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Factors Related to Diet Quality in Adolescent at Yadika 12 High School Depok

Faktor-Faktor yang Berhubungan dengan Kualitas Diet Remaja di SMA Yadika 12 Depok

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ABSTRACT

Background: Adolescents, a group with high nutritional needs, are facing the triple burden of malnutrition. Depok has the highest prevalence of overweight adolescents in Indonesia. Data shows an increase in the consumption of high-fat and high-sodium foods. Technological advancements have made foods more accessible, in 2020 Indonesia had the highest food delivery service usage in Southeast Asia. These factors may negatively impact adolescent diet quality, leading to health issues and higher risks of degenerative diseases.
Objectives: This study analyzes the factors related to diet quality among adolescents at Yadika 12 High School Depok.
Methods: This quantitative study used a cross-sectional design conducted at Yadika 12 High School Depok with 108 respondents selected using stratified random sampling. The dependent variable was diet quality, while the independent variables included the frequency of food delivery services usage, high-risk consumption habits, and nutrition knowledge. Diet quality was measured using the Diet Quality Index for Adolescents (DQI-A). Other variables were assessed using questionnaires and a Food Frequency Questionnaire. Bivariate analysis performed using the Spearman test.
Results: Bivariate analysis indicated that the frequency of food delivery services usage (r=-0.044, p-value=0.654) is not associated with diet quality. In contrast, high-risk consumption habits (r=-0.256, p-value=0.007) and nutritional knowledge (r=0.217, p-value=0.024) associated with diet quality.
Conclusions: High-risk consumption habits and nutrition knowledge are factors related to the diet quality of adolescents at Yadika 12 High School Depok. Interventions and implementing balanced nutrition guidelines and other nutritional information can be effective steps to improve the diet quality of adolescents.

INTRODUCTION

Adolescence is a transitional period from childhood to adulthood, spanning the ages of 10 to 19 years[1]. In Indonesia, adolescents represent 17% of the total population, which equates to 46 million individuals This demographic includes 48% females and 52% males. The majority of these adolescents reside in the provinces of Java, with West Java accounting for the highest concentration within this demographic [2]. As the largest age demographic in the country, adolescents are a primary focus and a crucial area for strategic human resource development[3]. During this phase, adolescents need a balanced nutritional intake for physical and cognitive growth, sexual maturation, and energy reserves[4]. Maintaining proper nutritional intake is essential for healthy growth[5]. Indonesian adolescents, who require balanced nutrition, are currently facing a triple burden of malnutrition including obesity, undernutrition, and micronutrient deficiencies[6]. There has been a significant increase in the consumption of high-fat and processed foods among adolescents, with a two-fold rise observed[7]. This change can negatively impact the quality of adolescents' diets, as high consumption of processed foods is associated with lower diet quality[8]. Diet quality is defined as an assessment of the quality of an individual's food intake and the balance between macro and micronutrient consumption[9]. For adolescents, diet quality, as measured by the Diet Quality Index for Adolescents (DQI-A), comprises three specific components: dietary quality, dietary diversity, and dietary equilibrium[10]. Diet quality is influenced by both internal and external factors, including gender, food intake, BMI, family income, parental education level, vegetarian diet, place of residence, age, socioeconomic status, and consumption of food away from home[11–13].

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Consumption of food-away-from-home is associated with lower diet quality[13]. Food-away-from-home refers to meals that are prepared or cooked outside of the home but can be consumed either at home or elsewhere [14]. These foods often contain high energy levels but tend to result in poor diet quality[13]. Currently, the purchases of food-away-from-home are supported by food delivery services, which allow people to access meals from outside their homes[15]. Food delivery services refer to the provision of food delivery from restaurants to the customer's home or preferred location[16]. In Southeast Asia, food delivery services experienced a 5% increase in 2022, generating revenues of $16.3 billion. Indonesia has emerged as one of the largest markets for food delivery services in Southeast Asia, followed by Singapore and Thailand, with total food delivery transaction value of $4.8 billion. Food delivery services are dominated by Grabfood (49%), Gofood (44%), and Shopeefood (7%)[17]. Jabodetabek region, which includes Depok, is the largest contributor to Indonesia's food delivery market, accounting for 70% of the total[18]. The use of food delivery services in Depok City is influenced by factors such as the social environment, advertising, and user satisfaction. Residents of Depok City commonly use delivery services to purchase fast food (35.1%), chicken dishes (33.9%), bubble tea (24.2%), coffee (23.0%), and cakes (22.6%)[19].

