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Diet quality index for adolescents scores among 16-18 years old adolescents

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ABSTRAK

Latar Belakang: *Remaja merupakan kelompok usia dengan kebutuhan gizi yang tinggi untuk mendukung pertumbuhan dan perkembangannya. Menurut Kementerian Kesehatan saat ini remaja tengah mengalami triple burden of malnutrition. Permasalahan gizi yang terjadi saat remaja dapat berdampak negatif dan terbawa hingga dewasa. Asupan gizi yang tidak seimbang serta kualitas diet yang rendah menjadi salah satu penyebab permasalahan gizi yang dialami remaja.*
Tujuan: *Menganalisis kualitas diet remaja pada SMA Yadika 12 Depok menggunakan Diet Quality Indeks for Adolescents (DQI-A).*
Metode: *Penelitian ini merupakan penelitian kuantitatif dengan desain studi cross sectional. Penelitian dilakukan di SMA Yadika 12 Depok dengan subjek sebanyak 108 siswa berusia 16-18 tahun. Pengambilan data dilakukan pada Februari 2024. Data kualitas diet didapatkan dari konversi form food recall 2x24 jam akhir pekan dan hari kerja dengan Diet Quality Indeks for Adolescents (DQI-A) yang telah dimodifikasi berdasarkan Pedoman Gizi Seimbang 2014. Data yang telah terkumpul di analisis menggunakan uji Mann-Whitney.*
Hasil: *Rata rata skor DQ adalah 7,55%, skor DD adalah 63,89%, dan skor DE adalah 26,91% dan skor kualitas diet (DQI-A) adalah 32,76%. Nilai terendah 13,38% dan tertinggi 58,72%. Berdasarkan nilai rata rata diketahui bahwa 54 responden (50%) memiliki kualitas diet kurang dan 54 responden (50%) memiliki kualitas diet baik. Hasil uji mann-whitney antara kualitas diet akhir pekan dan hari kerja responden (p= >0,05).*
Kesimpulan: *Rata rata kualitas diet responden 32,76%. Tidak terdapat perbedaan kualitas diet remaja pada akhir pekan dan hari kerja. Skor DQ menjadi yang teredah sehingga perlu adanya perhatian lebih terhadap komponen tersebut, dapat dengan melakukan penyuluhan berkala terkait faktor dan dampak dari rendahnya kualitas diet.*

KATA KUNCI: *kualitas diet; diet quality index for adolescents; kualitas pangan; keberagaman pangan; keseimbangan pangan*

ABSTRACT

Background: *Adolescents have high nutritional needs to support their growth and development. According to the Indonesian Ministry of Health, adolescents are currently experiencing a triple burden of malnutrition. Nutritional problems during adolescence can have negative impacts and persist in adulthood. Unbalanced dietary intake and low diet quality are key contributors to these nutritional issues in adolescents.*

Objectives: *To analyze the diet quality of adolescents at SMA Yadika 12 Depok using the Diet Quality Index for Adolescents (DQI-A).*

Methods: *This study is quantitative research with a cross-sectional design. The research was conducted at SMA Yadika 12 Depok with 108 subjects aged 16-18. Data collection took place in February 2024. Diet quality data were obtained by converting food recall forms (2x24 hours) for weekends and weekdays using the Diet Quality Index for Adolescents (DQI-A) based on the 2014 Indonesian Balanced Nutrition Guidelines. The collected data is analyzed using the Mann-Whitney test.*

Results: *The average DQ score was 7.55%, the DD score was 63.89%, the DE score was 26.91%, and the overall diet quality score (DQI-A) was 32.76%. The lowest score was 13.38% and the highest was 58.72%. Based on the average values, 54 respondents (50%) had poor diet quality and 54 respondents (50%) had good diet quality. The Mann-Whitney test showed no significant difference in diet quality between weekends and weekdays ($p > 0.05$.*

Conclusions: *The average diet quality of respondents is 32.76%. There is no difference in adolescent diet quality between weekends and weekdays. The DQ score was the lowest, indicating a need for greater attention to this component, potentially through regular counseling on the factors and impacts of poor diet quality.*

