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THE RELATIONSHIP BETWEEN STRESS LEVELS AND CARBOHYDRATE INTAKE WITH THE NUTRITIONAL STATUS OF STUDENTS OF SMPN 22 SURAKARTA

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Abstract. Multifactorial elements, including psychological and dietary factors such as stress levels and carbohydrate intake, influence adolescent nutritional status. This study analyzed the relationship between stress and carbohydrate intake with the nutritional status of 9th-grade students at SMPN 22 Surakarta. Using a quantitative approach with a cross-sectional design, data were collected from 141 randomly selected students. Stress levels were measured using the DASS-21 questionnaire, carbohydrate intake was assessed through a 24-hour recall over three non-consecutive days, and nutritional status was evaluated via BMI-for-age (BMI/U) z-scores. Results indicated that students with poor nutritional status exhibited higher severe stress (28.6%) and lower carbohydrate intake (10.8%). Conversely, students with better nutritional status reported moderate stress (22.7%) and higher carbohydrate intake (25%). However, bivariate analysis revealed no statistically significant relationship between stress levels and nutritional status (p=0.714), nor between carbohydrate intake and nutritional status (p=0.676). These findings suggest that stress and carbohydrate intake alone are insufficient predictors of adolescent nutritional status. Further research should investigate other influencing factors such as physical activity, overall dietary patterns, sleep quality, and psychosocial environment to address adolescent nutritional health comprehensively.

Keywords: stress levels; carbohydrates; nutritional status; adolescents; high school.

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INTRODUCTION

According to the WHO (*World Health Organization*), adolescents are individuals in the transition period from children to adults, where there are generally signs such as physical, emotional, and financial changes (Mastorci et al., 2024; Organization, 2023). Then, according to the BKKBN (Population and Family Planning Agency), the age range of adolescents is between 10 and 18 years old (Waluyani et al., 2022). The nutritional status of adolescents is one of the supports for growth and development. Good nutritional status can be obtained from adequate and efficient nutrient intake to promote brain development, physical growth, and optimal health. Adolescents aged 13-18 require considerable energy because of a lot of physical activity. Consumption patterns affect the nutritional status categories experienced by adolescents. A balanced consumption pattern is very necessary to avoid adverse effects, such as being susceptible to diseases in adulthood (Widnatusifah et al., 2020).

Stress factors can influence the nutritional status of adolescents. When a person is stressed, they will generally eat more high-calorie foods, which can affect their nutritional status (Bitty et al., 2018). Emotional instability in adolescents results in negative emotional responses, namely *emotional eating*. Emotional people generally have an increased appetite, so calorie intake also increases. However, some people experience a decrease in appetite to the point of not eating at all when they feel stressed (Juzailah & Ilmi, 2022). Based on research Mardiyah et al. (2024), it is known that there is a relationship between stress and nutritional status (*p-value* = 0.013).

The factors of stress experienced by adolescents can also affect the consumption of carbohydrates (Bahar et al., 2023). Carbohydrates contain 4 kcal in each gram and can produce glucose in the blood when consumed to store food reserves in the body. If there is an imbalance between the intake of incoming food and the body's needs, it can result in nutritional problems. This is proven through research Fitriani (2020), which suggests a significant relationship exists between the level of carbohydrate intake adequacy and the nutritional status of adolescents.

Based on the data results Ministry of Health (2014), the prevalence of nutritional status (BMI/U) in all adolescents aged 13-18 years in Surakarta City showed the percentage of the categories of thin (6.52%), obese (11.65%), and obese (4.31%). In the prevalence of nutritional status (BMI/U) of adolescent boys aged 13-18 years according to the characteristics of Central Java Province, the percentage of the categories of very thin (2.74%), thin (9.05%), obese (10.00%), and obese (4.88%). Meanwhile, the percentage of women aged 13-18 years is in the categories of very thin (0.71%), thin (3.98%), obese (10.27%), and obese (4.18%).

The results of a preliminary survey of 186 students at SMPN 22 Surakarta showed that the prevalence of students' nutritional status was undernutrition (4.3%), overnutrition (11.29%), and obesity (8.6%). Based on the background presented and the prevalence data obtained, a study will be carried out to determine the relationship between stress levels, carbohydrate intake, and nutritional status (BMI/U) of SMPN 22 Surakarta students.

Previous research by Fitriani (2020) showed a significant relationship between the adequacy of carbohydrate intake and adolescent nutritional status. Meanwhile, research by Mardiyah et al. (2024) confirmed the relationship between stress levels and nutritional status with a p=0.013 p-value. Both highlighted the variables separately and showed an influence on nutritional status. However, not many studies integrate two variables at once - stress level and carbohydrate intake - in one study targeting the nutritional status of adolescents simultaneously, especially with a quantitative approach in the Surakarta area. The novelty of this study lies in examining the combined relationship between stress and carbohydrate

consumption on nutritional status based on body mass index by age (BMI/U), which has not been widely studied in the local context and with a junior high school population. This study also expands the context by involving direct measurement and quantitative analysis to produce more representative data.

