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The Relationship Between Sedentary Behavior and Balanced Nutritional Knowledge with Nutritional Status in Adolescents

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Abstract

Adolescents are vulnerable to nutritional problems due to unhealthy eating habits and insufficient physical activity. Sedentary behavior and lack of balanced nutrition knowledge may be related to adolescent nutritional status. This study aimed to analyze the relationship between sedentary behavior and balanced nutrition knowledge with nutritional status among adolescents. The study used a cross-sectional design on 106 adolescents with proportional stratified random sampling. Instruments included ASAQ questionnaire for sedentary behavior, balanced nutrition knowledge questionnaire, and anthropometric measurements of nutritional status based on BMI/A z-score using WHO Anthro Plus. Analysis used Spearman Rho test. Results showed that the majority of respondents were 14 years old (35.8%), female (52.8%), participating in extracurricular activities (69.8%). High category sedentary behavior (59.4%) averaged 6.31 hours/day. Nutrition knowledge was poor category (53.8%). Nutritional status was mostly normal (64.2%), with distribution of severe malnutrition (0.9%), undernutrition (8.5%), overweight (18.9%), obesity (7.5%). There was no significant relationship between sedentary behavior and nutritional status (p=0.315) and balanced nutrition knowledge with nutritional status (p=0.449). These results indicate that sedentary behavior is not related to nutritional status because it is influenced by social media and family factors. Nutrition knowledge is not related to nutritional status because adolescents find it difficult to apply knowledge due to peer influence and environment.

Keywords: adolescents, balanced nutrition knowledge, nutritional status, sedentary behavior

INTRODUCTION

Adolescence, also known as adolescence growth The growth spurt is a crucial phase from childhood to adulthood, characterized by rapid development in various aspects. To support the significant physical changes during this period, increased nutritional intake, including vitamins and minerals, is required. These factors make adolescents more physiologically and nutritionally vulnerable during the transition to adulthood. Therefore, meeting adolescent nutritional needs requires special attention (Mardalena, 2021). Nutritional problems in Indonesia encompass three double burdens: malnutrition, obesity (overweight), and micronutrient deficiencies. Based on data from the 2023 Survei Kesehatan Indonesia (SKI), the prevalence of nutritional status in adolescents aged 13-15 years old, Riau Province has a number in the very thin category of 2.4%, above the Indonesian average of 1.9%. This indicates that Riau Province is one of the provinces that still has lower nutritional status than the average in Indonesia (Badan Kebijakan Pembangunan Kesehatan, 2023). Sedentary behavior comes from the Latin word " sedere," meaning to sit. This behavior refers to a lifestyle involving little or no physical activity (Girma, 2020). Physical activity affects nutritional status by regulating energy balance in the body. Based on data from We Are Social in 2024, internet users in Indonesia spent 7 hours and 38 minutes, above the global average. This is considered highly sedentary behavior, at ≥ 5 hours/day (Maidartati et al., 2022).

Based on research by Hisyam et.al in 2023, a link was found between sedentary behavior and nutritional status at SMAN 4 Kediri, where students had a high average sedentary behavior with a prevalence of 90% of students and adolescents with under or over nutritional status of 59%. Another study conducted by Alfionita, Sulistyorini, & Septiyono in 2023 found that adolescent nutritional levels would increase along with higher levels of sedentary behavior (Alfionita et al., 2023). Sedentary behavior in adolescents is not only influenced by individual behavior, but also by parenting patterns and family habits. The role of parents is very important in shaping adolescent sedentary behavior. If parents are unable to balance their children's learning activities at home with sports or physical activities, this will be a risk of obesity (Tampubolon & Kaban, 2021). Knowledge about balanced nutrition is another factor that influences nutritional status. Nutritional knowledge can influence a person's food choices, which in turn impacts their nutritional status. By improving nutritional understanding, individuals are expected to be more discerning in choosing healthy foods, paying attention to quality and variety to achieve optimal nutritional status (Selaindoong et al., 2020). Based on research conducted by Anggraini and Dewi in 2022, it was found that knowledge of balanced nutrition has an influence on nutritional status where as many as 32 people (31.4%) with normal nutritional status had knowledge of balanced nutrition and as many as 44 people (43.1%) with over nutritional status had low knowledge of balanced nutrition (Anggraini & Dewi, 2022). Another study by Azzahra & Suryaalamsah in 2024 found that there was a significant relationship between knowledge of balanced nutrition and over nutritional status in adolescents (Azzahra & Suryaalamsah, 2024). Based on this background, this study aims to determine the relationship between sedentary behavior and knowledge of balanced nutrition with nutritional status in adolescents.