KEYWORD*:* *diet quality; diet quality index for adolescents; dietary quality; dietary diversity; dietary equilibrium*

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INTRODUCTION

Adolescence represents a transitional phase from childhood to adulthood, typically occurring between the ages of 10 and 19 (1). As the largest demographic group in Indonesia's population, adolescents are a key focus and strategic point for interventions aimed at human resource development (2). This period is characterized by rapid growth, necessitating a balanced nutritional intake to ensure proper development. Nutritional deficiencies, including those related to energy and other essential nutrients during adolescence, can have adverse effects that may continue into adulthood (3,4). These days, Indonesian adolescents who have high nutritional needs are facing a triple burden of malnutrition such as overnutrition, undernutrition, and micronutrient deficiencies (5). West Java has a prevalence of underweight adolescents at 5.6%, overweight adolescents at 10.9%, and obese adolescents at 4.5%. In particular, adolescents in Depok exhibit the highest prevalence of overweight status in Indonesia, with a rate of 18.13% (6). Adolescents require a well-balanced nutritional intake to support their physical and cognitive development, sexual maturation, and energy requirements (3). Adolescents in Indonesia, who need balanced nutrition, are currently confronted with a triple burden of malnutrition, encompassing overnutrition, undernutrition, and a lack of essential micronutrients (5). Previous research has indicated that 31% of the students at SMA Yadika 12 Depok are classified as obese (7).

In addition, other studies have shown that 51.2% of students regularly consume junk food (8). The nutritional issues observed are attributed to imbalanced nutrient intake (9). Balanced nutrition can be achieved by improving the quality of the daily diet according to established recommendations (10). Diet quality refers to the dietary pattern or the variation among major food

groups compared to nutritional guidelines (11). Good diet quality has a positive impact on health, such as reducing the risk of degenerative diseases (12). According to the Diet Quality Index for Adolescents (DQI-A), developed by Vyncke et al. 2013, diet quality is divided into three main components: dietary quality (DQ), dietary diversity (DD), and dietary equilibrium (DE)(13). In response to the existing findings and concerns, the author is conducting a study to analyze the diet quality of adolescents at SMA Yadika 12 Depok using the Diet Quality Index for Adolescents (DQI-A).

MATERIALS AND METHODS

This study utilizes an observational analytical design and a cross-sectional method with a quantitative approach. Data collection was conducted in February 2024 at SMA Yadika 12 Depok. The study population consists of 233 students from SMA Yadika 12 Depok. The sample for this research includes 108 participants, selected based on the following criteria: active student at SMA Yadika 12 Depok, age between 16 and 18 years, good health status, not currently on a specific diet, not fasting, and willing to participate in and complete all of the research activities. Secondary data were obtained from SMA Yadika 12 Depok and included general information about the research site, student population data, and a list of student names. Primary data were collected through interviews using a questionnaire and a 2x24-hours food recall form. The 2x24-hour food recall method is utilized to more accurately represent the daily intake of the respondents. The data obtained from the 2x24-hour food recall will be processed and estimated to determine the quantity of food consumed by the respondents. To minimize potential bias in the recall data collection, data was gathered over two days. Additionally, both the data collection and estimation procedures will utilize conversion units and other supplementary tools, including the Food Photo Book by the Indonesian Ministry of Health's Individual Food Consumption Survey Team. The data from the 2x24-hour food recall forms will be processed into diet quality scores using the Diet Quality Index for Adolescents (DQI-A), adjusted according to the Pedoman Gizi Seimbang 2014. The assessment of diet quality, based on the DQI-A, includes three components: dietary quality (DQ), dietary diversity (DD), and dietary equilibrium (DE).