Fast food, snacks, and sweet beverages frequently ordered through food delivery services are classified as high-risk foods. Indonesian Basic Health Research defines high-risk foods as those that can heighten the risk of non-communicable diseases[20]. Data analysis from the Susenas 2000-2020 reveals a decrease in the consumption of vegetables and carbohydrate sources, along with an increase in the consumption of instant noodles and fried snacks[21]. This dietary shift could lead to a higher risk of degenerative diseases in the future. Eating habits and behaviors are influenced by a range of interrelated factors. Food and nutrition knowledge is a crucial factor that helps adolescents make informed food choices, understand the nutritional content of their food, and comprehend how nutrition impacts their health. However, most adolescents lack sufficient food and nutrition knowledge, which impairs their ability to choose and consume healthy[22]. A strong understanding of nutrition generally facilitates the effective implementation of balanced dietary practices[23]. As an individual's nutrition knowledge improves, their dietary patterns tend to become more favorable. Mistakes in food selection and insufficient nutrition knowledge can lead to nutritional issues, which are strongly associated with an individual's nutritional status[24].

Depok was selected as the research location because it is one of the cities in West Java Province with a low prevalence of adolescents with normal nutritional status. Conversely, it has the highest prevalence of adolescents with overweight/obesity[25]. Previous research indicates that 31% of students at Yadika 12 High School Depok are classified as obese, and other studies showed that 51.2% of these students frequently consume junk food[26,27]. Furthermore, a preliminary study revealed that 50% of 34 students from Yadika 12 High School Depok have high-risk consumption habits. Based on this data and existing issues, the author is conducting research to explore the factors related to diet quality among Adolescent at Yadika 12 High School Depok.

METHODS

This research uses an observational analytical design and a cross-sectional method with a quantitative approach. Data collection took place in February 2024 at Yadika 12 High School Depok. The study's population includes 233 students from Yadika 12 High School Depok, with a sample size of 108 students. The sample size was determined using the hypothesis test formula for the difference between two proportions. Sampling was conducted through stratified random sampling. The inclusion criteria for this study were active students at Yadika 12 High School Depok, aged 16-18 years, in good health and not in conditions that affect appetite or food intake, and willing to participate in all phases of the research. The exclusion criteria for this study are absence or failure to participate in any component of the research activities, withdrawal from the study, on specific diet programs, and individuals who are fasting.

The independent variables in this research include frequency of food delivery service usage, high-risk foods eating habits, and nutritional knowledge, while the dependent variable is diet quality. Primary data were gathered through interviews using a questionnaire form, a high-risk Food Frequency Questionnaire, and a 2x24-hours food recall form. The questionnaire form consists of informed consent, a characteristic questionnaire, a food delivery questionnaire, and a nutrition knowledge questionnaire. The characteristics questionnaire includes the following variables: age, gender, grade, allowance, father's education and employment status, mother's education and employment status, and parental income. The food delivery questionnaire is modified based on the research conducted by Harahap (2019), Putri (2020), and Salsabilla (2022). The nutrition knowledge questionnaire consists of 20 questions focused on Pedoman Gizi Seimbang. All the questionnaires have been validated for both reliability and validity. The high-risk Food Frequency Questionnaire includes food items related to high-fat foods, high-sugar foods, and high-sodium foods, to determine the high-risk food items consumed by respondents over the past month. The 2x24-hours food recall form will be analyzed to determine diet quality using the modified Diet Quality Index for Adolescents (DQI-A) based on the Pedoman Gizi Seimbang 2014. Further details about the components and calculations of the Diet Quality Index for Adolescents (DQI-A) are presented in Table 1.

The collected data will be analyzed, respondents' allowances were classified based on the average value, with those having an allowance above the average categorized as "high allowance," and those below the average categorized as "low allowance". Parental income is derived from the total earnings of employed parents and classified into four categories based on Statistics Indonesia. Diet quality was classified as "good" if the DQI-A score was greater than or equal to the median, and "low" if the DQI-A score was below the

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median. The frequency of food delivery service usage was classified as "rarely" if respondents utilized food delivery services less than three times per week, and "often" if they used these services three or more times per week. High-risk eating habits were categorized as "low risk" if the FFQ score was below the mean, and "high risk" if the FFQ score was equal to or greater than the mean. Nutrition knowledge scores obtained from the balanced nutrition knowledge questionnaire were divided into three categories, "good" for scores above 80, "moderate" for scores between 60 and 80, and "low" for scores below 60.