RESEARCH METHODS

This study uses a cross-sectional design. A sectional study was used to determine the prevalence or impact of a phenomenon (dependent variable) related to its causal factors (independent variables). This study was conducted at two schools: SMPN 8 Pekanbaru and SMPN 21 Pekanbaru. These schools were selected based on the highest data for overnutrition and undernutrition status from the Pekanbaru City Health Office in 2023. Furthermore, no research on the topic had been conducted at these two schools. Data collection was conducted from April 15 to May 21, 2025. The subjects of this study were SMPN 8 Pekanbaru and SMPN 21 Pekanbaru, with a population of 1,925 students. The sample size was determined using the Lemeshow formula and resulted in 100 students. To anticipate the possibility of dropout (DO), the sample size was increased by 10%, resulting in a total sample of 111 students. The sampling technique used was proportional sampling. stratified Random sampling, with inclusion criteria including adolescents aged 13-15 years, willing to be respondents, able to speak good and correct Indonesian, not having chronic diseases such as diabetes, heart and lung disease, and able to complete the questionnaire independently. Of the 111 students collected, 5 did not meet the inclusion criteria, so the total sample analyzed was 106 students.

This research has obtained ethical approval from the Institut Kesehatan Payung Negeri Pekanbaru with No. 175/IKES PN/KEPK/II/2025 dated March 7, 2025. The subjects of this research are adolescents under 18 years of age. Therefore, during the research process and the signing of the informed consent consent accompanied by a teacher as the student's guardian. The dependent variable of this study is nutritional status. The data was obtained by calculating the body mass index for age (BMI/A) through anthropometric measurements. Anthropometric measurements used a digital scale and microtoise, then calculated using the WHO Anthro plus v.1.0.4 application. The independent variables of this study were sedentary behavior and

knowledge of balanced nutrition. Sedentary behavior was obtained using The Adolescent Sedentary Activity Questionnaire (ASAQ) asks how much time people spend sitting or lying down while doing activities. It covers two situations: school days (Monday-Friday) and weekends (Saturday and Sunday). The questionnaire was collected using Google. form and distributed through the group WhatsApp messages were provided during anthropometric measurements and the completion of the balanced nutrition knowledge questionnaire in barcode form. Knowledge of balanced nutrition was obtained using a balanced nutrition knowledge questionnaire, which aims to measure an individual's understanding of the concepts and principles of balanced nutrition. It consists of 19 multiple-choice questions with Cronbach's reliability test results Alpha 0.820.

The nutritional status research data was analyzed using WHO Anthro plus v.1.0.4, while for univariate analysis and bivariate analysis of variables using Statistical Program for Social Science (SPSS) version 26 and Microsoft Excel 2019. Univariate analysis in the study includes respondent characteristics, level and average of sedentary behavior, level of knowledge of balanced nutrition, and nutritional status of respondents. Bivariate analysis used is the Spearman test which is used to analyze the relationship between sedentary behavior and knowledge of balanced nutrition with nutritional status in adolescents. Sedentary behavior is obtained using using The Adolescent Sedentary Activity Questionnaire (ASAQ), then categorized into 3, namely low sedentary level 2 hours/day (120 minutes/day), moderate sedentary level 2-5 hours/day, and high sedentary level >5 hours/day (>300 minutes/day). After that, the average is calculated to see the average sedentary behavior per day. Knowledge of balanced nutrition was obtained using a balanced nutrition knowledge questionnaire and categorized into 3 levels, namely a value of less than 80%. Nutritional status was measured using a digital scale and microtoise, then analyzed using WHO Anthro plus. Then the results were seen based on BMI/U and categorized into 5 categories, namely poor nutritional status with a value of <-3 SD, nutritional status less than -3 to <-2 SD, good nutritional status with a value of -2 to +1 SD, overnutrition status with a value of +1 to +2 SD, and obesity status with a value of >+2 SD.