The collected data is processed using Microsoft Excel or Google Sheets, while statistical testing is conducted using SPSS software. The data is initially tested for normality using the Kolmogorov-Smirnov test. Subsequently, the Mann-Whitney test is applied to determine whether there is a significant difference between the means of the samples. This study has received ethical approval and has been deemed ethically acceptable by Komisi Etik Penelitian Kesehatan Universitas Prima Indonesia (KEPK UNPRI) with approval number 082/KEPK/UNPRI/11/2024.

RESULTS AND DISCUSSIONS

This study involves 108 respondents who are active students in X-XI grades at SMA Yadika 12 Depok. The distribution of respondent characteristics is detailed in **Table 1**. The respondents are predominantly male, with 57 students (52.8%), and the majority are 16 years old (57.4%), with a significant portion being in grade XI (62%).

Table 1. Distribution of Characteristics

Variable	Number (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

In this study, diet quality was assessed using the Diet Quality Index for Adolescents (DQI-A), which has been adapted to align with Pedoman Gizi Seimbang 2014. The diet quality score was

derived from the 2x24-hours food recall data collected on both weekdays and weekends. This approach ensures a more comprehensive representation of the respondents's actual intake. Based on Vyncke et al. (2013), as cited in Rahmawati & Riyadi (2023), stated that the DQI-A consists of three components: dietary quality (DQ), dietary diversity (DD), and dietary equilibrium (DE). The diet quality scores based on the DQI-A range from -33% to 100%, with higher scores indicating better diet quality(13).

Table 2. Distribution of Diet Quality

Variable	Mean	SD	Min	Max
Diet Quality	32.76%	7.81%	13.38%	58.72%

The average Diet Quality Index for Adolescents (DQI-A) score in this study is 32.76%, with a range of scores from 13.38% to 58.72%. Respondents with scores above the average are considered to have a good diet quality. The results of the univariate analysis indicate that the proportion of adolescents at SMA Yadika 12 Depok with good diet quality and those with poor diet quality are equal, each constituting 50% of the sample.

Table 3. Distribution of Diet Quality by Gender

Diet Quality	Mean	SD	Min	Max
Male	32.91%	7.07	17.74%	49.88%
Female	32.6%	7.97	13.38%	58.72%

Based on the distribution of diet quality by gender in **Table 3**, it is observed that the average diet quality score for male respondents is slightly higher (32.91%) compared to the average diet quality score for female respondents (32.60%). The minimum scores also indicate that male respondents have higher scores than female respondents. The greatest difference between female and male respondents is seen in the average dietary diversity score, which is 2.70%. This indicates that male respondents consume a greater variety of foods from the recommended food groups. Factors such as growth and development and differences in muscle mass contribute to males having a larger consumption pattern compared to females (14). Additionally, females who are more concerned with their appearance may tend to exhibit eating behaviors that are less aligned with optimal dietary practices. Eating behavior and food choices are positively associated with an individual's diet quality (15). Another research using the Diet Quality Index-International has indicated that females tend to consume a higher quantity of fruits and sweet foods while consuming less red meat. Furthermore, the average daily energy intake and diet quality scores for females are generally lower compared to males (16). These findings are consistent with studies conducted in Shiraz, Japan, and Jakarta, which have reported that the diet quality of adolescent females is lower than that of their male counterparts (17–19).

The average component scores of the respondents' diet quality according to the DQI-A, including Dietary Quality (DQ), Dietary Diversity (DD), and Dietary Equilibrium (DE) are presented in **Table 4.**

Table 4. Average Scores Based on DQI-A Assessment Components

Categories of DQI-A Assessment	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 assessed based on the nutrient density of respondents' food intake, which is calculated by dividing the energy content by the weight of the consumed food (20). In this study, the average DQ score for respondents was 7.55%. This relatively low DQ score may be attributed to the consumption of foods with high energy density, such as high-sugar items, sugar-sweetened beverages, and fried foods, which negatively impact diet quality. This observation aligns with Vidyarini's study of adolescents in Jakarta, which reported an even lower average DQ score of 2.07% (10). The research indicated that the low DQ score was due to a high intake of energy-dense foods, including sweets, fried items, and chips. Adolescents often prioritize taste and satiety over nutritional value, resulting in suboptimal dietary choices (21). Prolonged consumption of high-energy, high-fat, and high-sugar foods can contribute to the development of obesity (22).