Secondary data, provided by Yadika 12 High School Depok, includes general information about the research location, the total number of students, and a list of students. The collected data is processed using Microsoft Excel or Google Sheets. Univariate and bivariate analyses were performed using SPSS software. Bivariate analysis is conducted using Spearman's test. The study has received ethical approval from Komisi Etik Penelitian Kesehatan Universitas Prima Indonesia (KEPK UNPRI) on February 27, 2024, under approval number 082/KEPK/UNPRI/11/2024.

Table 1. Overview of Diet Quality Index for Adolescents (DQI-A) calculation and component taken from Vyncke et al. (2013)

Food Group	Recommended Daily Intake	Dietary Quality Assessment Components				
*Recommended foods		Dietary Quality (DQ)= Amount consumed food items (g) x weighting factor Weighting factor: preference group = 1 intermediate group = 0 low nutrient, energy-dense group = -1	Dietary Diversity (DD)= 1 point for each food group if at least 1 serving consumed	Dietary Adequacy (DA)= *Actual intake/ minimum recommended Values >1 were truncated to 1	Dietary Excess (DEx) = (Actual intake – maximum recommended)/ maximum Values > 1 were truncated to 1 Values < 0 were truncated 0	Dietary Equilibrium (DE)= DA-DEx
1. Water	2150-2300					
2. Carbohydrates	5-8					
3. Animal protein	3					
4. Plant protein	3					
5. Vegetables	3					
6. Fruits	4					
7. Fat and oils	5-6					
Non-recommended foods						
8. Snacks and candy	<50					
9. Sugared drinks and juice	<300					
Score of components		$\frac{\Sigma(DQ)}{\Sigma gx100\%}$	$\frac{\Sigma(DD)}{7x100\%}$	$\frac{\Sigma(DA)}{7x100\%}$	$\frac{\Sigma(DEx)}{9x100\%}$	$\frac{\Sigma(DE)}{9x100\%}$
DQI-A A Score				$\frac{(DQ+DD+DE)}{3}$		

*Modified according to Pedoman Gizi Seimbang 2014.

RESULTS AND DISCUSSIONS

Respondent Characteristics

This study involved 108 respondents who are active students in grades X-XI at Yadika 12 High School Depok. The majority of the respondents are male, with 57 students (52.8%). Most respondents are 16 years old (57.4%) and are in grade XI (62%). The average allowance for respondents is IDR 27,515, with 52.8% having a high allowance. The highest level of education for the respondents' fathers is predominantly college graduates (59.3%), and all (100%) fathers are employed. The highest level of education for the respondents' mothers is also mostly college graduates (48.1%), and 67 mothers (62%) are not employed. Parental income is predominantly in the very high category (75%), which exceeds IDR 3,500,000.

Table 2. Distribution of Subjects Based on Individual Characteristics

Variable	Frequency (n)	Percentage (%)
Age		
16 years	62	57.4
17 years	44	40.7
18 years	2	1.9
Gender		
Male	57	52.8
Female	51	47.2

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Variable	Frequency (n)	Percentage (%)
Grade		
X	41	38
XI	67	62
Allowance		
Low	51	47.2
High	57	52.8
Father Education		
Did not complete high school	5	4.6
Completed high school	39	36.1
University	64	59.3
Father Employment Status		
Employed	108	100
Not Employed	0	0
Mother Education		
Did not complete high school	10	9.2
Completed high school	46	42.6
University	52	48.1
Mother Employment Status		
Employed	41	38
Not Employed	67	62
Parental Income		
Low	2	1.9
Medium	10	9.3
High	15	13.9
Very High	81	75.0

Diet Quality: The diet quality scores are derived from the conversion of 24-hour food recall data collected on both weekdays and weekends. The Diet Quality Index for Adolescents (DQI-A) consists of three components: dietary quality, dietary diversity, and dietary equilibrium. The dietary quality score based on DQI-A ranges from -33% to 100%, with higher DQI-A scores reflecting better diet quality[10]. In this study, the average diet quality score was 32.76%, with scores ranging from 13.38% to 58.72%. Respondents with scores above the median are considered to have good diet quality, comprising 50% of the sample.

