0.89 [22], 0.840 [23] for social, 0.73 [12], 0.76 [22], 0.745 [23] for conformity, indicating good internal consistency [12], [23]. The current study used the Indonesian version of PEMS (I-PEMS) [24]. I-PEMS had a good construct validity with the Cronbach's alpha coefficients of 0.89 (coping), 0.86 (reward enhancement), 0.82 (social), and 0.678 (conformity) [24].

2.3. Procedure and analysis

The Research Ethics Committee of Padjadjaran University, Bandung, Indonesia, granted an approval for the current study with reference number of 1176/UN6.KEP/EC/2019. After obtaining consent from the participants, the participants were invited to complete the Google Form version of the questionnaires (the Indonesian version of TFEQ-R18 and PEMS) as well as the demographic data. The current study used SPSS 22.00 for Mac for the data analysis. Descriptive analysis, *t*-tests, ANOVA, Mann-Whitney, and clustering mean k were performed for the data analysis. In the current study, the cluster analysis using clustering mean k was utilized to conduct the segmentation. The cluster analysis was used to describe patterns of combination between eating styles and palatable eating motives in every cluster. The analysis was performed with the following steps: First, determine the participants' clusters or segments based on the subscales of eating styles and palatable eating motives. Second, perform the cluster analysis applying k-means method. In order to standardize the scores of eating styles and palatable eating motives before applying clustering mean k, z-score was employed in this study.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Participants, demographic information, and BMI

A total of 135 undergraduate students from general population in one university in Bandung, Indonesia, participated in this study. The participants were comprised of males and females between ages of 17 to 24 years old, and their average age was 20.5 years ($S=3.97$). A total of 71.9% of the participants were female students. Table 1 presents the participants' demographic information and BMI.

Demographic information in Table 1 showed that the participants were mostly between 19-20 years old (48.9%) and between 21-22 years old (40%). Regarding their health conditions, majority of the

participants had healthy weight (60.7%), had no record of psychiatric illnesses (99.3%), no medical record related to eating behavior (91.9%), no illnesses at the time they answered the questionnaires (88.1%), no history of diet (91.1%), and were not on a diet (74.1%). The majority of them did not perform moderate-intensity exercises (physical activities of 150 minutes per week) (72.6%). Concerning their social-economic conditions, the majority of the participants were living with their parents (80.7%), with monthly food expenses between IDR 500,000-1,499,000 (61.5%), mostly for buying snacks and meals (60.7%). In summary, demographic information showed that the majority of the participants were in healthy condition, not on a diet, and did not perform moderate-intensity exercises. Although students were in healthy condition, the focuses of GENTAS [5] were not yet optimally implemented.

Table 1. Demographic information and BMI (N=135)

Demographic characteristics and category	%	n
Gender		
Male	28.1	38
Female	71.9	97
Age group		
17-18	3.7	5
19-20	48.9	66
21-22	40.0	54
23-24	7.4	10
BMI		
Underweight: <18	16.3	22
Healthy weight: 18-24.9	60.7	82
Overweight: 25-29.9	15.6	21
Obese: 30-39.9	7.4	10
Severely obese: ≥40	0	0
Psychiatric illnesses		
Yes	0.7	1
No	99.3	134
Medical record related to eating behavior		
Yes	11.9	16
No	88.1	119
Psychological record related to eating behavior		
Yes	8.1	11
No	91.9	124
History of diet		
Yes	8.9	12
No	91.1	123
Current diet program		
Yes	25.9	35
No	74.1	100
Current illness		
Yes	11.9	16
No		
Residence		
Live with parent	80.7	109
Rent a room	8.8	12
Others		
Monthly expenses		
<IDR. 500,000	27.4	37
IDR. 500,000-1,499,000	61.5	83
≥IDR. 1,500,000	11.1	15
Food purchased		
Snacks only	28.1	38
Snacks and meals	60.7	82
Meals only	3.7	5
Others	7.4	10
Moderate intensity exercise (150 minutes per week)		
Yes	27.4	37
No	72.6	98

Source: primary data

3.1.2. Descriptive statistics

a) Eating styles

Results concerning eating styles are presented in Table 2. Results showed that the participants' scores on uncontrolled eating (N=135; M=19.23; SD=4.41) were higher than their scores on cognitive restraint (N=135; M=13.85; SD=3.97) and on emotional eating (N=135; M=6.66; SD=2.27). Referring to the

external hypothesis, food cues could trigger individual to consume food excessively [10], [11], [19]. These results exhibited that the participants' eating behavior were more influenced by external food cues such as the taste, the smell, the displays. The participants were more likely to lose control in eating when they saw external food cues, even when they were not physiologically hungry [10], [11], [19]. The participants' eating behavior was less aimed to respond to their negative emotion or was not the side effect of the restriction of food intake [10], [11], [19]. Further analysis showed that significant differences were found in the following items: i) emotional eating style across gender (sig.=0.001; $p<0.05$), ii) emotional eating style between BMI-categories, which was between healthy weight and obese (sig.=0.013; $p<0.05$), and iii) uncontrolled eating style across age groups, which were between 17-18 years old and 23-24 years old (sig.=0.013; $p<0.05$).