Dietary diversity (DD) is determined by summing the recommended food groups consumed by respondents. According to Pedoman Gizi Seimbang 2014, the recommended food groups include seven categories: water, carbohydrates, animal proteins, plant proteins, vegetables, fruits, and fats (23). After calculating the portions from each recommended group, the average DD score for respondents was found to be 63.89%. The DD score is closely related to the number of food groups consumed by respondents. In this study, the average consumption was only 4.5 out of the 7 recommended food groups. The intake of vegetables and fruits was notably lower compared to other food groups, with an average of only 0.32 and 0.38 portions per day, respectively. These values are significantly below the recommended intake of 3 portions of vegetables and 4 portions of fruits per day (23). The low consumption of vegetables and fruits contributes to the reduced DD score. This finding is consistent with the results of Vidyarini, Miskiyah, and Briawan's research, which reported DD scores of 56.35% and 52.5%, respectively (10,24). The consumption of vegetables and fruits among adolescents can be influenced by factors such as gender, nutritional knowledge, availability, cooking skills, and support from parents and peers (25,26).

Dietary Equilibrium (DE) is determined by the difference between dietary adequacy and excess in respondents' food intake. To calculate the DE score, the Dietary Adequacy (DA) score is subtracted from the Dietary Excess (DEx) score. DA is computed by dividing the actual intake by the recommended portions for each food group. In this study, the average DA score is 47.30%. DEx is calculated by measuring the intake that exceeds the recommended portions, with an average DEx score of 9.88%. The DE value is obtained by subtracting DEx from DA. The average DE score for respondents is 26.91%. This score is lower compared to a study on adolescents in Jakarta, which reported a DE score of 62.59% (10). The low DE score is attributed to the respondents's intake not aligning with the recommended portions. This is further supported by the average daily intake data, which includes 1477 ml of water, 4.29 portions of carbohydrates, 3.82 portions of animal proteins, 0.52 portions of plant proteins, 0.32 portions of vegetables, 0.38 portions of fruits, 6.54 portions of fats, 36.87 grams of snacks and candies, and 38.13 ml of sweetened beverages. Based on these averages, the intake of water, carbohydrates, plant proteins, vegetables, and fruits is below the recommended levels, while the intake of animal proteins and oils exceeds the recommended portions. For non-recommended food groups, the intake is relatively well-controlled, as the average consumption does not exceed the recommendations, with 50 grams for snacks and candies and 300 ml for sweetened beverages.

The Diet Quality Index for Adolescents (DQI-A) score is derived from the average of dietary quality (DQ), dietary adequacy (DA), and dietary excess (DEx) components. In this study, the calculated DQI-A score is 36.29%. This score is lower compared to those reported by Vidyarini Miskiyah and Briawan which were 40.34% and 52.6%, respectively (10,24). Diet quality scores are influenced by factors such as food adequacy, diversity, and the quantity of consumption from each food group (10). The low average DQ score in this study reflects the respondents' consumption of high-density foods, which negatively impacts the overall diet quality score. Since DQI-A is the average of these three main components, a low DQ score adversely affects the total DQI-A score. Additionally, inadequate consumption of plant proteins, fruits, and vegetables in relation to recommended levels contributes to the lower DQI-A score observed among the respondents.