RESEARCH RESULTS AND DISCUSSION

Table 1. Respondent Characteristics Based on Age, Gender, Extracurricular Activities

Characterictics	Frequency (n)	Percentage (%)
Age (Years)		
13	37	35.0
14	38	35.8
15	31	29.2
Gender		
Male	50	47.2
Female	56	52.8
Extracurricular		
Yes	84	79.2
No	22	20.8

Based on the statistical test results in Table 1, 106 adolescents participated in this study who met the inclusion criteria and participated in the study until completion. Most of the respondents were 14 years old, namely 38 people (35.8%). The number of female respondents outnumbered the number of male respondents, namely 56 people (52.8%). In terms of participation in extracurricular activities, it was found that the majority of respondents participated in extracurricular activities, totaling 84 people (79.2%).

Table 2. Overview of Sedentary Behavior Levels

Sedentary Behavior	Frequency (n)	Percentage (%)
Low	0	0
Medium	8	7.5
High	98	92.5

Based on the analysis results presented in Table 2, it was found that the majority of respondents had a high level of sedentary behavior with a total of 98 people (92.5%), and for respondents who had a moderate level of sedentary behavior, there were 8 people (7.5%).

Table 3. Average Sedentary Behavior Overview

Variabel	Mean	SD	Min-Max	95% CI
Average Sedentary Behavior	6.31	1.05	2.63-8.47	6.10-6.51

In table 3, the results of statistical tests show that the average sedentary behavior per day is 6.31 hours (6 hours 18 minutes 36 seconds) (95% CI: 6.1-6.51) with a standard deviation of 1.05. The average sedentary behavior per day is a minimum of 2.38 hours (2 hours 22 minutes 48 seconds) and a maximum of 8.47 hours (8 hours 28 minutes 12 seconds). The interval estimation results show that 95% believe that the average sedentary behavior per week is between 6.1 hours (6 hours 6 minutes) and 6.51 hours (6 hours 30 minutes 36 seconds).

Table 4. Average Distribution of Sedentary Behavior Based on Sedentary Activities in a Week

Sedentary Category	Sedentary Activities	Average Per Day (Minutes)	Average Per Day (Hours)
Entertainment using screens	Watch TV	33.27	0.55
	Watching videos/DVDs/Youtube/ Tiktok	93.22	1.55
	Using the computer for fun (Like playing games) online , watching YouTube , watching TikTok)	0.04	0.00
	Play Play station	-	-
	Playing on tablet/gadget/cellphone	143.63	2.39
Journey	Travel by transportation (car/bus/train/ship)	12.75	0.21
Cultural activities	Reading comics, story books etc.	6.09	0.10
	Playing with dolls/cars / robots/lego/ lato-lato etc.	30.75	0.51
	Doing crafts or skills (such as making slime , making crafts with origami/popsicle sticks)	6.60	0.11
	Playing/practicing a musical instrument	49.24	0.82
Social activities	Sit back and relax (chat with family, friends)	3.36	0.06

Table 4 shows that the analyzed data shows that the activity that spends the highest amount of sedentary behavior is playing with tablets/gadgets/cellphones with an average of 143.63 minutes (2.39 hours) per day, which covers 37.90% of the total sedentary behavior of respondents. Meanwhile, the activity with the lowest sedentary behavior time is using computers for entertainment (P3) which only reaches 0.04 minutes per day or 2 seconds per week, which is only 0.01% of the total sedentary behavior. Overall, the analysis results show that the majority of respondents' sedentary behavior is spent on activities involving the use of digital screens, with a total proportion reaching 71.29%, namely from playing with tablets/gadgets/cellphones, watching videos/DVDs/Youtube/ Tiktok , and watching TV.