This study aims to determine the relationship between stress levels and carbohydrate intake with the nutritional status of ninth-grade students at SMPN 22 Surakarta. This study is expected to provide a more comprehensive picture of the factors that influence the nutritional status of adolescents, so that it can be the basis for decision-making in nutrition intervention efforts in the school environment. The benefit of this study is that it will contribute to the world of education and health by developing strategies to improve the nutritional status of students by considering psychological aspects (stress) and carbohydrate consumption patterns. In addition, this study can also be a reference for the development of a more contextualized school-based nutrition education curriculum.

MATERIALS AND METHODS

The research design employed in this study is a quantitative analytic study using a cross-sectional approach, aimed at identifying the relationship between stress levels, carbohydrate intake, and nutritional status (BMI/U) among students of SMPN 22 Surakarta. This design was selected to collect and analyze data at a single time. The study population consisted of all grades VIII and IX students at SMPN 22 Surakarta. A random sampling technique was used to sample 141 students who met the inclusion and exclusion criteria. Ethical approval was obtained from the Health Research Ethics Committee (KEPK) FK UMS with 5548/B.1/KEPK-FKUMS/II/2025.

The data collection instruments included: (1) the DASS-21 questionnaire to measure students' stress levels, (2) a 24-hour food recall form repeated on three non-consecutive days to assess carbohydrate intake, and (3) anthropometric measurements (height and weight) to calculate Body Mass Index (BMI) adjusted by age (BMI/U) using z-score classification based on WHO growth standards. Before deployment, the DASS-21 instrument was tested for validity and reliability and met the required standards in previous literature. The nutritional status assessment was performed using a calibrated digital scale and stadiometer to ensure measurement accuracy. Nutrient intake data were processed using the NutriSurvey software to calculate daily carbohydrate consumption in grams and percentage adequacy.

The data analysis process was conducted in two stages: univariate analysis was used to describe the characteristics of respondents (e.g., frequency distributions of stress levels, carbohydrate intake categories, and nutritional status), while bivariate analysis (Spearman rank correlation test) was conducted to determine the relationship between independent variables (stress and carbohydrate intake) and the dependent variable (BMI/U). Statistical analysis was carried out using SPSS version 25, with a significance level of $p < 0.05$. The results were presented in tables and narrative form to facilitate interpretation and discussion.

RESULTS AND DISCUSSION

Respondent Characteristics

This research was conducted at SMP Negeri 22 Surakarta from February to March 2025. The number of respondents who participated in this study amounted to 141 students. The characteristic data of the respondents that have been obtained are as follows:

Table 1. Respondent Characteristics Data

Category	Frequency (n=141)	Percentage (%)
Gender		
Man	68	48,2
Woman	73	51,8
Age		
13-15 years old	125	88,7
16-18 years old	16	11,3
Stress Level		
Normal	42	29,8
Light	53	37,6
Keep	22	15,6
Heavy	17	12,1
Very heavy	7	5
Carbohydrate Intake		
Less	111	78,7
Enough	22	15,6
More	8	5,7
Nutritional Status		
Bad	1	0,7
Less	15	10,6
Good	100	70,9
More	18	12,8
Obesity	7	5

Source: Primary Data for February-March 2025

Based on Table 1, there were 68 male respondents and 73 female respondents. According to the Ministry of Health, there are two age categories: 13-15 and 16-18. The age group of 13-15 years is 125 people, and 16 people are aged 16-18. The highest stress level was in the mild stress category of 53 people (37.6%). Most of the carbohydrate intake category was less than or not meeting the needs of 111 people (78.7%), while the most nutritional status was good nutrition, with 100 respondents (70.9%).

A person's nutritional needs are determined according to age, gender, body size, physical activity, and metabolism. Nutrient intake and absorption, physical activity, and consumption patterns are internal nutritional status factors. As for external factors, they include economic factors and the eating habits of each individual (Rarastiti, 2023). Food consumption must be considered from quality to quantity because it can impact nutritional status. If a person's diet is good and regular, it will result in optimal nutritional status (Ramadhani et al., 2024).

According to research (Wilujeng et al., 2023), it is known that more female students experience stress compared to male students. There are differences in the response levels between the sexes to stress. Women's responses have a level of alertness that tends to be negative to stress due to the process of changing the hormones estrogen and progesterone, and an increase in the hormone cortisol. These hormones trigger feelings of anxiety, fear, and stress. Meanwhile, men can generally control the stress and competition they face, even considering that stress can be used as motivation or encouragement to be positive.

