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Original Research Paper

The correlation between mental health and eating behavior in Indonesian college students: a cross-sectional study

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Abstract

The prevalence of mental health disorders in Indonesia from the 2018 Basic Health Research data shows anxiety disorders of 9.8%, depression of 6%. Whereas, in 2022 from I-NAMHS data, the value increased 26.7% for anxiety disorders and total mental disorders of 34.9%, especially among adolescents and students. This study aims to explore the eating behavior and mental health status of college students in Indonesia. This study employed a quantitative descriptive research design with a cross-sectional approach. The inclusion criteria for this study included college students in Indonesia from diploma/S1/S2 programs aged 16-30 years. The exclusion criteria for the study were research respondents who were diagnosed by a doctor with chronic diseases such as diabetes, kidney failure, heart disease, stroke, mental or psychiatric disorders. Quantitative research data collection used online questionnaires (DASS-21 and EBPQ) which were distributed to respondents using social media platforms. The sample size of the study was 549 people. The sample selection used the Convenience Sampling method. Data were analyzed using STATA. The study showed that 549 respondents from 32 provinces in Indonesia; 68 (12.39%) people experienced depression; 166 (30.24%) people experienced anxiety, and 37 (6.74%) people experienced stress. Stress, anxiety, and depression showed a significant relationship to emotional eating behavior, fast food planning, and skipping meals ($p<0.05$). This study can provide a deeper understanding of stress, anxiety, and depression that can affect eating behavior, so that it can be the basis for public education and interventions for healthier eating patterns to improve mental and physical health.

Keywords: eating behavior; mental health; students

1. Introduction

A sharp increase in mental health disorders has been reported among college students (Hernández-Torrano et al., 2020). Mental health includes emotional, psychological and social well-being that affects how a person thinks, feels and acts (Centers for Disease Control and Prevention 2019; World Health Organisation 2022). Mental health status has worsened recently due to the COVID-19 outbreak, which has led to increased levels of anxiety among students (Sundarasen et al., 2020). The 2018 Basic Health Research showed that the prevalence of mental health disorders in adolescents in Indonesia reached anxiety disorders of 9.8% and depression of 6% (Riskesdas, 2018). According to the Self-Reporting Questionnaire-20 (SRQ-20) from the 2023 Indonesian Health Survey, the prevalence of mental health problems in those aged 15 years and over in Indonesia showed a figure of 2%, and in Yogyakarta Special Province, it was 1.9%, approaching the national figure (RI, 2023). Research by I-NAHMS in 2023 showed that there were 5.5% of adolescents who experienced some mental disorders from 34.9% of adolescents who experienced mental health problems (Indonesia National Adolescent Mental Health

Survei, 2022). Students revealed that they were struggling to cope with the new way of learning that required them to be online for long hours to attend lectures and complete their assessments and assignments (Kotera, 2021; Mohamad et al., 2021). Changes in environment and food intake during the life phase are thought to be factors causing increased mental health problems among college students (Acharya et al., 2018; Demenech et al., 2021). Increased collaboration between researchers and a more holistic approach are needed to understand students' mental health issues (Hernández-Torrano et al., 2020). This study becomes a novel contribution by specifically examining the relationship between mental health status and eating behaviors among college students in Indonesia. This group of college students is still rarely studied in the existing literature, especially in the context of post-pandemic psychological challenges and dietary changes. This study fills an important knowledge gap in understanding the socio-behavioral dynamics that influence the well-being of college students in Indonesia by integrating national mental health prevalence data and student lifestyle changes. This study aimed to assess the eating behaviors and mental health status of college students. Previous studies have shown associations between various socio-demographic factors and dietary intake in college students (Abdel Wahed & Hassan, 2017; Acharya et al., 2018). The prevalence of mental health disorders in Indonesia in people aged 15 years and over from various sources shows a figure of 2% (RI, 2023) and 34,9% (Indonesia National Adolescent Mental Health Survei, 2022), so this study aims to find out how mental health problems occur in Indonesia and how they can affect eating behavior, especially in students.