Table 2. Descriptive statistics of eating styles (N=135)

Eating styles	N	%	Mean	SD
Uncontrolled eating	135	100	19.23	4.41
Cognitive restraint	135	100	13.85	3.97
Emotional eating	135	100	6.66	2.27

Source: primary data

b) Palatable eating motives

Results concerning palatable eating motives are presented in Table 3. Results showed that the participants' score on reward-enhancement motive (N=135; M=16.81; SD=4.77) was higher than coping motive (N=135; M=13.31; SD=4.87), social motive (N=135; M=12.45; SD=3.74), and conformity motive (N=135; M=11.47; SD=3.88). It suggested that the participants' consumption of palatable food was primarily determined by the motives for experiencing pleasure and for having exciting experiences of the food itself [15], [22], rather than for forgetting their problems and worries, for feeling better (coping motive), for increasing enjoyment of being with others (social motive) or fitting with others (conformity motive). These findings were in line with the previous study among undergraduate students in Turkey [25].

Further analysis revealed that there were significant differences in the following items: i) coping motive across gender (sig.=0.012; $p<0.05$), ii) social motive across monthly expenses, that were between IDR 500,000-IDR 1,499,000 and \geq IDR 1,500,000 (sig.=0.012; $p<0.05$), iii) social motive across residences, including living with parents and renting a room (sig.= 0.032; $p<0.05$). According to this study there was no significant difference between coping motive and BMI. These findings contradicted with the previous results showing correlations between coping motive and BMI, especially among obesity population [25]. The participants' score for conformity motive in this study was the lowest among the scores of three other motives, which was different from the results of [25].

Table 3. Descriptive statistics of palatable eating motives (N=135)

Palatable eating motives	N	%	Mean	SD
Social motive	135	100	12.45	3.74
Coping motive	135	100	13.31	4.87
Reward-enhancement motive	135	100	16.81	4.77
Conformity motive	135	100	11.47	3.88

Source: primary data

c) Clustering based on eating styles and palatable eating motives

In the process of clustering, the criteria of clustering were previously defined based on eating styles (i.e., uncontrolled eating, cognitive restraint, and emotional eating) and palatable eating motives (i.e., social motive, coping motive, reward-enhancement motive, and conformity motive). After the data of the study was proven suitable for clustering, a hierarchical cluster analysis was applied to determine the number of clusters. Then, the analysis was performed to examine whether there were outliers. It was found that the data of this study had no outliers, and it was determined that the number of clusters was three clusters. The cluster analysis using k-means method was then performed, and the determination of cluster means was conducted by the algorithm. Results of the analysis of variance showed that there was a significant difference between the three clusters ($p<0.05$), indicating that the clustering are significantly different from each other ($p<0.05$), hence the clustering could be regarded as valid. The following descriptions presented the three clusters based on eating styles dan palatable eating motives.

- Cluster 1-emotional eating style and coping motives

Students' eating styles and palatable eating motives during the COVID-19 pandemic (Wilis Srisayekti)

Cluster 1 was the largest cluster of the three clusters that included 41.5% of the total participants. This cluster was composed by participants who had a tendency to overeating in response to internal negative emotional factors (such as anxiety) [10], [11], [19]. Eating for these participants was primarily driven by coping motive in order to forget about their problems and worries (such as stress, college-related problems), to have a better feeling if they are experiencing negative situations and moods [12].

Majority of the participants in this cluster were in the age group of 19-20 years old (19.3%) with an average age of 20.57 years old, and 31.1% of them were female. Regarding BMI category, a total of 23.7% of the participants in this cluster were categorized as healthy weight (Mean of BMI=23.2 which was the highest BMI compared to the average BMI of the other two clusters), 8.1% were overweight, and 5.2% were obese. None of the participants had a psychiatric illness. However, 8.1% of them (which was the highest percentage of the participants) reported that they had psychological record that influenced their eating behavior such as stress, anxiety, college-related problems, intrapersonal and interpersonal problems, and unspecified personal problems. At the time of the study, 3% of them had medical records that affected their eating behavior and 3.7% had an illness that affected their diet such as ulcers and chronic gastritis. A total of 12.6% of the participants followed a certain diet aiming at losing weight (9.6% in which 1.5% of them was requested by other person), at maintaining a healthy body and muscles (1.5%), and at preventing ulcers (1.5%). A total of 24.4% of the participants were living with their parents with the average monthly expenses between IDR 500.000-1.499.000 (34.1%) that was mainly used to buy meals and snacks (28.9%). A total of 11.9% of the participants in this cluster (the highest percentage among the three clusters) performed moderate intensity exercises (approximately 150 hours per week).

