The relationship between stress levels and the habits of consuming high-sugar food among undergraduate students

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ABSTRACT

The SKI 2023 survey revealed that 81% of students consume foods high in sugar, while a preliminary study found that severe academic stress increases by 34.2% among students aged 21 to 25. High-sugar food consumption is believed to help reduce stress temporarily. This study aims to investigate the relationship between stress levels and the consumption of high-sugar foods among students at Universitas 'Aisiyiyah Yogyakarta (UNISA). This analytical observational research employed a cross-sectional design. The sample consisted of 168 students aged 18 to 25 selected using purposive sampling. Data were obtained through the UNISA-UiTM (Universitas 'Aisyiyah Yogyakarta and Universitas Teknologi MARA) 2023 Mental Health research. Respondent characteristics were collected using a structured questionnaire, high-sugar food consumption habits were assessed using the Q-FFQ, and stress levels were measured with the DASS questionnaire. Data collection was conducted both online and offline. Spearman rank correlation analysis was performed, with a significance threshold of $p<0.05$. The findings revealed that 39.2% of students experienced stress, while 52.98% had a habit of consuming high-sugar foods. However, the analysis showed no statistically significant relationship between stress levels and high-sugar food consumption ($p=0.11$). While no direct correlation was established, high-sugar food consumption remains a concern due to its potential health impacts. Students are encouraged to adopt healthier dietary habits by monitoring their sugar intake, reading nutritional labels, and limiting high-sugar foods to 1–3 times per week. Promoting awareness of balanced diets and stress management techniques may help improve students' mental and physical well-being.

1. Introduction

Students as agents of change, social control, resilient next generations, and role models have an important role in society [1]. In addition, students also have various activities in lectures, starting from assignments given by lecturers and other assignments listed in the Tri Dharma of Higher Education. Many students avoid academic tasks by delaying their work because they feel afraid and confused, thus causing stress [2]. Stress conditions in college students result in unhealthy eating changes such as eating too little, overeating, eating fatty foods or containing sugar [3]. Eating is one of the ways for students to cope with stress or coping stress [4]. Students who experience high stress often consume sugar [5]. In addition, the recommended daily sugar consumption according to WHO

in 2015 is 10% of total energy (200 kcal) or equivalent to 10 teaspoons/person/day (50 grams/person/day) of sugar. Types of foods that are high in sugar such as biscuits, cookies, candies, chocolate, brownies, cakes, sweet bread, fruit sandwiches, pies, cobblers, pastries, donuts, and ice cream [6–8].

Based on the estimated average intake of added sugar worldwide by age, children aged 1-4 years have a prevalence of 8%, children aged 4-12 years have a prevalence of 11%, children aged 13-18 years have a prevalence of 13%, adults aged 19-64 years have a prevalence of 10%, and those over 65 years old have a prevalence of 8% [9]. The 2023 Indonesia Health Survey (SKI) reported that among residents over 3 years, 33.7% consume sweet foods more than once per day, 56.28% consume sweet foods 1-6 times per week, and 10.1% consume sweet foods less than three times per month. Among respondents aged 20-24 years, 58.9% consumed sugary foods 1-6 times per week, more than those aged 15-19 years and 25-29 years [10]. Additionally, a study at the Faculty of Medicine of Sam Ratulangi University found that 81% of students frequently consume sugary foods and drinks, and a study at the University of 'Aisyiyah Yogyakarta showed that 50% of students often consume foods high in sugar [11].

The habit of consuming high-sugar foods can have various health impacts, such as obesity, hypertension, cardiovascular disease, and diabetes [12–15]. Factors that contribute to the consumption of high-sugar foods include sleep disturbances, menstruation, and stress. Short sleep duration leads to increased secretion of the hormone cortisol, which promotes the consumption of fast food or high-sugar foods [16]. During menstruation, low levels of the hormone estradiol affect insulin sensitivity, influencing the consumption of certain foods, especially chocolate and sweet foods [17,18].

One significant factor is stress, which makes individuals feel frustrated, angry, or nervous. Stress is a natural human response that helps us overcome challenges and threats [19]. According to the Directorate of Prevention and Control of Non-Communicable Diseases (P2PTM) of the Ministry of Health of the Republic of Indonesia, symptoms of stress include restlessness, pale complexion, heart palpitations, difficulty falling asleep or poor sleep, decreased appetite or overeating, irritability, difficulty concentrating, and physical complaints like headaches, abdominal pain, ulcers, and excessive sweating [20]. Stress is characterized by difficulty relaxing and can be accompanied by emotions such as anxiety and irritability [19]. It occurs due to several factors, including psychological, academic, biological, lifestyle, social, and socioeconomic factors [21–25].