An individual's diet quality is influenced by various factors, both internal and external, including personal characteristics, food security, and consumption patterns. Characteristic factors that influence diet quality include gender, physical activity, psychological factors, health perceptions, parental education level, academic courses, academic performance, mobile phone use, and socioeconomic status. Parental education has been shown to affect children's diet quality, as children of parents with higher education tend to consume healthier foods and have increased intake of fruits and vegetables. Socioeconomic status also influences diet quality, with individuals from lower socioeconomic backgrounds typically consuming fewer fruits, vegetables, whole grains, fiber, fish, and seafood (27,28,29). Food security directly affects consumption behavior. Populations experiencing food insecurity tend to exhibit poorer

consumption patterns, with limited access to fruits and vegetables due to high costs. These communities are more sensitive to price and frequently choose more affordable, nutritionally poor foods. Moreover, the frequency of home-cooked meals is lower in food-insecure regions (30). The poor diet quality observed in adolescents is frequently associated with their consumption behaviors. Adolescents tend to snack more often, skip meals, dine away from home, consume late-night meals, and prefer fast food, all of which contribute to a deterioration in overall diet quality (31). In this study, diet quality was assessed using a 2x24-hours food recall conducted on both weekends and weekdays. Respondents, who are high school students, typically spend 5 to 8 hours per day at school during weekdays. The availability of food in the school cafeteria and the surrounding environment can significantly influence the respondents's intake and nutritional adequacy (32). Differences between the school environment and home often result in variations in dietary intake between weekends and weekdays. On school days, food diversity tends to be higher compared to weekends (33). The average DQI-A scores for respondents on weekends and weekdays are presented in **Table 5.**

Table 5. Average scores for weekends and weekdays

DQI-A Assessment Component	Average Score (%)		
	Weekends	**Weekdays**	***p-value***
Dietary Quality (DQ)	6.45	8.66	0.710
Dietary Diversity (DD)	63.76	64.02	0.650
Dietary Adequacy (DA)	46.78	47.82	0.362
Dietary Excess (Dex)	9.93	9.83	0.570
Dietary Equilibrium (DE)	26.45	27.56	0.375
DQI-A Score	32.17	33.34	0.482

The Mann-Whitney U test for all DQI-A components showed no significant differences in diet quality between weekends and weekdays (>0.05). Based on the 2x24-hours food recall results, respondents had nearly identical total consumption on weekends and weekdays, with differences only in the types of foods consumed. This similarity resulted in minimal variation in the average scores for each diet quality component, thus no significant difference in diet quality between weekends and weekdays. This finding is consistent with research conducted on adolescents in Bogor City, which also reported no significant difference in diet quality between weekends and weekdays (>0.05) (24). Overall, this study found that diet quality scores and their components were higher on weekdays. Research in Yogyakarta City also indicated that on school days, the consumption of vegetables, fruits, meat, poultry, fish, and dairy products was higher (33).
The strength of this study lies in the fact that research on diet quality remains relatively scarce. The use of DQI-A, which encompasses three key aspects, provides a more comprehensive assessment of diet quality and allows for a more focused identification of the underlying issues, thereby facilitating the development of targeted solutions to address diet quality problems among adolescents. However, a limitation of this study is that it exclusively focuses on adolescent diet quality, without exploring other potential factors that may influence diet quality. Furthermore, the limited sample size is insufficient to fully represent the overall adolescent population**.**

CONCLUSIONS AND RECOMMENDATIONS

The characteristics of the respondents indicate that the majority are male (52.8%), 16 years old (57.4%), and in the 11th grade (62%). The average dietary quality (DQ) score for respondents is 7.55%, the average dietary diversity (DD) score is 63.89%, and the average dietary excess (DE) score is 26.91%. The average Diet Quality Index for Adolescents (DQI-A) score for respondents is 32.76%, with the lowest value being 13.38% and the highest value being 58.72%. Based on the average values, it was found that 54 respondents (50%) have a poor diet quality and 54 respondents (50%) have a good diet quality. The writers recommend that

respondents should pay more attention to diet quality, particularly focusing on the aspect of dietary quality, which was identified as the lowest among the components assessed. This improvement can be achieved by adhering to balanced nutrition guidelines, balanced nutrition messages, and other nutritional information already available. It is also suggested that both the community and schools provide regular education and counseling to adolescents regarding the factors and impacts of poor diet quality. Additionally, the writers recommend that future studies consider different variables such as peer influence, parental influence, or social media exposure, and involve varying sample sizes and research locations to better understand other factors affecting diet quality.

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