Table 5. Overview of Balanced Nutrition Knowledge Level

Balanced Nutrition Knowledge	Frequency (f)	Percentage (%)
Poor	57	53.8
Moderate	44	41.5
Good	5	4.7

Table 5 shows that the level of knowledge of the majority of respondents was lacking, with 57 people (53.8%), then the value was sufficient with a total of 44 people (41.5%) and the value was good with a total of 5 people (4.7%).

Table 6. Percentage Distribution of Correct Answers Based on Questionnaire Items on Balanced Nutrition Knowledge

Aspect	Indicator	Question Number	Percentage of Correct Answers (%)
Knowledge types, sources, and functions of nutrients	Understand the range of various types of food that meet balanced nutrition (C1)	1	57.5
	Understanding the main role of nutrients such as carbohydrates, proteins, fats, and minerals (C1)	2	67.9
		3	59.4
		4	57.5
		5	28.3
	Comparing nutrient sources between carbohydrates and vegetable protein (C2)	8	2.8
	Classify food ingredients as sources of animal protein (C2).	10	96.2
The relationship between nutrients and health	Understanding recommendations for drinking water and the effects of water deficiency (C1)	6	78.3
		7	97.2
	Linking diseases that can be caused by excessive consumption of salty foods (C3)	9	71.7
	Follow recommendations for exercise, physical activity, and a healthy lifestyle (C3)	15	47.2
		16	59.4
		17	93.4
Knowledge of general guidelines for balanced nutrition	Prepare a sample food menu (C2)	11	63.2
	Follow the daily salt intake limit (C3)	12	35.8
	Calculating the estimated calories from food ingredients (C2)	13	32.1
	Following general guidelines on balanced nutrition (C3)	18	27.4
		19	86.8
	Improving food preparation (C3)	14	38.7

Table 6 shows that the average percentage of correct answers was 56.4%, indicating a lack of knowledge. The highest percentage of correct answers was found for understanding the effects of water deprivation (97.2%). Conversely, the lowest percentage of correct answers was for comparing carbohydrate and plant-based protein sources (2.8%).

Table 7. Overview of Nutritional Status

Nutritional Status Category	Frequency (f)	Percentage (%)
Malnutrition	1	0.9
Malnutrition	9	8.5
Good Nutrition	68	64.2
Overnutrition	20	18.9
Obesity	8	7.5
Total	106	100

Table 7 explains the picture of nutritional status with the majority of respondents showing good nutritional status in the number of 68 people (64.2%), then overnutrition in the number of 20 people (18.9%), then undernutrition in the number of 9 people (8.5%), then obesity in the number of 8 people (7.5%), and malnutrition in the number of 1 person (0.9%).

Table 8. Sedentary Behavior and Nutritional Status in Adolescents

Nutritional status	Sedentary Behavior						Total		P-Value	Correlation Coefficient
	Low		Currently		Tall					
	N	%	N	%	N	%	N	%		
Malnutrition	0	0	0	0	1	0.9	1	0.9	0.315	0.098
Malnutrition	0	0	0	0	9	8.5	9	8.5		
Good Nutrition	0	0	8	7.5	60	56.6	68	64.2		
Overnutrition	0	0	0	0	20	18.9	20	18.9		
Obesity	0	0	0	0	8	7.5	8	7.5		
Total	**0**	**0**	**8**	**7.5**	**98**	**92.5**	**106**	**100**		

Based on table 8, the results of the Spearman rho statistical analysis test, it was found that Sedentary behavior does not have a significant relationship with nutritional status in adolescents by obtaining a p-value (0.315) < α = (0.05). It can be concluded that Ha1 is rejected and H01 is accepted, meaning there is no relationship between sedentary behavior and nutritional status in adolescents. The relationship between sedentary behavior and nutritional status in adolescents has a correlation coefficient of 0.098 which is classified as a very weak relationship or correlation category.