During stressful conditions, the hypothalamus will secrete CRH (Corticotropin-Releasing Hormone), cortisol, and glucocorticoids, which can affect appetite as well as satiety and hunger [26]. Glucocorticoids will contribute to a decrease in insulin's ability to inhibit Neuropeptide Y (NPY)/Agouti-Related Protein (AGRP) in the arcuate nucleus of the hypothalamus (ARC), which has the opposite effect of decreased appetite. An excess of glucocorticoids will lead to an increase in appetite. It can also affect eating intake and increase "comfort food" preferences [27]. Usually, comfort foods contain high calories, one of which is high-sugar or sweet foods [28]. Types of high-sugar foods such as: candies, cakes, cookies, brownies, pies, cobblers, sweet breads, pastries, donuts, and ice cream [6]. Consuming and digesting high-sugar foods can have a feedback effect that dampens stress responses and emotions [29].

A 2020 study in Malaysia showed that college students with high-stress levels consumed sugar more frequently than those with low-stress levels. There is also a relationship between high stress and the frequency of sugar consumption among students [5]. Research in Kotamobagu City, North Sulawesi, showed that stress levels decrease with age, but academic stress levels peak at ages 15-20 [30].

Various studies have examined the relationship between stress levels and the consumption of high-sugar foods. This research has been conducted in Malaysia [5], Bekasi [31], and Purwokerto [32]. The study in Purwokerto found no significant relationship between stress levels and the habit of consuming high-sugar foods. Similarly, research in Bekasi found only a very weak correlation between stress levels and added sugar consumption behavior. However, the study in Malaysia reported a significant relationship between stress levels and the consumption of sugary foods. These mixed results highlight ongoing debates regarding the link between stress and high-sugar food consumption. This study aims to investigate this relationship further, contributing to a clearer understanding of the topic. The findings are hoped to enhance scientific knowledge and provide valuable insights for promoting healthier dietary habits and stress management strategies.

2. Method

This study is a quantitative research project with an observational analytical design utilizing a cross-sectional approach. The independent variable is the stress level, while the dependent variable is the habit of consuming high-sugar foods. The data source comprises secondary data from research conducted by Agil Dhiemitra Aulia Dewi, S.Gz., MPH was obtained indirectly by the researcher. Data collection involves reviewing results from the 2022-2023 UNISA-UiTM Mental Health Research under ethics approval number 2635/KEP-UNISA/III/2023. The study's subjects are active students at the University of 'Aisyiyah Yogyakarta, aged 18-25 years, with 168 participants. The sampling method used is purposive sampling, which evaluates the population and excludes those unsuitable for the study. Inclusion criteria consist of students at the University of 'Aisyiyah Yogyakarta who are 18-25 years old. Exclusion criteria include students who are menstruating/pregnant, have a history of diabetes mellitus, or are on a sugar intake restriction diet.

The data taken includes (1) Characteristics of respondents, (2) Stress level measured by the DASS-21 questionnaire, and (3) Habits of consuming high-sugar foods measured by Q-FFQ. The respondents' characteristics data instrument used a structured questionnaire containing student names, ages, genders, sleep disorders, and pocket money. The stress level instrument uses the DASS-21 questionnaire. The questionnaire contains 21 questions, 7 of which are questions to find out the level of stress, including (1) I feel that I become angry because of trivial things, (2) I tend to overreact to a situation, (3) I feel like I've spent a lot of energy when I'm feeling anxious, (4) I'm feeling restless, (5) I find it difficult to relax, (6) I find it challenging to be patient in dealing with distractions from what I'm doing, (7) I feel that I'm irritable. Filling out the questionnaire by looking at the questions and answering by choosing the four answer options provided, namely: (1) 0: Doesn't suit me at all, or never, (2) 1: Suits me to some degree, or sometimes, (3) 2: Suits me to a conceivable extent, or quite often, (4) 3: Fits me very much, or often [33,34]. Categorizing stress levels is adapted from S.H. Lovibond & Lovibond (1995) in Caetano et al. (2017), the score obtained is multiplied by 2 and categorized into 2; normal (score 1-14) and stress (score >15).

The habit of consuming high-sugar foods was measured using the Q-FFQ questionnaire instrument. The foodstuff listed in the Q-FFQ has been modified based on the subject taken. Here is a list of high-sugar foods; (1) Bika Ambon Cake, (2) Cheese Sponge, (3) Brownies, (4) Donuts, (5) Layer Cake, (5) Mud Cake, (6) Bowl Cake, (7) Legit Layer Cake, (8) Surabaya Layer Cake, (9) Molen Banana, (10) Putri Ayu Cake, (11) Chocolate Sweet Bread, (12) Cheese Martabak, (13) Peanut Chocolate Martabak. Scoring on the frequency of consumption includes: (1) >3 times per day is given a score of 50 (2) 1 time per day is given a score of 25 (3) 3-6 times per week is given a score of 15 (4) 1-2 times per week is given a score of 10 (5) 2 times a month is given a score of 5 (6) never given a score of 0. Categorize the habit of consuming high-sugar food, which is said to be frequent (> median Q-FFQ) and said to be rare (< median Q-FFQ) [35].