2. Research Method

This study employed a quantitative descriptive research design with a cross-sectional approach (online questionnaire) with the population and sample of the study are college students from 33 provinces in Indonesia. This study was conducted from August 2023 to April 2024. The inclusion criteria for the first phase of this study were college students in Indonesia from diploma or undergraduate or postgraduate programs and were willing to become research respondents with an age range of 16-30 years. The exclusion criteria for this study were individuals diagnosed by a doctor of having chronic diseases such as diabetes, kidney failure, heart disease, stroke, mental or psychiatric disorders. The sample size of the study was calculated using the Krejcie-Morgan formula with a population of all students in Indonesia registered with *PDDIKTI (Pangkalan Data Perguruan Tinggi* - Higher Education Database*)* in 2022, namely 6,349,841 and 549 people were obtained from a minimum sample size of 406 people. The sample selection used the Convenience Sampling method. Quantitative research data collection used an online questionnaire distributed to respondents using social media platforms such as WhatsApp, Telegram, Twitter, Instagram, and Facebook. Mental health status was measured using the Depression Anxiety Stress Scales (DASS-21) questionnaire and eating behavior was measured using the Eating Behavior Pattern Questionnaire (EBPQ). The operational definition for the eating behavior variable is a condition that describes a person's behavior towards eating manners, eating frequency, eating patterns, eating preferences and food selection measured using the EBPQ questionnaire which consists of aspects of emotional eating, healthy eating habits, eating out habits, eating sweets, skipping meals, consuming snacks, eating low fat and planned eating. The questionnaire was taken from internationally standardized research and translated into Indonesian (Schlundt et al., 2003). Data were categorized into two categories, namely good eating behavior (if above the average population score) and poor (if below the average population score). The operational definition for the mental health variable is a health status that includes emotional, psychological, and social well-being that affects how a person thinks, feels and acts reflected in the level of depression, stress and anxiety. Data were categorized into 2 categories, namely depressed (if the score is > 9), not depressed (if the score is 0-9); anxious (if the score is > 7), not anxious (if the score is 0-7); stressed (if the score is > 14)

and not stressed (if the score is 0-14). The research data were analyzed using STATA. Data collection was carried out online through a questionnaire using a google form containing questions related to eating behavior and mental health (depression, stress, anxiety) that could be filled in by students. Students who were willing to take part in the study then filled out two types of questionnaires. The first questionnaire was a modified EBPQ eating behavior questionnaire that had been tested for validity and reliability. The second questionnaire was the DASS-21 questionnaire to measure depression, stress, and anxiety with a total of 21 questions. This research has received approval from the ethics committee of Universitas Aisyiyah Yogyakarta with the ethical eligibility number No. 2635/KEP-UNISA/III/2023.

3. Results and Discussions

3.1.Sociodemographic Characteristics of Respondents

The results of the univariate test to see the frequency distribution and socio-demographic characteristics of the respondents can be shown in Table 1.

Table 1. Respondent Characteristics

Characteristics	Total n (%)	Depression		Anxiety		Stress	
		Yes n= n(%)	No n= n(%)	Yes n= n(%)	No n= n(%)	Yes n= n(%)	No n= n(%)
Age							
<23 Years	520 (94,7)	63 (12,1)	457 (87,9)	157 (30,2)	363 (69,8)	35 (6,7)	485 (93,3)
≥23 Years	29 (5,3)	5 (17,2)	24 (82,8)	9 (31,0)	20 (69,0)	2 (6,9)	27 (93,1)
Gender							
Man	78 (14,2)	10 (12,8)	68 (87,22)	20 (25,6)	58 (74,4)	5 (6,4)	73 (93,6)
Woman	471 (85,8)	58 (12,3)	413 (87,7)	146 (31,0)	325 (69,0)	32 (6,8)	439 (93,2)
Tribe							
Javanese	312 (56,8)	42 (13,5)	270 (86,5)	93 (29,8)	219 (70,2)	25 (8,1)	287 (91,9)
Kalimantan	43 (7,8)	6 (13,9)	37 (86,1)	15 (34,9)	28 (65,1)	3 (6,9)	40 (93,1)
Riau Islands	14 (2,6)	6 (42,9)	8 (57,1)	7 (50,0)	7 (50,0)	1 (7,1)	13 (92,9)
Nusa Tenggara	25 (4,6)	1 (4,0)	24 (96,0)	5 (20,0)	20 (80,0)	0 (0,0)	25 (100,0)
Papua	12 (2,2)	1 (8,3)	11 (91,7)	1 (8,3)	11 (91,7)	0 (0,0)	12 (100,0)
Sulawesi	65 (11,9)	6 (9,2)	59 (90,8)	24 (36,9)	41 (63,1)	4 (6,1)	61 (93,9)
Sumatra	78 (14,2)	6 (7,7)	72 (92,3)	21 (26,9)	57 (73,1)	4 (5,1)	74 (94,9)
University							
State University	59 (10,8)	3 (5,0)	56 (95,0)	14 (23,7)	45 (26,8)	0 (0,0)	59 (100,0)
Polytechnic	44 (8,0)	6 (13,6)	38 (86,4)	13 (29,5)	31 (70,5)	1 (2,3)	43 (97,7)
Private University	446 (81,2)	59 (13,2)	387 (86,8)	139 (31,2)	307 (68,8)	36 (8,1)	410 (91,9)
Education							
Diploma	34 (6,2)	7 (20,6)	27 (79,4)	12 (35,3)	22 (64,7)	1 (2,9)	33 (97,1)
S-1	514 (93,6)	60 (11,7)	454 (88,3)	153 (29,8)	361 (20,2)	36 (7,0)	478 (93,0)
S-2	1 (0,2)	1 (100,0)	0 (0,0)	1 (100,0)	0 (0,0)	0 (0,0)	1 (100,0)
Allowance							