Table 9. Relationship between Knowledge of Balanced Nutrition and Nutritional Status in Adolescents

Nutritional status	Balanced Nutrition Knowledge						Total		P-Value	Correlation Coefficient
	Not enough		Enough		Good					
	N	%	N	%	N	%	N	%		
Malnutrition	1	0.9	0	0	0	0	1	0.9	0.449	0.074
Malnutrition	7	6.6	2	1.9	0	0	9	8.5		
Good Nutrition	34	32.1	30	28.3	4	3.8	68	64.2		
Overnutrition	11	10.4	8	7.5	1	0.9	20	18.9		
Obesity	4	3.8	4	3.8	0	0	8	7.5		
Total	**57**	**53.8**	**44**	**41.5**	**5**	**4.7**	**106**	**100**		

Spearman statistical analysis test results rho, as shown in Table 9, shows that knowledge of balanced nutrition has no significant relationship with nutritional status in adolescents. This is indicated by a p-value of 0.449, which is greater than α = 0.05. Therefore, H0 is accepted and Ha is rejected, meaning there is no significant relationship between knowledge of balanced nutrition and nutritional status in adolescents. The correlation coefficient value of 0.074 indicates that the relationship is very weak.

Discussion

The age distribution of respondents shows that the majority are 14 years old, as many as 38 people (35.8%), followed by 13 years old as many as 37 people (35%), and 15 years old as many as 31 people (29.2%). This result is in line with the research of Pradifa, Fikri and Kurniasari which found that the majority of respondents were 14 years old, as many as 117 people (60%) (Pradifa, Fikri & Kurniasari, 2023). Arihandayani in Nafi'ah and Hadi explained that teenagers who have entered the age of 13 years and above show a 1.5 times higher tendency to engage in sedentary behavior for more than 6 hours every day compared to teenagers who are still under 13 years old (Nafi'ah & Hadi, 2022). Based on gender, there were more female respondents, namely 56 people (52.8%) compared to male respondents, as many as 50 people (47.2%). This finding is in line with the research of Pradifa, Fikri and Kurniasari (2023) with 124 women (63.3%), This is also in line with the research of Rahayu and Kusuma in 2022 with 164 women (93.2%) (Bunga & Kusuma, 2022). Hu, Zhou, Crowley-McHattan and Liu revealed that adolescent girls are more likely to engage in less active behavior compared to

adolescent boys caused by biological factors and cultural backgrounds Hu, Zhou, Crowley-McHattan & Liu., 2021). The results of the study showed that 98 people (92.5%) of respondents had high levels of sedentary behavior with an average of 6.31 hours per day. This result is in line with the research of Pradifa, Fikri and Kurniasari in 2023 which found 129 people (66.2%) of respondents with high levels of sedentary behavior. This is also in line with the research of Alfionita, Sulistyorini and Septiyono in 2023 with 34 people (48.7%) with high levels of sedentary behavior (Alfionita et al., 2023) . The results of this study are also in line with Prana in 2023 with an average of 377 minutes (6.28 hours). Sedentary behavior was higher on weekends with 100 people (94.3%) compared to school days with 91 people (85.8%). This finding is in line with the findings of Fajar, et, al . in 2023 that during weekends students tend to spend more time indoors for leisure activities without doing significant physical activity (Fajar et al., 2023).

The level of knowledge of balanced nutrition of the majority of respondents was in the poor category (57 people) (53.8%), the adequate category (44 people) (41.5%), and only 5 people (4.7%) were in the good category. These results are in line with research by Anggreini, Astuti & Nurhartanto (2025) which found 57 people (67.1%) of respondents with poor knowledge (Anggreini et al., 2025). Asmini in Tepriandy and Rochadi (2021) explained that knowledge about good nutrition does not directly determine nutritional status because adolescents often have difficulty applying their nutritional knowledge in daily life due to external influences such as peers, family, and the surrounding environment (Tepriandy & Rochadi, 2021). The nutritional status of respondents showed that the majority had good nutritional status, as many as 68 people (64.2%), overweight 20 people (18.9%), underweight 9 people (8.5%), obesity 8 people (7.5%), and malnutrition 1 person (0.9%). These results are in line with research by Rochmah and Nadhiroh (2024) which found that 34 people (42.5%) had good nutritional status, 29 people (36.3%) had overweight, and 17 people (21.3%) had underweight. Although the majority of respondents had good nutritional status, the percentage of 64.2% is still below the national data which reached 76.1%.