The questionnaire was distributed online using Google Forms and shared through social media platforms like Instagram and WhatsApp. Specifically, it was promoted via Instagram Stories, WhatsApp Groups, and WhatsApp Stories. Clear instructions were provided on the form to guide respondents in completing it. If respondents encountered difficulties, enumerators were available to assist with direct messages. For data analysis, bivariate analysis was performed using the Spearman Rank test, with a significance level set at $p < 0.05$.

3. Results and Discussion

3.1. Results

The total sample in this study was 168 respondents. Based on the research results, the respondents' characteristics in the form of gender, age, stress level, habits of consuming high-sugar food, monthly allowance, and sleep disorders are shown in Table 1.

Table 1. Characteristics of Respondent

Characteristic Respondent		Frequency		Min	Max	Median	Mean	±SD
		f	*%*					
Gender	Male	11	6.55					
	Female	157	93.45					
Ages (years)	18-20	128	76.19	18	24	20	19.64	±1.28
	21-25	40	23.81					
Monthly allowance	<Rp 1.000.000	98	58.33	100.000	15.000.000	1.000.000	1.273.988	±1.362.560
	Rp 1.000.000 – Rp 3.000.000	66	39.29					
	>Rp 3.000.000	1	2.38					
Sleep disorders	Yes	82	48.81					
	No	86	52.19					
Stress levels	Stress	66	39.29	1	19	6.5	7.11	±4.14
	Normal	102	60.71					
Habits of consuming high-sugar food	Often	89	52.98	5	525	70	99.22	±100.35
	Rarely	79	47.02					

Table 1 shows the demographic and behavioral characteristics of the study sample. Most respondents were women (93.45%), with an average age of 19.64 ± 1.28 years, predominantly between 18–20 years (76.13%). The average monthly allowance of respondents was Rp 1,273,988 ± 1,362,560, with 58.33% receiving less than Rp 1.000.000 per month. Additionally, 48.81% of respondents reported experiencing sleep disorders. The average stress level among students was 7.11 ± 4.14, with 39.29% classified as experiencing stress. Regarding dietary habits, the average frequency of high-sugar foods was 99.22 ± 100.35, with 52.98% of students frequently consuming such foods.

Table 2. List of High-Sugar Food Consumption

High-sugar Food list	Frequency	
	f	%
Donut	137	81.55
Brownies	128	76.19
Chocolate sweet bread	122	72.62
Steamed sponge	110	65.48
Banana molen	104	61.90
Penauts chocolate martabak	102	60.71
Cheese martabak	95	56.55
Cheese sponge	92	54.76
Layer cake	85	50.60

Table 2 shows that the food most consumed by students is donuts, as much as 81.55%, followed by brownies, as much as 76.19%.

Table 3. Gender, Ages, Habits of Consuming High-Sugar Food and Stress Level

Variable		Stress level n (%)	
		Normal (Score 0–7)	*Stress* (Score ≥ 8)
Gender	Male	9 (81.82)	2 (18.18)
	Female	93 (59.24)	64 (40.76)
Ages (years)	18-20	78 (60.94)	50 (39.06)
	21-25	24 (60.00)	16 (40.00)
Habits of consuming high-sugar food	Often	49 (55.06)	40 (44.94)
	Rarely	53 (67.09)	26 (32.91)

Table 3 shows that the level of stress in women (40.76) is higher than that of men (18.18). The stress level for the age range of 18-20 years with 21-25 years is 0.94%. Respondents who often consume foods high in sugar have higher stress levels than those who rarely consume.

Table 4. The Relationship Between Stress Levels and The Habits of Consuming High-Sugar Food

Variable	Habits of Consuming High-Sugar Food	
	r	*p*
Stress Levels	0.12	0.11

Table 4 shows that the p-value for stress levels with high sugar food consumption habits is 0.11 > 0.05, which indicates that Ha is rejected and H0 is accepted. That is. There is no relationship between stress levels and the habit of consuming high-sugar foods.