In summary, those results revealed that negative emotional experiences were the essential issues for participants' eating behavior in this cluster. It was driven particularly in response to internal negative emotional factors and a coping motive for forgetting their worries and problems. Among the three clusters, this cluster had the highest percentage of participants for the following characteristics, namely i) who had healthy weight with the highest BMI compared to the average BMI of the other two clusters, and it had participants who had overweight and obese, ii) who followed a certain diet aiming at losing weight and maintaining a healthy body and muscles (9.6%), iii) who performed moderate intensity exercises (11.9%), and iv) who were living with their parents with the average monthly expenses between IDR 500,000-1,499,000, that was mainly used to buy meals and snacks. Besides, this cluster had also the highest percentage of participants who had psychological and medical records influencing their eating behavior, and who had illnesses that affected their diet. The findings also showed that the focuses of GENTAS [5] had not been implemented thoroughly.

- Cluster 2-cognitive restraint style

The proportion of cluster 2 within the total participants was 26.7%, the fewest participants among the three clusters. This cluster was composed by participants who had a tendency to use cognitive control in restraining their food intake [10], [11], [19], particularly in order to lose or to control weight. These participants tended to overeat when they lost their self-control [10], [11], [19]. Compared to the participants in the other two clusters, the participants in this cluster were the least affected by all the palatable eating motives especially by coping motive and reward-enhancement motive [12].

Majority of participants in this cluster were in the age group of 19-20 years old (17%) with an average age of 20.67 years old, and 17% of them were female. A total of 17% of the participants were in the category of healthy weight with the average BMI of 21.7 (which was the lowest BMI compared to the average BMI of the other two clusters). There was only one participant who was categorized as obese. Out of all participants, the only one participant who had psychiatry illness was in this cluster. This participant had bipolar conditions, anxiety, borderline personality, and depression. A total of 3.7% participants in this cluster reported that they had psychological record that affected their eating behavior, such as family problems, mental illnesses, and addiction. A total of 2% of the participants had medical record that affected their eating behavior, and at the time of the study, 2.2% of the participants had illnesses that affected their diet, including gastritis, GERD, and scoliosis. A total of 7% of participants in this cluster followed a certain diet aiming at losing weight (3%, one participant followed intermittent fasting), at treating gastritis (0.7%), at keeping healthy (1.5%), and at maintaining weight to prevent scoliosis from getting worse. A total of 23.7% of the participants were living with their parents (34.1%) with the average monthly expenses between IDR 500,000-1,499,000, where they mainly bought snacks only (11.9%, the highest percentage of the participants who bought snacks only). Among the participants in this cluster, 6.7% performed moderate intensity exercises (approximately 150 minutes per week). It was the least percentage of the three clusters.

In summary, participants' eating behavior in this smallest cluster was characterized by cognitive control in restraining their food intake, specifically for losing or controlling their weight, and least affected by palatable eating motives. Among the three clusters, this cluster had the lowest percentage of participants

for the following characteristics, namely i) who had the lowest BMI compared to the average BMI of the other two clusters although they were still in healthy condition, ii) who followed a certain diet with several reasons (7%), iii) who performed moderate intensity exercises (6.7%), and iv) who were living with their parents with the average monthly expenses between IDR 500,000-1,499,000, that was highly percentage for snacks only. Occupied with restraining their food intake, this cluster had the lowest percentage of participants who had psychological records influenced their eating behavior. The findings also exhibited that the focuses of GENTAS [5] had not been fully implemented.

- Cluster 3-uncontrolled eating style and all palatable eating motives

Cluster 3 involved 31.8% of the total participants. This cluster was composed by participants who had a tendency to lose control in eating when they were hungry or when they saw external food cues even when they were not physiologically hungry [10], [11], [19]. The loss of control over their food intake was due to their susceptibility to tempting food cues [10], [11], [19], such as palatable food. As opposed to the cluster 2, the participants in this cluster were the most affected by all of the palatable eating motives [12]. Hence, a strong tendency of the participants in this cluster to overeat not only because of losing their control over external food cues, but also due to their motives to fit in and get along with other people, to enjoy parties or gathering with other people in which eating activities were involved, to experience pleasure and to have exciting experiences of the food itself, to forget their problems and worries, as well as to feel better when they were having negative emotional experiences or negative situations.

