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THE INFLUENCE OF SWEETENED BEVERAGE CONSUMPTION, SCREENING TIME, AND PHYSICAL ACTIVITY ON UNDERWEIGHT NUTRITIONAL STATUS IN STUDENTS

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ABSTRACT

The problem of underweight in adolescents is a public health issue that requires special attention because it has an impact on physical, mental, and social growth. In the Indonesian Health Survey (SKI 2023) of South Sumatera, the prevalence of nutritional status (IMT/U) in adolescents aged 13-15 years was 8.76% who were underweight with thin and very thin conditions. Some factors that can affect underweight nutritional status include consumption of sugar-sweetened beverages, duration of screening time (use of screen-based devices), and physical activity. This study aims to determine the effect of sugar-sweetened beverage consumption, screening time, and physical activity on underweight nutritional status in students of SMPN 1 Runjung Agung, South Ogan Komering Ulu Regency in 2025. This type of research is quantitative with a cross-sectional design. The sample consisted of 40 class VIII students selected using the purposive sampling technique. Data were collected through anthropometric measurements (IMT/U), the FFQ questionnaire for sugar-sweetened beverage consumption, IPAQ for physical activity, and the screening time questionnaire. Data were analyzed univariately and bivariately using the chi-square test. The results showed that screening time had a significant influence on the incidence of underweight ($p = 0.043$). Meanwhile, consumption of sugar- sweetened beverages ($p = 0.664$) and physical activity ($p = 0.625$) did not show a significant influence on the incidence of underweight. It can be concluded that screening time is a significant factor in underweight nutritional status in adolescents, while consumption of sugar-sweetened beverages and physical activity have no significant effect. Behavioral intervention on the use of digital devices is needed as an effort to maintain the nutritional status of adolescents.

Keywords: physical activity**;** screening time; sugar-sweetened beverages; underweight

INTRODUCTION

Adolescence is a population with an age period of 10-19 years, adolescence, often called the *adolescent* period, is a transition period from childhood to adulthood which is characterised by physical, mental, emotional and social development (WHO, 2018) The Ministry of Health divides the adolescent period into three parts, namely early adolescence (10-13 years), middle adolescence (14-16 years), late adolescence (17-19 years). Physically, the adolescent period is characterised by changes in physical characteristics and psychological functions, especially those related to the organs of reproduction, while from a psychological perspective, adolescence is when individuals experience changes in cognitive, emotional, social, and moral aspects. Growth spurts affect body composition, level, physical activity, body weight, and bone mass growth. Many nutritional problems among adolescents 15-19 years old experience *underweight* (Anggraini, 2022). *Underweight* is one of the nutritional problems facing Indonesia. *Underweight* can occur if the amount of energy and nutrient consumption is not sufficient according to needs. Unbalanced nutrient intake in adolescents will hinder the growth and development process. Adolescents who are *underweight* have an impact on their physical, mental, intellectual and social health. Other consequences of *underweight* problems are disruption of learning and cognitive abilities, and decreased concentration.

Adolescents are vulnerable to nutrition problems (Alamsyah et al., 2021). Based on the results of health survey data in Indonesia, the prevalence of *underweight* aged 13-15 years is 7.6%. Meanwhile, in South Sumatra based on the results of the Indonesian Health Survey (SKI 2023), the prevalence of nutritional

status (IMT / U) in adolescents aged 13-15 years is 8.76% experiencing underweight with thin and very thin conditions (SKI, 2023). Factors that cause adolescent *underweight* include, among others, unbalanced food intake is a direct cause of malnutrition, restrictive diets, poor eating habits, lack of nutrition-related knowledge and families with socioeconomic levels (Karno et al., 2024). Nutritional knowledge is an understanding in the selection of various healthy and nutritious foods (Alamsyah et al., 2021). Nutritional knowledge is also knowledge about foods that are safe for consumption and food processing so that food does not cause disease problems (Alamsyah et al., 2021). The level of nutritional knowledge can be a very influential factor in eating attitudes and behavior. This can be caused because if a person's nutritional knowledge is not fulfilled or adequate, it can lead to unhealthy behavior. If eating behavior is followed by correct nutritional knowledge, nutritional needs will be met (Alamsyah et al., 2021).