Table 3. Average Scores by DQI-A Assessment Components

DQI-A Assessment Category	Score (%)
Dietary Quality (DQ)	7.55
Dietary Diversity (DD)	63.89
Dietary Equilibrium (DE)	26.91
DQI-A Score	32.76

Dietary Quality (DQ) is determined by assessing the energy density of the respondents' food intake. This involves dividing the energy content of the consumed food by its weight[28]. The results of the 2x24-hours food recall will be processed and estimated to determine the weight of food consumed by the respondents. The estimation process will utilize conversion units as well as other supplementary tools. In this study, the average DQ score among respondents was 7.55%. Dietary Diversity (DD) is measured by counting the number of recommended food groups consumed by the respondents[10]. According to Pedoman Gizi Seimbang 2014, these food groups include water, carbohydrates, animal protein, plant protein, vegetables, fruits, and fat[29]. The average DD score for respondents was 63.89%. The study found that respondents consumed an average of 4.5 out of the 7 recommended food groups, with the lowest consumption of fruits, vegetables, and plant proteins. This finding aligns with Vidyarini's research on adolescents in Jakarta, which reported a lower DD score of 56.35%[30]. Dietary Equilibrium (DE) is calculated by finding the difference between dietary adequacy and dietary excess. DE is obtained by subtracting dietary excess (DEx) from dietary adequacy (DA). DA is measured by comparing the actual portion consumed to the recommended portion. The average DA score in this study was 47.30%. Dietary excess is calculated by determining how much the intake exceeds the recommended portion. The average DEx in this study was 9.88%. As a result, the average DE score for respondents was 26.91%.

The dietary quality score (DQI-A) is calculated as the average of the DQ, DA, and DE scores, resulting in a DQI-A score of 36.29%. This is lower compared to the average score of 52.6% found in Miskiyah & Briawan studies of adolescents in Bogor City[31]. This lower dietary quality score may be influenced by factors such as food adequacy, diversity, and the quantity of consumption across different food groups[30]. The particularly low average DQ score in this study may be due to respondents consuming foods with high energy density, thereby affecting the overall dietary quality score.

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Additionally, insufficient intake of plant proteins, fruits, and vegetables, compared to recommendations, could contribute to the low DQI-A scores observed in the respondents.

Table 4. Distribution of Food Delivery Service Usage, Food Consumption Habits, and Nutrition Knowledge

Variable	Frequency (n)	Percentage (%)	Mean	SD	Min	Max
Food delivery service usage						
Rarely (<3x/Week)	91	84.3	1.8	0.96	0	5
Often (≥3x/Week)	17	15.7				
Food Consumption Habits						
Low risk (Skor FFQ < 473.10)	52	48.1	473.10	159.96	50.00	915.00
High-risk (Skor FFQ ≥ 473.10)	56	51.9				
Nutrition Knowledge						
Good (>80)	2	1.9	53.47	12.14	25.00	90.00
Moderate (60-80)	36	33.3				
Low (<60)	70	64.8				

Frequency of food delivery service usage

The analysis results indicate that 84.3% of respondents rarely use food delivery services. Descriptive distribution of the frequency of using food delivery services is shown in Table 4. Based on univariate analysis, the average frequency of food delivery service use among respondents is 1.81 times per week, with a minimum of no usage at all and a maximum of 5 times per week. In this study, male respondents use food delivery services slightly less frequent on average (1.7 times per week) compared to female respondents (1.9 times per week). The infrequent use is attributed to factors such as food prices, lack of promotions, delivery fees, and the fact that food delivery services are only used when with friends[32]. Layalia & Stefani reported similar findings, with respondents predominantly using food delivery services rarely, 1-3 times a week (94.5%) [33]. In this study, respondents use food delivery services due to appealing offers/promotions, time-saving for ordering or waiting in line, reluctance to visit food establishments, the variety of food options available, and the opportunity to try new foods.