Majority of participants in this cluster were in the age group of 19-20 years old (17%) with an average age of 20.33 years old, and 23.7% of them were female. A total of 20% of the participants were in the category of healthy weight with an average BMI of 22. None of the participants reported having a psychiatric illness. However, 5.2% of them reported that they had psychological records that affected their eating behavior, such as anxiety, stress due to parental and social pressures, or unspecific problems. A total of 1.5% of them had medical records that affected their eating behavior. At the time of the study, 5.2% of the participants had an illness that affected their diet, such as allergy problems, acute ulcers, gastroenteritis, and GERD. A total of 8.1% of the participants were on a certain diet aiming at losing weight (3%, one of them followed volumetric diet), at gaining weight (0.7%), at maintaining health (2.2%), at body building (0.7%), at treating their illnesses including ulcers (0.7%) or GERD (0.7%). A total of 23% of the participants lived with their parents with the average monthly expenses between IDR 500,000-1,499,000 (20%), that was mainly used to buy meals and snacks (28%). A total of 8.9% of the participants in this cluster performed moderate intensity exercises (approximately 150 hours per week).

In summary, participants' eating behavior in this cluster was driven by a tendency to lose control in eating when they were hungry or when they saw external food cues even when they were not physiologically hungry. As opposed to the cluster 2, their eating behavior was also driven by all of the palatable eating motives. This cluster had the percentage of participants between cluster 1 and cluster 2 for the following characteristics, namely i) who had healthy weight with the BMI's value between cluster 1 and cluster 2, ii) who followed a certain diet aiming at maintaining health and for treating their illnesses (8.1%), and iii) who performed moderate intensity exercises (8.9%). This cluster had the highest percentage of participants who were living with their parents with the average monthly expenses between IDR 500,000-1,499,000, that was mainly used to buy meals and snacks. In addition, this cluster had also the highest percentage of participants who had illness that affected their diet, the lowest percentage of participants who had medical records that influenced their eating behavior, and some percentages of participants who had psychological records that affected their eating behavior. Although in general the participants were relatively in healthy condition, their tendency to loss control in eating should receive attention. The findings also showed that participants in this cluster did not fully implement GENTAS [5].

3.2. Discussion

The current study was carried out in response to GENTAS, an intervention program launched by Indonesian government in the year of 2016 to reduce obesity rate. Findings of a research in 2018 conducted by Indonesian Basic Health Research reported that individuals with obesity in Indonesia had been increasing although GENTAS had been implemented. As recommended by [8] and [9], in order to implement the intervention more effectively, the current study used behavioral approach, especially to explore the psychological determinants of eating behavior. Individual differences in driving factors of eating behavior, including eating styles and palatable eating motives were examined. Based on previous studies [8], [9], [16], the current study was conducted among students [5]. It aimed to describe students' eating styles and palatable eating motives, as well as to determine clusters based on those eating styles and palatable eating motives.

Findings showed that, in general, participants of the current study had healthy weight. Majority of them did not implement GENTAS thoroughly. Their eating behavior was generally more characterized by uncontrolled eating, the motive of excitement of the food itself, and experiencing pleasure of the food.

Regarding BMI, the findings on palatable eating motives were not in line with the findings from [25]. Three clusters were obtained in the current study with their own characteristics. The first and the largest cluster included 41.5% of the total participants whose eating behavior was driven by emotional eating style and coping motive. Negative emotional experiences were the essential issues underlying their eating behavior. They had difficulties to resist emotional cues and used eating to cope with psychological distress [10], [11], [19]. Their eating behavior was driven primarily by motive to forget about their worries and problems, as well as to feel better whenever they were in negative moods and situations [12]. The second and smallest cluster included 26.7% of the total participants. Cognitive control was the main issue for participants' eating behavior in this cluster. None of palatable eating motives drove their eating behavior. Cognitive control to restrain their food intake [10], [11], [19] was used in order that they could lose or control weight. The third cluster included 31.8% of the total participants whose eating behavior was characterized by uncontrolled eating style and driven by all palatable eating motives. Loss of control over food intake [10], [11], [19] was the main feature of participants' eating behavior in this cluster, in addition to all palatable eating motives.