Implementing a healthy lifestyle is very important to maintain and improve the health of each individual, especially during adolescence. An unbalanced lifestyle, such as an irregular diet and excessive consumption of sugary drinks, is one of the factors that can cause *underweight* and *obesity*. According to the Directorate of Non-Communicable Disease Prevention and Control (P2PTM) in 2022, the recommendation for sugar consumption per person per day is a maximum of 10% of total daily energy (200 kcal), equivalent to four tablespoons or 50 grams. However, research findings by (Fachruddin et al., 2022) showed that most respondents (55.1%) had a high frequency of consumption of sugary drinks, namely three or more times a day. Sugary drinks include various types of drinks containing free sugars, including carbonated drinks, fruit/vegetable juices, powdered drinks, sweet tea, ready-to-drink coffee, and flavored milk. Based on WHO data (2023), high consumption of sugar-sweetened beverages is a global concern, as it is associated with various health problems. In the Southeast Asia region, Indonesia ranks third in the amount of sugar-sweetened beverage consumption, reaching 20.23 liters per person per year (Hambali, 2022). Recent research shows that 66% of children and adolescents aged 5-19 years and 64% of adults aged over 20 years in Indonesia consume sugar-sweetened beverages more than once per day (Hartini,)2024. The high consumption of these drinks is one of the risk factors for nutritional status disorders that need to be intervened since school age (Fachruddin et al., 2022).

In addition to the consumption of sugar-sweetened beverages, physical activity also has an important role in maintaining the nutritional status of adolescents. Physical activity helps the body's metabolism in burning energy, thus preventing the accumulation of excess fat. For adolescents who are overweight, physical activity is needed to help burn fat. Conversely, *underweight* adolescents also need sufficient physical activity to keep their metabolism optimized. Lack of physical activity will cause the incoming energy to not be used effectively, resulting in an imbalance in nutritional status (Martanti et al., 2024).

In addition, one important indicator in modern public health studies is screening time, which is the time individuals spend on screen-based activities. These activities include watching television, playing video games, and using a computer, smartphone, or tablet. High screen time duration has been associated with various negative impacts, both physically and mentally, especially in adolescents. Therefore, the measurement and evaluation of screen time is important in assessing adolescents' daily living behavior and its relation to their nutritional status (Afifah & Azizah, 2023).

Based on these problems, efforts are needed to analyze the factors that influence *underweight* in students related to consumption of sugar-sweetened beverages, *screening time*, and physical activity. Therefore, the researcher wants to conduct a study with the title Effect of Sugar-Sweetened Beverage Consumption,

Screening Time, and Physical Activity on Nutritional Status or Underweight Nutrition Problems in Students of SMPN 1 Runjung Agung, South Ogan Komering Ulu Regency.

METHOD

The research method used was quantitative with a *cross-sectional* design. This research was conducted at a junior high school located in the working area of the Runjung Agung Health Centre in Gedung Wani Village, precisely at SMPN 1 Runjung Agung, South Ogan Komering Ulu Regency.

The sampling technique in this study used the *purposive sampling* technique by observing the restriction criteria that the researcher had determined (Puteri, 2023). The number of semples was 40 people as research subjects. This study begins with measuring height using a microtoise and weighing body weight using a body scale. Furthermore, respondents filled out a questionnaire on the consumption of sugary drinks using this study measuring the consumption of sugary drinks using *Food Frequency Frequency* (FFQ), the *International Physical Activity* Questionnaire (IPAQ) for physical activity, and Screening Time questionnaire. The next step is the analysis of primary data to determine the effect of sugar-sweetened beverage consumption, screening time, and physical activity on underweight nutritional status in students using the chi-square test if the data is normally distributed and fisher test if it is not normally distributed.

RESULTS AND DISCUSSION

The characteristics of respondents in this study are mostly in the adolescent age range, with an average age of 13-15 years, which is the middle school age group. Based on the results of measuring body mass index to age (IMT/U), most respondents were in the normal nutritional status category, although there were some who fell into the thin and fat categories. The daily pocket money of the respondents varied, with most of them earning Rp5,000-Rp10,000 per day, which may influence their snack consumption patterns at school.

Table 1.
Characteristics of Respondets

Characteristics		f	%
	Age		
Age	13 th	4	10%
	14 th	36	90%
	15 th	0	0%
Pocket money	IDR 8.000	10	25%
	IDR 15.000	16	40%
	IDR 5.000	14	35%
Gender	Male	14	35%
	Female	16	65%

Students' consumption of sweetened beverages as measured by FFQ (*Food Frequency Questionnaire*) form for the last week was obtained by the respondents themselves.