Sedentary behavior and nutritional status showed no significant results with a p- value of 0.315 which is greater than α 0.05, meaning there is no significant relationship between sedentary behavior and nutritional status in adolescents. This finding is in line with the research of Pradifa, Fikri and Kurniasari (2023), Yuniarahmah (2023), and Kamaruddin (2021) which showed no significant relationship between sedentary behavior and nutritional status. However, this result differs from the research of Wardani, Suyasa and Wulandari (2022) which found a relationship between sedentary behavior and the incidence of obesity where sedentary behavior increases the risk of obesity by a factor of 5.15 times (Wardani, Suyasa & Wulandari., 2022). The absence of a significant relationship in this study can be explained because 60 people (56.6%) of adolescents with good nutritional status also engaged in high levels of sedentary behavior, indicating that nutritional status is influenced by various factors other than sedentary behavior. The analysis of the relationship between knowledge of balanced nutrition and nutritional status also showed insignificant results with a p- value of 0.449, which is greater than α 0.05, meaning there is no significant relationship between knowledge of balanced nutrition and nutritional status in adolescents. This result is in line with research by Yuniarti (2023), Elyawati, Abdurrachim, and Anwar (2023), and Suryawati, Kisnawaty, and Setiyaningrum (2024) which showed no significant relationship. (Yuniarti, 2023) (Elyawati, Abdurrachim dan Anwar, 2023) (Suryawati, Kisnawaty dan Setiyaningrum, 2024)However, this is different from the research of Wijayanti and Haryanti (2024) who found a relationship between the level of knowledge and nutritional status. Maslakhah and Prameswari (2022) explained that knowledge of balanced nutrition is an indirect factor that influences nutritional

status, but is not the main cause of nutritional status problems, and the most influential factors are food intake and infectious diseases. Purba, et,al. (2024) also explained that good knowledge of balanced nutrition has not been applied in everyday life, especially in adolescents, because friends, family, and the environment generally influence the psychological stability of adolescents. This indicates a gap between knowledge and practice in the context of adolescent nutrition (Purba et al., 2024). Research data shows that 64 (60.4%) adolescents with good nutritional status have insufficient and sufficient knowledge, indicating that knowledge is not automatically applied to healthy eating behavior.

Adolescence, as a period of growth, requires adequate nutrition and activity to support growth. The relationship between sedentary behavior, adolescence, and nutritional status needs to be understood by considering the short-term and long-term impacts and their implications for nursing practice. In the short term, sedentary behavior can cause disruptions in energy balance, sleep patterns, academic concentration, and reduced social interactions that are essential for adolescent psychosocial development. Long-term impacts include the formation of sedentary habits that persist into adulthood and an increased risk of diseases such as obesity, diabetes mellitus, hypertension, dyslipidemia, cancer, osteoporosis, musculoskeletal disease, depression, and even death. The findings of this study have important implications for nursing science, where nurses need to develop innovative educational programs.

CONCLUSION

Based on the results of the study, it can be concluded that there is no significant relationship between sedentary behavior and nutritional status (p-value = 0.315>0.05) or between knowledge of balanced nutrition and nutritional status (p-value = 0.449>0.05) in adolescents. The majority of respondents have a high level of sedentary behavior (92.5%) with an average of 6.31 hours per day and a low level of nutritional knowledge (53.8%), but most respondents still have good nutritional status (64.2%), although there are 35.8% of respondents who experience nutritional problems including malnutrition (0.9%), undernutrition (8.5%), overnutrition (18.9%), and obesity (7.5%). These findings indicate that adolescent nutritional status is influenced by various complex factors besides sedentary behavior and nutritional knowledge, including the influence of social media, family, peers, and the environment. Based on the findings in this study, the development of nursing science needs to be directed at developing innovative educational programs that are appropriate to the characteristics of today's adolescents, so that material on nutritional literacy and physical activity can be better accepted and applied in everyday life.

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