Characteristics	Total n (%)	Depression		Anxiety		Stress	
		Yes n= n(%)	No n= n(%)	Yes n= n(%)	No n= n(%)	Yes n= n(%)	No n= n(%)
<1 Million	228 (41,5)	32 (14,0)	196 (85,0)	72 (31,6)	156 (68,4)	19 (8,3)	209 (91,7)
≥1 Million	321 (58,5)	36 (11,2)	285 (88,8)	94 (29,3)	227 (70,7)	18 (5,6)	303 (94,4)
Religion							
Hindu	2 (0,4)	0 (0,0)	2 (100,0)	0 (0,0)	2 (100,0)	0 (0,0)	2 (100,0)
Islam	532 (97,0)	65 (12,2)	467 (87,8)	161 (31,3)	371 (69,7)	36 (6,8)	496 (93,2)
Nasrani	15 (2,8)	3 (20,0)	12 (80,0)	5 (33,3)	10 (66,7)	1 (6,7)	14 (93,3)
Status							
Single	546 (99,5)	68 (12,4)	478 (87,6)	165 (30,2)	381 (69,8)	37 (6,8)	509 (93,2)
Married	3 (0,5)	0 (0,0)	3 (100,0)	1 (33,1)	2 (66,7)	0 (0,0)	3 (100,0)
Total	**549 (100%)**	**68 (12,38%)**	**481 (87,61%)**	**166 (30,24%)**	**383 (69,76%)**	**37 (6,74%)**	**512 (93,26%)**

Source: Primary Data, 2023

The results showed that the depression rate of the total student respondents was 12.38%; the anxiety rate was 30.24%, and the stress rate was 6.74%. These results differ from the results of the 2023 Indonesian Health Survey and the results of research by the Indonesian National Adolescent Mental Health Survey (I-NAMHS) in 2022 because they used different instruments. In the 2023 SKI, the respondents were over 15 years old and were not specifically students. The research by I-NAMHS was conducted on respondents aged 10-17 years and used the Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-5) diagnostic instrument, while this study used the DASS-21 and focused on students. There has been no similar research previously targeting students throughout Indonesia. Respondent characteristics show that most respondents are under 23 years old (94%); most are female (85.8%); most come from Java (56.8%); most come from private universities (81.2%); most come from undergraduate students (93.6%); most have allowance above IDR 1,000,000; most are Muslim (97%); and most are unmarried (99.5%). At the age of under 23 years, the proportion of respondents experiencing anxiety shows the highest number, followed by depression, and the smallest is stress. Most respondents are female; and the proportion experiencing anxiety is the highest, followed by the proportion of depression and stress. Most respondents come from Java followed by Sumatra, Sulawesi, and Kalimantan. The anxiety rate is generally experienced the most by undergraduate students and comes from private universities. Respondents with allowance above IDR 1,000,000 tend to experience more anxiety, depression, and stress. Respondents aged 18 to 22 years has a higher prevalence of depression, anxiety and stress compared to participants aged 23 years, because at that age, students struggle to adapt to university life, which involves independent decision-making and time management (Quehl et al., 2017). The results also show that women have a higher prevalence of mental health problems compared to men. This result is in line with previous studies, which explained that female participants are more susceptible to mental illness because they have softer feelings (Kotera et al., 2021).