Table 5. Distribution of Food Delivery Service Usage

Variable	Frequency (n)	Percentage (%)
Time of Using Food Delivery Services		
Never	7	6.54%
Morning (00:01 – 10:00)	2	1.87%
Afternoon (10:01 – 14:00)	25	23.36%
Evening (14:01 – 18:00)	24	22.43%
Night (18:01 – 00:00)	49	45.79%
Food Delivery Services Used		
Never	7	6.48%
Gofood	84	77.78%
ShopeeFood	10	9.26%
GrabFood	7	6.48%

The most frequently used delivery service among respondents is GoFood (77.1%), which is a food delivery service from the Gojek app. This aligns with the studies by Fadila and Layalia & Stefani as GoFood offers attractive features such as various discounts and more affordable prices[33,34]. In this study, respondents most often used food delivery services for dinner or late-night meals, specifically between 18:01 and 00:00 (45.4%). This differs from adults, who preferred using food delivery services during lunchtime (67.3%)[35]. The types of food ordered by respondents through delivery services included fast food (such as chicken dishes, pizza, and burgers), Japanese dishes (sushi, takoyaki, and taiyaki), Indonesian cuisine (fried rice, fried noodles, meatballs, noodles, soto, seblak, and satay), and sweet items (cakes, martabak, and bread). The beverages were mostly sweet drinks, including various teas, coffee, bubble tea, ice cream, juice, and soda. The food and beverages were sourced from various restaurants including McDonald's (MCD), Kentucky Fried Chicken (KFC), Hokben, Pizza Hut, Burger King, Mie Gacoan, Mixue, Chatime, Teguk, Kopi Kenangan, Janji Jiwa, and other establishments. This finding is consistent with studies by Osaili, which found that fast food is the most commonly ordered type through delivery services (87.1%)[35].

High-Risk Food Consumption Habits

The analysis indicates that the majority of respondents have high-risk consumption habits (51.9%). Table 4 presents a descriptive distribution of the variable related to high-risk consumption habits among respondents. The average of high-risk food frequency questionnaire score in this study is 473.10. The lowest value is 50 while the highest value is 915. The high prevalence of these habits may be attributed to easy access and availability of such foods. The surrounding environment offers a variety of high-risk foods and beverages, such as sweet drinks, fried foods, and salty snacks, which are readily available to all students. Students frequently select foods based on preferences

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such as taste, appearance, habits, and price, rather than considering health factors[36]. The extensive availability and convenient access to unhealthy foods influence adolescents to select these options[37–39]. Additionally, adolescents's preference for junk food contributes to the high incidence of high-risk consumption habits. This preference arises because of junk food's quick preparation, easy accessibility, appealing taste, large portions, exposure to advertising, and the image of the restaurants[40,41].

Nutrition Knowledge

The analysis reveals that the majority of respondents have low nutrition knowledge (64.8%). Table 4 provides a descriptive distribution of respondent's nutrition knowledge. Respondents have an average nutrition knowledge score of 53.47. The lowest score is 25, while the highest score is 90. The low level of nutrition knowledge may be attributed to the fact that 54 respondents (50%) reported that they have never received nutrition education. Other respondents reported acquiring their knowledge through various sources such as counseling, socialization, family, social media, the internet, healthcare professionals, school, friends, and television.

Table 6. Respondents Nutrition Education

Variable	Frequency (n)	Percentage (%)
Nutrition Education		
Received nutrition education	54	50%
Have not received nutrition education	54	50%

In comparison, a study conducted in Quebec, Canada, reported a higher average level of nutrition knowledge, with a score of 64.7[42]. Nutrition knowledge is closely related to an individual's behavior and attitudes regarding food. It significantly impacts eating habits by affecting both the types and amounts of food consumed. Insufficient nutrition knowledge may result in lower energy intake and contribute to abnormal nutritional status[43,44].

Table 7. Bivariate Analysis of The Relationship Between Frequency of Food Delivery Service Usage, High-Risk Food Consumption Habits, Nutrition Knowledge with Diet Quality Among Adolescents at Yadika 12 High School Depok

Variable	*r*	p-value	*n*
Frequency of Food Delivery Service Usage	-0.044	0,654	108
High-Risk Food Consumption Habits	-0,256	0,007	108
Nutrition Knowledge	0,217	0,024	108

Frequency of food delivery service usage factor

According to Table 7, there is no significant relationship between the frequency of food delivery service usage and diet quality among students at Yadika 12 High School Depok (p-value=0.654). In this study, only 17 respondents (15.7%) frequently used food delivery services. This finding aligns with the research by Maretha and Jannah, which also reported no significant relationship between food delivery service usage and dietary quality (p-value=0.869, r=-0.020; p-value=0.777, r=-0.035). The reduced use of food delivery services may be attributed to the presence of numerous food vendors, snack bars, and restaurants in the vicinity of the adolescents, leading them to prefer purchasing food and beverages directly. Furthermore, adolescents with limited allowances are likely to consider factors such as food prices, promotions, and delivery costs before utilizing food delivery services. These considerations may explain why food delivery services have a negligible impact on the diet quality of adolescents. The contribution of food ordered through delivery services to adolescent's overall dietary patterns is relatively minor, resulting in a limited impact on their diet quality [32,45].