3.2. Discussion

The significance value, as shown in Table 3 (p>0.05), indicates no relationship between stress levels and the consumption of high-sugar foods. The correlation coefficient for stress level and the habit of consuming high-sugar foods shows a very weak relationship (r=0.12). This finding aligns with research conducted in Purwokerto and Depok, which revealed a very weak relationship between stress levels and the consumption patterns of high-sugar and high-fat foods [31,32]. This contrasts with the results of research conducted in Malaysia, which found a relationship between stress intensity and the consumption of sweets or sugar [5]. However, the relationship between stress levels and the habit of consuming high-sugar foods tends to be in the same direction, meaning that the higher the student's stress level, the more often they consume high-sugar foods. Similarly, research

conducted in Purwokerto found that the stress level caused by consuming high-sugar foods has a one-way relationship; the higher the student's stress level, the more often they consume sweet foods [32].

The study results showed that 39.29% of students experience stress. When stressed, the hypothalamus secretes CRH, cortisol, and glucocorticoids, which affect appetite as well as feelings of fullness and hunger [26]. Glucocorticoids decrease insulin's ability to inhibit the neuropeptide Y/Agouti-related protein in ARC. Glucocorticoids decrease insulin's ability to inhibit neuropeptide Y/Agouti-related protein in the arcuate nucleus of the hypothalamus (ARC), leading to an increased appetite. This can also affect food intake and increase "comfort food" preferences [27]. Typically, comfort foods are high in calories, with high-sugar or sweet foods being one of the types [28]. After consuming and digesting high-sugar foods, there is a feedback effect that dampens stress responses and emotions [29].

The habit of consuming high-sugar foods can have several health impacts, including diabetes mellitus, obesity, and heart disease. Sugary foods contain a lot of calories that can lead to obesity. One of the factors causing obesity is the consumption of high-sugar foods. A study conducted in the city of Manado showed a positive correlation between the consumption of sweet foods and nutritional status [11]. Consumption of high-sugar foods increases the risk of weight gain and accumulation of body fat [51]. Severe obesity is linked to a higher risk of developing dyslipidemia, hypertension, type 2 diabetes, and cardiovascular disease [52]. Obesity is a significant risk factor for 85% of patients with type II diabetes mellitus [53]. People who consume high-sugar foods are at a greater risk of developing diabetes mellitus compared to those who do not [54]. Excessive consumption of high-sugar foods results in the body becoming resistant to insulin, causing a decrease in sensitivity to sugar levels. This condition is accompanied by the inability of muscles and fat tissue to increase glucose uptake, leading to higher blood sugar levels in the body [53]. Consumption of high-sugar foods can lead to obesity, high triglycerides, high blood sugar, and high blood pressure, all of which are risk factors for heart disease [55]. Frequent consumption of high-sugar foods can cause the body to become resistant to insulin. Insulin functions as a suppressor of the lipase enzyme. Nonesterified fatty acids (NEFAs) are released when insulin levels are low. This high release of NEFAs can lead to dyslipidemia [56].

There was no relationship between stress levels and other factors that could cause the habit of consuming foods high in sugar, such as sleep and menstrual disorders. Sleep disorders in students at 'Aisyiyah University Yogyakarta were experienced by almost half (48.81%) of the total students who were the subjects of the study. This condition is related to increased secretion of the hormone cortisol [16]. Short sleep duration is related to the high frequency of consumption of soft drinks and sugary foods. Poor sleep quality often consumes soda. soft drinks. fast food. instant noodles. and sweet foods [57]. Menstrual variables were controlled by excluding respondents who menstruated. During menstruation. the desire to eat high-sugar food increases [58]. Low estradiol hormones during menstruation will affect insulin sensitivity. which will be a factor in the desire to consume certain foods [17]. During menstruation. many women have changed their eating habits. mainly related to the consumption of chocolate and sweet foods [18].

One limitation of this study is that it focused solely on high-sugar foods and did not include high-sugar drinks. Currently, students are more mindful of consuming sweet foods because they know that these can lead to weight gain. However, they tend to pay less attention to the consumption of high-sugar drinks, which can have sugar content just as high as that of high-sugar foods.

4. Conclusion

Fostering healthier dietary habits among students is crucial for their overall well-being. Managing the consumption of high-sugar foods plays a significant role in preventing potential health risks associated with excessive sugar intake. Students are encouraged to cultivate mindful eating practices by checking nutritional labels to assess sugar content and limiting their consumption of high-sugar foods to 1-3 times per week. These measures can help students develop sustainable, balanced eating habits that align with long-term health goals. Future research should take a broader perspective by including high-sugar drinks as an additional variable to better understand total sugar consumption patterns. Furthermore, examining other contributing factors, such as psychological stress, lifestyle behaviors, and socioeconomic influences, could provide a more holistic view of how dietary habits are shaped and their impact on health. This expanded approach would help inform targeted interventions to support healthier lifestyle choices among students.

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Conflict of Interest

The authors report no conflicts of interest.

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