Normality test using Shapiro Wilk test was conducted to determine whether the data were normally distributed on mental health problem variables including stress, anxiety, depression, and eating behavior including the tendency to consume low-fat foods, emotional eating, choosing sweet snacks, cultural

behavior of consuming healthy foods, planning fast food, and skipping meals. The test results showed that only the eating behavior data skipping meals were normally distributed (p value> 0.05). Hence, variables that were not normally distributed were then tested using the Spearman rank correlation test (non-parametric) to determine the relationship between mental health problem variables and to determine the direction and strength of the relationship.

3.2.Relationship between Mental Health Problems and Eating Behavior

The results of the bivariate test using the Spearman rank statistical test on the stress and eating behavior variables are shown in Table 2.

Table 2. Results of Spearman Rank Correlation Test of Mental Health Problems (Stress, Anxiety, Depression) with Eating Behavior

Stress Level	Low-fat food		Emotional food		Sweet snacks		Cultural behaviour / living environment/ healthy eating		Fast food meal planning		Skipping meals	
	p - value	r	p-value	r	p-value	r	p-value	R	p-value	r	p-value	r
Stress	0.1834	-0,0556	0.0001*	0.2886	0.0016*	0.131	0.0519	-0.0811	0.0001*	0.2189	0,0001*	0.2435
Anxiety	0,035*	-0.0880	0,0001*	0.2485	0.0151*	0.1013	0.1365	-0.0622	0.0001*	0.2273	0.0001*	0.2268
Depression	0.0162	-0.1003	0.0001*	0.2220	0.0727	0.0749	0.0608	-0.0782	0.0001*	0.2789	0.0001*	0.2365

Description: * has a significant relationship
Source: Primary Data, 2023

Based on the results of the Spearman rank statistical test on the stress and eating behavior variables, it shows that from the emotional eating category (p = 0.0001), the tendency to consume sweet snacks (p = 0.0016), planning fast food meals (p = 0.0001), and skipping meals (p = 0.0001) shows a significant relationship with a positive correlation direction. These results indicate that the higher the stress level, the higher the behavior of student respondents to consume sweet snacks, plan to eat fast food, and skip meals. However, in the variables of low-fat food consumption, and cultural/environmental behavior for healthy eating, there is no significant relationship with stress levels in student respondents. However, if considering the r correlation of the two variables, it leads to a negative correlation. This means that there is a tendency for the higher the stress level in student respondents, the lower the tendency to choose low-fat foods and undergo cultural/environmental behavior for healthy eating. Furthermore, the test results on the variables of anxiety and eating behavior showed a significant relationship in the consumption of low-fat foods (p = 0.035), emotional eating (p = 0.0001), the tendency to consume sweet snacks (p = 0.0151), planning fast food meals (p = 0.0001), and skipping meals (p = 0.0001). The direction of the relationship between anxiety and low-fat foods showed a negative correlation; and a positive direction of the relationship in the aspects of emotional eating, sweet snacks, fast food planning, and skipping meals. This shows that the higher the level of anxiety, the higher the behavior of student respondents to eat emotionally, consume sweet snacks, planning fast food, skip meals, and the lower the behavior to consume low-fat foods.

The correlation test on depression variable with behavior showed significant relationship on emotional eating component (p=0.0001), planning fast food meal (p=0.0001), and skipping meal (p=0.0001) with positive relationship direction. This result proves that higher level of depression, higher emotional eating behavior, fast food meal planning, and skipping meal.