High-risk food consumption habits factor

Based on the Spearman test results in Table 7, there is a significant relationship between high-risk consumption habits and diet quality among students at Yadika 12 High School Depok(p-value=0.007, r=-0.256). This indicates a negative correlation between diet quality and high-risk consumption habits. Individuals with high-risk consumption habits tend to have lower diet quality scores. The correlation between high-risk food consumption habits and diet quality may be attributed to the high frequency of high-risk food intake among adolescents. Specifically, 51.9% of respondents exhibit a habit of consuming high-risk foods. Additionally, the low average Dietary Quality (DQ) scores of 7.55% suggest that respondents mainly consume foods with low energy density, such as fried items and sweet foods and beverages. Previous study reveals that high consumption of sugar-sweetened beverages is associated with poorer diet quality[46]. Similar research focusing on high-fat and salt foods indicates that a strong preference for these types of foods is associated with a higher intake of saturated fats, sodium, and other non-recommended foods. The studies also found that consumption of high-fat and high-sodium foods is associated with lower scores on the Canadian-Healthy Eating Index (C-HEI)[47].

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Nutrition knowledge factor

The Spearman test results in Table 7 reveal a significant positive relationship between nutrition knowledge and diet quality among students at Yadika 12 High School Depok (p-value=0.024, r=0.217). This indicates that higher nutrition knowledge is associated with better diet quality. High nutrition knowledge positively influences food choices and eating behavior[48]. Therefore, individuals with higher nutrition knowledge tend to have adequate micronutrient intake, lower rates of unhealthy eating patterns, and higher consumption of fruits and vegetables, while having lower consumption of salty snacks and high-sugar drinks[49–52]. These findings align with studies by Jezewska-Zychowicz & Plichta and Akkartal & Gezer, which also reported a positive relationship between nutrition knowledge and dietary quality and eating patterns[51,53]. An intervention involving 226 adolescents in two schools in Banepa showed that ongoing exposure to nutrition education can enhance the quality of adolescents' diets. Incorporating nutrition education into school activities has been found to improve adolescents's knowledge, attitudes, and healthy eating habits[54].

The strength of this study lies in the fact that research on diet quality remains relatively scarce. The use of the diet quality index for adolescents (DQI-A), which covers three key aspects, provides a more comprehensive assessment of diet quality and allows for a more focused identification of underlying issues. This facilitates the development of targeted solutions to address diet quality problems among adolescents. A limitation of this study is the assessment of high-risk consumption habits, which relies on respondents' recall of their food consumption over the past month. As a result, repeated questioning is required to ensure the accuracy of respondents' answers. Additionally, this study is limited to examining diet quality through variables such as the frequency of food delivery service usage, high-risk consumption habits, and nutrition knowledge, and does not account for all potential factors that could influence diet quality. Furthermore, the limited sample size is insufficient to fully represent the overall adolescent population.

CONCLUSIONS

There is no significant relationship between the frequency of food delivery service usage and diet quality among students at Yadika 12 High School Depok. However, significant relationships were found between high-risk consumption habits and nutrition knowledge with diet quality. In conclusion, the diet quality of students at Yadika 12 High School Depok is related to high-risk consumption habits and nutrition knowledge factors. These results highlight the need for adolescents to be more mindful of their dietary choices. Improving dietary quality can be achieved by adhering to balanced nutrition guidelines, utilizing nutrition education, and applying the nutritional knowledge they have gained. The researchers suggest that future studies should use different variables, such as the influence of peers, parental influence, or social media exposure, with a larger sample size and different research locations, so that other factors affecting diet quality can be identified.

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CONFLICT OF INTEREST AND FUNDING DISCLOSURE

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AUTHOR CONTRIBUTIONS

ZFH: conceptualization, design, methodology, data collection, analysis, reporting, and publication of the research; AQM: assistance and supervision throughout the process, particularly during the writing and publication phases, ensuring the quality and integrity of the research; UW: assistance and supervision throughout the process, particularly during the writing and publication phases, ensuring the quality and integrity of the research.

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