Table 2.
Consumption of Sugar-sweetened beverages of Respondents

Consumption habits of sweetened beverages	f	%
Moderate (1-5x/week)	8	20%
High (>1x/day)	32	80%

The results of the data that have been processed can be seen in table 2 above that the consumption of sweet drinks of SMPN 1 Runjung Agung students mostly falls into the high category, namely > 1x / day for as many as 80% of students. Sweet drinks (*sugar-sweetened beverages*) are a type of drink that is calorific and high in sugar but low in nutrients. The type of added sugar in sweetened beverages can be

sucrose, white sugar, brown sugar, honey, or *high fructose corn syrup* (HFCS). If sugary drinks are consumed in excess, it can increase the risk of non-communicable diseases such as type ll diabetes mellitus and cardiovascular disease (Fachruddin et al., 2022). The instrument for measuring the consumption of sweetened beverages is obtained by filling out the FFQ (*Food Frequency Questionnaire*) form. The FFQ method is used to determine the nutritional intake habits of individuals at a certain time (Nurmalita, 2020). Based on the results of research conducted on students of SMPN 1 Runjung Agung, it can be seen that as many as 80% of students mostly have high consumption of sweetened drinks (1x / day) while the consumption of medium sweetened drinks (1-5x / week) is 20%. This happens because most students consume high-sugar snacks such as coca- cola, sprite, iced tea, etc. every day. This is in line with research conducted by Sari (2021) regarding the consumption of sugary drinks in adolescents, with the results of the study showing the types of sugar-sweetened drinks that are often consumed in ready-to-eat packaging (Sari, 2021). Based on the results of the study, it is known that the majority of students have daily pocket money in the range of IDR 5,000 to IDR 10,000. This amount of pocket money indirectly affects students' food and beverage consumption patterns in the school environment.

Factors that influence the consumption patterns of sugary drinks can be divided into 3, namely the individual, social, and environmental spheres. Individual scope including health knowledge, health beliefs, and parental skills, can influence the choice of drinks in children. Social factors include peer influence, adolescents are strongly influenced by friendship groups; if their friends like to buy and consume contemporary drinks, it is likely that they will participate, and the role of families who are accustomed to providing sweet drinks at home or often invite children to buy contemporary drinks, outside can form similar consumption habits in children. At the environmental level, such as the availability of sweetened drinks, attractive promotions on product prices, and policies related to school drinks will affect the choice of drinks consumed (Styaningrum et al., 2023). Screening time measurement uses a screening time questionnaire, which is filled in directly by the respondent and accompanied by the researcher.

Table 3
Screening time of Respondents

Screening Time	f	%
Moderate (<2-4 hours/day)	5	12.5%
High (>4h/day)	35	87.5%

The results of the processed data can be seen in table 3 above, which show that the screening time of SMPN 1 Runjung Agung students is mostly in the high category (>4 hours/day), namely 87.5% of students.

Screening time refers to the duration of time spent doing activities in front of an electronic device screen, such as a television, computer, tablet, or smartphone. These activities include watching videos, playing games, surfing the internet, and using social media (Pertama, 2022). The screening time measurement instrument was carried out using the screening time questionnaire instrument. Based on the results of research conducted on students of SMPN 1 Runjung Agung, students can be seen in table 3, which shows that as many as 87.5% of students have high screening time (>4 hours / day). This is because technological developments have shifted the form of activities carried out by adolescents so that they do not require a lot of body movement. These activities include playing computers, gadgets, or watching television, which only requires sitting to do so, thus causing a lack of physical activity in adolescents (Pradana, 2022). The results showed that the most dominant type of screening time activity carried out by students was playing mobile phones (HP), which included activities such as playing games, accessing social media, and watching videos. This research is in line with research conducted by Pradana (2022),

who states in his research that 94% of respondents are included in the *High screentime* (HST) category and 6% in the *Low screentime* (LST) category (Pradana, 2022). Measurement of physical activity using the *International Physical Activity Questionnaire* (IPAQ) which was filled directly by the respondent and accompanied by the researcher.