The mechanism when an individual experiences stress, the body will respond by dealing with the stress. The mechanism of acute stress effects begins as soon as an individual encounters a stressor, the sympathetic nervous system immediately responds by activating the adrenal medulla to release catecholamines, namely epinephrine (adrenaline) and norepinephrine (noradrenaline). These hormones cause an increase in heart rate, blood pressure, and blood flow to skeletal muscles, and increase blood glucose through glycogenolysis and gluconeogenesis. In addition, there is dilation of the bronchioles and pupils, and decreased digestive activity, all of which serve to prepare the body for a rapid response to the threat (Ghasemi et al., 2024). In addition, when a person experiences stress, the hypothalamus releases corticotropin-releasing hormone (CRH), which stimulates the anterior pituitary to secrete ACTH. ACTH then triggers the adrenal cortex to produce glucocorticoids, primarily cortisol. Cortisol has an orexigenic (appetite-increasing) effect by stimulating the expression of orexigenic neuropeptides such as neuropeptide Y (NPY) and agouti-related peptide (AgRP) in the hypothalamus. In addition, cortisol increases the production of ghrelin, a hormone that stimulates appetite, and can cause resistance to leptin, a hormone that normally suppresses appetite. Ghrelin, known as the "hunger hormone," is produced by cells in the stomach and increases before meals. Stress, both acute and chronic, can increase ghrelin levels, which serve as a coping mechanism by reducing anxiety and increasing food intake. Increased ghrelin during stress also contributes to increased emotional eating behaviors and preferences for high-calorie foods. Leptin, a hormone produced by fat cells, functions to suppress appetite and increase energy expenditure. However, chronic stress and elevated cortisol levels can lead to leptin resistance, where the brain becomes less responsive to satiety signals sent by leptin. This leads to increased food intake and contributes to weight gain. The interaction between ghrelin, leptin, and cortisol creates a cycle in which stress increases appetite through increased ghrelin and leptin resistance, while cortisol reinforces preferences for high-calorie foods. This combination can lead to overeating, particularly of foods high in fat and sugar, in response to stress (D, 2016).

Individuals who experience stress tend to choose to consume processed foods that are high in calories and fat based on research results and supported by previous research in Brazil (Santana et al., 2021). Eating high-fat, high-energy foods is considered a form of stress management, but although eating high-fat, high-energy foods does not directly solve the cause of stress or problems, it can create a feeling of well-being (Vidal et al., 2018). Previous research found that 110 teenagers (87.4%) consumed fatty foods. The foods commonly consumed in this study were spring rolls, fried potato sticks, fried bananas, stuffed tofu, otetsushi, and fried sweet potatoes, Moonshine, Sausages, Meatballs and Hamburgers (Sulistyadewi & Masitah, 2020). Previous research in Malaysia showed that respondents who experienced depression, anxiety, and stress, felt happy after consuming sweet foods such as chocolate, ice cream, cakes and sweet drinks (Muniandy et al., 2024a). This is because sugar or simple carbohydrates are associated with tryptophan synthesis. High levels of CHO will increase tryptophan levels, which will increase serotonin levels (Jenkins et al., 2016). Serotonin is a neurotransmitter associated with feelings of well-being (feeling happy) (Salehi et al., 2024). This sequence of events explains the reason for feeling happy after consuming sweet/simple CHO food. In addition, student respondents of the research in Malaysia also tend to choose spicy food, caffeinated drinks, and salty food. Salty food which is generally also found in fast food according to respondents can increase focus in studying in relation to cortisol excretion. Spicy food and caffeinated drinks are stated to be able to release stress and anxiety in students in relation to endorphin hormone secretion (Muniandy et al., 2024b).

Symptoms of depression, anxiety, and stress are mental health conditions that are closely related to changes in eating behavior such as decreased appetite and overeating. Several studies using instruments that measure emotional eating have shown a link between binge eating disorders in response to depression and anxiety. This is because individuals who experience symptoms of depression experience

impaired function in coping with their condition and lead to eating disorders to reduce the negative mood they experience. In addition, stress also results in physiological changes, such as increased cortisol secretion, which can stimulate the sensation of hunger an can also cause paradoxical hypoactivation of the Hypothalamic Pituitary Axis (HPA) and atypical neurovegetative symptoms of increased appetite (Al-Musharaf, 2020; Rohmah, 2022) . Other studies also show that overeating behavior, consumption of sweet foods and drinks, and low-fiber foods tend to be higher in workers who work for long periods of time, such as students who have stress from workloads and academic activities (Mansouri et al., 2022).

4. Conclusion

The higher the stress level in students, the lower the low-fat eating behavior and the higher the eating behavior of consuming sweet snacks, planning to consume fast food, and skipping meals (Zulkarnain & Muniroh, 2023). The higher the level of anxiety in students; indicates the lower the behavior of eating low-fat foods and the higher the emotional eating behavior, the tendency to consume sweet snacks, fast food planning, and skipping meals. In the depression variable, it is concluded that the higher the level of depression indicates the higher emotional eating behavior, fast food planning, and skipping meals. Individuals with mental health problems tend to have unhealthy eating behaviors such as emotional eating, consuming sweet foods, choosing fast food (Zahrah et al., 2023), and skipping meals. This research can provide a deeper understanding of how stress, anxiety, and depression can affect eating behavior, so that it can be the basis for public education and healthier eating pattern interventions to improve mental and physical health.

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