This is commensurate with the research of Akbar (2023), that there is a relationship between the influence of sex and the level of stress, with a value of p=0.017. Another study showed that gender had a relationship with stress levels, with a p=0.006 p-value in the study

Mahlithosikha & Wahyuningsih (2021), which says that women tend to prioritize feelings and emotions when dealing with a problem.

Carbohydrate intake data were obtained by distributing a 24-hour recall form for 3 non-consecutive days, which was then compared with the nutritional adequacy rate (AKG).

During the study, it was found that grade IX students of SMPN 22 Surakarta rarely ate breakfast and dinner at home. Most of them preferred to buy light snacks at school, so it can be said that the source of carbohydrates, such as rice, noodles, potatoes, etc., is only 1-2 units of exchange/day.

Nutrient intake in adolescents plays an important role, and an imbalance in the food consumed can inhibit adolescent growth. The majority of adolescents lack knowledge about balanced nutrition due to a lack of proper understanding. There are still many teenagers who do not understand the nutritional needs of adolescents, which leads to irregular diets and the selection of foods only according to what they are interested in (Ronitawati et al., 2022).

Adolescent nutritional status has many causative factors, such as eating habits, economic factors, and education level. The nutritional intake of adolescent boys and girls is differentiated according to needs because there are specific biological and physiological changes in the body. Nutritional fulfillment in adolescents is important to prevent the onset of chronic diseases in adulthood, such as diabetes, cancer, and cardiovascular disease. Adolescents who can meet their nutritional intake will experience good body development, such as sexual maturation and smooth linear growth (Margiyanti, 2021).

The Relationship between Stress Level and Nutritional Status of SMPN 22 Surakarta Students

The stress level data was tested using the Kolmogorov-Smirnov normality test and showed a result of p=0.000 (p < 0.05), meaning that the data was declared abnormal. A Spearman Rank test follows these smaller significance values because the data is abnormal. The results of the stress level test with the nutritional status of SMPN 22 Surakarta are as follows:

Table 2. Results of the Stress Level Relationship Test with the Nutritional Status of SMPN 22 Surakarta Students

	Nutritional Status												
Stress levels	**Bad**		**Less**		**Good**		**More**		**Obesity**		**Total**		**p *value***
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	
Normal	1	2,4	2	4,8	29	69	7	16,7	3	7,1	**42**	**100**	**0,714**
Light	0	0	8	15,1	40	75,5	3	5,7	2	3,8	**53**	**100**	
Keep	0	0	1	4,5	15	68,2	5	22,7	1	4,5	**22**	**100**	
Heavy	0	0	2	11,8	12	70,6	2	11,8	1	5,9	**17**	**100**	
Very heavy	0	0	2	28,6	4	57,1	1	14,3	0	0	**7**	**100**	
Total	**1**	**0,7**	**15**	**10,6**	**100**	**70,9**	**18**	**12,8**	**7**	**5**	**141**	**100**	

Table 3. Statistical Value of the Relationship between Stress Level and Nutritional Status of SMPN 22 Surakarta Students

Variable	**Min.**	**Max.**	**Median**	**p *value***
Nutritional Status (BMI/U)	-4.00	3,84	-0,63	0,714
Stress Level	2	36	10,81	

*Spearman *Rank Test*

Based on Table 2, it is known that respondents with an undernourished status have a very severe stress level of 28.6%, and respondents with a more nutritional status have a moderate level of stress, which is 22.7%. Table 3 shows that the value of p=0.714 (p > 0.05), meaning H0 is accepted, or it can be said that there is no significant relationship between the level of stress and the nutritional status of the students at SMPN 22 Surakarta. This is in line with research Lubna (2024), that there was no strong correlation between the stress level and the nutritional status of the students at the Mamba'ul Ma'arif Denanyar Jombang Islamic Boarding School, with a result of p=0.515 (p > 0.05). The absence of this relationship can occur because everyone has different abilities in overcoming a problem. Differences in the capacity of each person to meet the demands and pressures of the surrounding environment have the potential to be disruptive, dangerous, and uncontrollable. The cause of abnormal nutritional status is not only a stress factor, but also from other factors such as disease, knowledge, and socioeconomic conditions.

Other research belongs to Fathimatuzzahra et al. (2024), resulting in data p=0.850 (p > 0.05), which shows no relationship between stress levels and nutritional status of SMAN 1 Kandangan students. The extended learning hours with the whole day school system cause most students to miss breakfast and lunch. The increasing prevalence of snacks is also a supporting factor for students to feel full without good nutritional content for the body.