Table 4
Physical Activity of Respondents

Physical Activity	f	%
Light (<600 MET)	39	97.5
Moderate (600-2999 MET)	1	2.5

The results of the processed data can be seen in table 4 above that physical activity in students of SMPN 1 Runjung Agung is such that as many as 97.5% have light physical activity (<600 METs). Physical activity according to the *World Health Organization* (WHO) in 2020 is all body movements by skeletal muscles, and that movement requires energy expenditure. Movements made during free time or transport trips from one place to another or which are part of work are examples of physical activity (Dani, 2024). This physical activity measurement instrument uses the *International Physical Activity Questionnaire* (IPAQ), which is a questionnaire containing several questions related to a person's physical activity. Based on the results of research conducted on SMPN 1 Runjung Agung students, it can be seen in table 4 which shows that as many as 97.5% of students have mild physical activity (<600 MET). This is because the activities carried out by students at school are only sports once a week, not too many physical activities such as studying, sitting, snacks and mostly laziness, so that respondents have mild physical activity. As for moderate physical activity as many as 1 student, this also proves that respondents can also do moderate physical activities such as cleaning mutual cooperation, cleaning the house, and diligently exercising at home. This research is in line with research conducted by Dani (2024) which states in his research that 86.2% of respondents have mild physical activity and 13.8% of respondents have moderate physical activity (Dani, 2024). Data collection on nutritional status is obtained from the measurement of height (H), weight (W) and age (A).

Table 5.
Nutritional Status of Respondents

Nutritional Status	f	%
Underweight (-3SD to -2SD)	26	65%
Not *underweight* (-2SD to +1SD)	14	35%

Based on the results of measurements and calculations regarding the nutritional status of respondents based on IMT/U can be seen in table 5 which shows that students who are not *underweight* 35% and *underweight* 65% of SMPN 1 Runjung Agung student respondents. *Underweight* is a condition where a person's weight is below the range that is considered healthy for height and age. In adolescents, *underweight* can have a negative impact on physical, mental, intellectual, and social health, including disruption of learning ability and concentration (Pokhrel, 2024). From the results of the study on obtained the nutritional status of respondents of SMPN 1 Runjung Agung students based on the IMT/U index, it is known that most students have a nutritional status of 65% who have *underweight* nutrition, while for nutritional status that is not *underweight* 35% of students. Analysis conducted to test the effect of consumption of sweetened beverages with the incidence of underweight based on the IMT / U index using the *chi-square* test.

Table 6.
Sweetened Beverage Consumption Habits on the Incidence of *Underweight*

Nutritional Status	Sugary Drink Consumption		Total		*p-value*
	Medium	High	f	%	
Underweight	3	22	25	62,5	0.664
Not *Underweight*	5	10	15	37,5	

Based on the table above, it is known that the results of the *chi-square* test show that the p-value is greater than 0.05, namely the p-value 0.0664, which indicates that there is no effect of beverage consumption on the incidence of *underweight* at SMPN 1 Runjung Agung. It is known that the results obtained are p value> 0.05 which means that there is no effect of consumption of sweetened beverages on the incidence of *underweight* with a *p value* of 0.664. This study is in line with previous research conducted by Masir (2022) that there is no relationship between consumption of sweetened beverages and nutritional status (Masir, 2022). While researching, Yasmin (2023) found a significant relationship between the consumption of sugary drinks and the nutritional status of students (Yasmin, 2023).

The difference in results between this study and Yasmin's (2023) study may be due to differences in the focus of nutritional status analysis. This study highlights the incidence of underweight, while Yasmin examines overall nutritional status, including obesity, which is physiologically more susceptible to being affected by excess sugar consumption. In addition, factors such as location, respondent characteristics, sample size, and control of confounding variables such as total calorie intake also influenced the results. This suggests that the relationship between sugar-sweetened beverage consumption and nutritional status is contextual and needs to be analyzed thoroughly by considering various other factors, such as general dietary patterns with consumption of sweetened beverages often accompanied by a diet high in saturated fat and low in fiber also contributing to excess energy and risk of poor nutritional status (Bleich SN, 2022). The consumption of sugary drinks can be one of the factors that affect nutritional status. Nutritional status is the end result of the balance between the food that enters the body and the body's need for nutrients. Each individual has daily nutritional needs that must be met, based both on the number of calories needed and the content of nutrients consumed (Dani, 2024). The analysis used to test the effect of screening time on the incidence of *underweight* based on IMT/U used the *chi-square* test.