The three clusters obtained in this study were in line with the previous findings on clustering based on eating styles, namely i) clustering based on maternal eating behavior and problematic eating behavior of children [26] and ii) clustering students' eating behavior for weight loss interventions [27]. However, the obtained three clusters were different from the previous findings aimed at clustering eating behavior of Hungarian general population which obtained five clusters [17]. Findings of the current study, which was determining clusters based on two eating driving factors i.e., eating styles and palatable eating motives, were more complex compared to the previous findings that determined clusters based on only one eating driving factor. Therefore, results of this study provided more specific considerations for developing an intervention, that was the implementation of government intervention GENTAS among students as they included two driving factors of eating behavior. In this light, the findings of the current study could be considered as new results.

Concerning eating behavior during the COVID-19 pandemic, findings from previous studies in general mainly focused on diet [28], nutritional state [29], food consumption [16], [30]–[33], and eating behavior [34]. Particularly, findings of similar studies in Indonesia were focused on diets [35], [36], food pattern [37], [38], eating in the absence of hunger [8], [9], and binge eating [21]. On this point, the current study that included clustering based on eating styles and palatable eating motives aiming at intervention to reduce obesity rate could be considered as new results.

When it comes to the implementation of the results, findings of the current study exhibited generally that eating behavior of participants was more characterized by uncontrolled eating, the motive of excitement of the food itself, and experiencing pleasure of the food. Based on those results, a general basic of intervention for the GENTAS implementation among students could be designed. However, further results showed that the current study found three clusters of eating behavior based on eating styles and palatable eating motives, where every cluster had its own characteristics. These findings provided more opportunities for the institution to develop tailored, more specific, and customized intervention plans according to the cluster of the individual participant. For example, the findings of three clusters of eating behavior showed that majority of the participants were in the cluster 1 where emotional issues were the main feature of their eating behavior (41.5% of the total participants). Based on those findings, the institution could develop intervention using channels that were already available at the institution, involving various professionals related to eating behavior such as counselor (from the counseling center to help participants handling their emotional problems that affects their eating behavior), medical doctor (from the health center to help participants who had medical record related to their eating behavior), nutritionist (to help participants with diet), and experts in fitness (to help participants with planning the exercises). This intervention approach that involves various professionals in handling participants' eating behavior according to their cluster could also be applied in similar way in giving intervention to the participants in the other two clusters (cluster 2 and cluster 3). Concerning the data was collected in the conditions of COVID-19 pandemic, when restrictions was enforced and vaccines for COVID-19 were not yet provided, the intervention should be developed in such a way so that it would be relevant to non-COVID period. It means that there should be possibilities to apply the intervention when the restrictions are no longer enforced and nearly everybody has already got vaccinated. An online or hybrid intervention is probably a suitable choice. The intervention's procedure should include an identification of the participant's eating behavior cluster. The application of this approach for implementing GENTAS among students is expected to be more appropriate and effective in reducing obesity rate. This could be introduced as a new approach and could be added to the list of the existing approaches for eating behavior interventions, such as simple intervention [39], diet and exercises [40], intervention addressing food-related impulsivity [41], educational intervention [42], healthy eating behavior [43], web-based nutrition intervention [44], implicit process interventions [45], intervention addressing behavioral intention [46]. Limitations of the current study included the method to collect demographic information of the participants in the time of COVID-19 pandemic, where the information was obtained based on participants' report only.

Additionally, this study also used its own unstandardized instruments, such as instrument to measure participants' height and weight for calculating BMI. If the intervention approach for implementing GENTAS among students is to be applied in the post COVID-19 pandemic, it is necessary to make sure whether clusters of eating behavior remain the same. It should be taken into account considering results of previous studies reporting differences in students' eating behavior during and before the COVID-19 pandemic [9].

4. CONCLUSION

Results of the current study indicate that uncontrolled eating generally characterizes the participants' eating behavior in the time of COVID-19 pandemic, where the eating behavior is more influenced by external food cues. The excitement of the food itself and of experiencing pleasure are determinants of the consumption of palatable food. Majority of the participants generally have not implemented the focus of GENTAS, an intervention program launched by the Indonesian government to reduce obesity rate. Furthermore, this study obtains three clusters, including the largest cluster that is composed of emotional eating style and coping motive, the smallest cluster that is characterized by cognitive restraint eating style, and the cluster that is composed of cognitive uncontrolled eating style and all palatable eating motives. The findings about these clusters provided possibilities to develop new approach in eating behavior intervention for GENTAS' implementation among students, focusing on tailored intervention based on the cluster of the individual participant which involves various professionals, using available channels at the institution. In addition to identification of the participant's eating behavior cluster being included in the procedure, the intervention should be developed in such a way so that it will be relevant to non-COVID period, when the restrictions are no longer enforced and nearly everybody has already got vaccinated. An online or hybrid intervention is an introduced choice.

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