The above explanation is not in line with the research Octi et al. (2024), where the result was p=0.005 (p < 0.05), which means that there is a relationship between the stress level and adolescents' nutritional status at SMAN 1 Pekanbaru, where the nutritional status of the respondents, mainly measured, has a good nutrition category. There will be changes in appetite and diet in people with stress, such as *under-eating or over-eating,* so that it disturbs the balance of the body. The body will respond by triggering a physiological response related to food intake.

The Relationship between Carbohydrate Intake and the Nutritional Status of SMPN 22 Surakarta

Carbohydrate intake data was tested using *the Kolmogorov-Smirnov* normality test and showed a result of p=0.847 (p > 0.05), meaning that the data was declared normal. The Pearson test then follows this greater significance value due to normal data. The results of the carbohydrate intake test with the nutritional status of SMPN 22 Surakarta are as follows:

Table 4. Results of the Relationship Test between Carbohydrate Intake and Nutritional Status of SMPN 22 Surakarta Students

Carbohydrate Intake	**Nutritional Status**												**p *value***
	Bad		**Less**		**Good**		**More**		**Obesity**		**Total**		
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	
Less	1	0,9	12	10,8	77	69,4	15	13,5	6	**5,4**	**111**	100	0,676
Enough	0	0	3	13,6	17	77,3	1	4,5	1	**4,5**	**22**	100	
More	0	0	0	0	6	75	2	25	0	**0**	**8**	100	
Total	**1**	**0,7**	**15**	**10,6**	**100**	**70,9**	**18**	**12,8**	**7**	**5**	**141**	100	

Table 5. Statistical Value of the Relationship between Carbohydrate Intake and Nutritional Status of SMPN 22 Surakarta Students

Variable	**Min.**	**Max.**	**Mean ± SD**	**p *value***
Nutritional Status (BMI/U)	-4.00	3,84	-0,42±1,45	0,676

Carbohydrate Intake	70,39	232,16	135,41

*Uji *Pearson*

Table 4 shows that the respondents with less nutritional status have less carbohydrate intake (10.8%), and those with higher nutritional status have more carbohydrate intake (25%). Table 5 shows that the test results*, namely p=0.676 (p > 0.05),* indicate no significant relationship between carbohydrate intake and nutritional status of SMPN 22 Surakarta students. The results of this study show that the category of low carbohydrate intake (<50%) has the most respondents, namely 111 people. After being traced, many students are losing weight and have a habit of not eating breakfast, so carbohydrate intake results are categorized as inadequate. From the results, recall 24 hours, 141 respondents only ate staple foods 1-2 times/day with an average portion of rice of 1-2 centongs. Many prefer to eat snacks such as fried foods, biscuits, chips, etc., that do not have enough nutritional content for the body. According to Putri et al., (2022)His study also reported no correlation between carbohydrate intake and adolescent nutritional status, as shown by p=0.271 (p > 0.05).

Nutritional status is influenced by the amount and utilization of nutrients in the body. Carbohydrates are one of the macronutrients needed as the main source of energy. If the consumption is inadequate, it can affect their storage in the body because carbohydrates act as energy reserves in the form of glycogen and cannot be converted back into glucose in the blood. On the other hand, if the consumption of carbohydrates exceeds the capacity it should, it will be processed by liver cells into fat (Rarastiti, 2023).

Worth the research Faridi et al. (2023), the results of the statistical test obtained were p=0.349 (p > 0.05), so there was no significant relationship between carbohydrate intake and the nutritional status of high school teenagers in the South Jakarta Region. The amount of pocket money that school children have plays a role in students' purchasing power for food outside the home. In general, an increase in pocket money tends to make children consume their favorite foods more often without considering their nutritional content (Ronitawati et al., 2022).

CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that the respondents with poor nutritional status have very severe levels of stress (28.6%) and low carbohydrate intake (10.8%). Then, respondents with higher nutritional status had moderate levels of anxiety (22.7%) and higher carbohydrate intake (25%). The statistical analysis results showed no significant relationship between stress level and nutritional status of students, with a value of p=0.714. In addition, no significant relationship was found between carbohydrate intake and nutritional status of students, with a value of p=0.676.

Based on the results of this study, several suggestions can be given. For SMPN 22 Surakarta, it is hoped that it can provide more intensive socialization and education about the importance of balanced nutrition and children's social-emotional development, so that students can be more directed in maintaining their diet and managing the stress levels they face. In addition, providing tips on effective learning can also help students control their emotions. For SMPN 22 Surakarta students, it is expected that they will be able to maintain a healthy diet and try to manage personal emotions so that they do not feel pressured easily in dealing with the dynamics of the surrounding environment. As for the next researcher, it is recommended to enrich the literature review and conduct research with a more appropriate

design and treatment, so that the results of the hypothesis proposed can be proven more strongly.

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