Table 7.
Screening Time on the Incidence of *Underweight*

Nutritional Status	Screening Time		Total		*p-value*
	Medium	High	f	%	
Underweight	2	24	26	65	0.043
Not Underweight	3	11	14	35	

Based on the table above, it is known that the results of the *chi-square* test show a p-value> 0.05, namely the p-value = 0.043, which indicates that there is a significant influence between screening time and the incidence of *underweight*. It is known that the results obtained are p-velue <0.05, which means that there is an effect of screening time on the incidence of *underweight* with a p-value of 0.043. This study is in line with research conducted by Hida (2020) that there is a relationship between *screentime* and adolescent nutritional status. Excessive screening time is associated with an increased risk of poor nutritional status in adolescents. This is due to a decrease in physical activity with time spent in front of the screen tending to replace time for physical activity resulting in an increased risk of nutritional status (Firdaus, 2020). High screening time affects the eating habits of adolescents. During screening time, individuals tend to consume high-calorie foods or drinks such as sugar- sweetened beverages which can increase the risk of malnutrition (Mardatillah, 2022). The analysis conducted to test the effect of physical activity with the incidence of *underweight* based on IMT / U using the *chi-square* test.

Table 8
Physical Activity on the Incidence of *Underweight*

Nutritional Status	Physical Activity		Total		*p-value*
	Moderate	Light	f	%	
Underweight	0	25	25	62,5	0.625
Not *Underweight*	1	14	15	37,5	

Based on the table above, it is known that the p-value = 0.625 which indicates that there is no significant

influence between physical activity and the incidence of *underweight.* It is known that the results obtained are p-value> 0.05, which means that there is no effect of physical activity on the incidence of *underweight* with a p-value of 0.625. This study is in line with research conducted (Aprillia, 2024) regarding physical activity with the nutritional status of Maradekayya Junior High School students, which shows that there is no significant correlation between physical activity and nutritional status. Meanwhile, in research conducted by (Zein, 2023) on physical activity with the nutritional status of students of SMPN YLPI Pekanbaru, there is a significant relationship between physical activity and the nutritional status of students.

The difference in results between this study and Zein's (2023) study is most likely due to the different focus of the nutritional status studied. This study only analyzed the incidence of underweight, while Zein analyzed nutritional status in general, including overweight and obesity, which are more sensitive to changes in physical activity. In addition, different physical activity measurement methods and respondent characteristics, such as diet and socioeconomic background, may also influence the results. The absence of a significant effect in this study indicates that physical activity is not the only factor that determines underweight nutritional status, and other factors such as nutrient intake, medical history and eating habits need to be considered.

In addition, the phenomenon in the field shows that the physical activity of adolescents at SMPN 1 Runjung Agung tends to be low. This condition is exacerbated by the lack of adequate sports facilities at school and PJOK learning which is often not optimal to encourage students to move actively. Students' awareness of the importance of physical activity is still low, and most consider sports to be a tiring and unimportant activity. One of the activities that school-age children can do is to take part in extracurricular activities at school and outside school. Physical activity is a variable for energy expenditure, therefore physical activity is used as one of the behaviours to maintain normal nutritional status. Based on several studies, it is revealed that physical activity with sufficient intensity for 60 minutes can maintain ideal body weight and also support the growth and development process, including the achievement of age-appropriate height. This study has several limitations that need to be considered. First, the number of samples used was only 40 students of SMPN 1 Runjung Agung, so the results of this study have limitations in generalizing to the wider adolescent population and to adolescent populations in other areas. Secondly, data were collected using self-report-based questionnaires such as FFQ, IPAQ, and screening time, which have the potential to cause information bias due to memory errors or discrepancies in respondents' answers. In addition, this study did not include other factors that may influence underweight nutritional status, such as breakfast habits, overall daily consumption patterns (including intake of main meals and snacks), as well as psychological factors and medical history that may also potentially affect the nutritional status of adolescents.

CONCLUSION

The majority of students at SMPN 1 Runjung Agung had high consumption of sugary drinks (80%) and moderate consumption (20%). In addition, most students (87.5%) have a high screening time duration, and only 12.5% are in the moderate category. In terms of physical activity, almost all students (97.5%) were classified as having light physical activity, and only 2.5% had moderate physical activity.The results of the chi-square test showed that there was no significant influence between the habit of consuming sugary drinks and the incidence of underweight ($p = 0.664$), and there was no influence between physical activity and the incidence of underweight ($p = 0.625$). However, there is a significant influence between screening time and the incidence of underweight in students of SMPN 1 Runjung Agung with a value of $p = 0.043$ ($p < 0.05$).

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