



FACTORS AFFECTING ADOLESCENTS NUTRITIONAL STATUS IN PALEMBANG

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ABSTRACT

Adolescence is a period of nutritional vulnerability. The prevalence of overnutrition status in adolescents is increasing from year to year along with the trend of screen time, physical inactivity, and consumption of junk food in adolescents. This study aims to determine the relationship between screen time, physical activity, and consumption of junk food with the nutritional status of adolescents aged 13-15 years in the two junior high schools in Palembang. Junior High School 11 and Junior High School 40 Palembang were chosen as research locations because these two schools have been practicing face-to-face learning since September 2021. This study used a cross sectional design with 68 subjects selected by purposive sampling method. The results showed that there were 14 adolescents (20.6%) who had overweight nutritional status. Most adolescents (79.4%) have high screen time. There are 57.4% of adolescents who are not active in physical activity and 45.6% of adolescents who often consume junk food. There was no relationship between screen time (p-value = 0.270) and consumption of junk food (p-value = 0.944) with nutritional status of the subjects, but there was a relationship between physical activity and the nutritional status (p-value = 0.035). Parents and schools are expected to be able directing the behavior of screen time, physical activity, and consumption of junk food in adolescent become more positive and meet the existing recommendations.

Keywords: adolescents, junk food, nutritional status, physical activity, screen time

Introduction

Adolescence is a nutritionally vulnerable period¹. Adolescents need proper and relatively large amounts of nutrients because they are in a phase of rapid growth (growth spurt). Good nutritional status can prevent adolescents from various diseases, especially infectious diseases and can optimize adolescent growth and development². However, in reality the double burden of nutrition (undernutrition and overnutrition) still occurs in middle-income and developing countries such as Indonesia³. The prevalence of obesity among adolescents aged 13-15 years in Indonesia has increased from 8.3% in 2013 to 16% in 2018^{4,5}. Meanwhile, the prevalence of malnutrition in Indonesia reached 8.7% in 2018 (5). Palembang City is one of the cities with a high prevalence of over nutrition in adolescents aged 13-15 years, reaching 14.44% in 2018⁴

In this sophisticated era, gadgets are well known to teenagers and even children. According to the 2017 Technology, Information and Communication (ICT) Usage Survey, approximately 65.34% of individuals aged 9-19 years have a smartphone. Christofaro *et al.*⁶ revealed that there is a high prevalence of adolescents who have a high level of screen time, that is, around 9 out of 10 adolescents spend more than two hours a day in screen activities. Adolescents who have screen

time exceeding the recommendation (>2 hours/day) are 2.6 times more likely to be obese than adolescents with sufficient screen time (≤ 2 hours/day)⁷.

Along with the trend of high screen time, the level of physical activity in society continues to decline from year to year. The proportion of people aged >10 years in Palembang who are active in carrying out physical activities decreased from 69.2% in 2013 to 46.23% in 2018^{8,9}. Physical activity during the COVID-19 pandemic also decreased, namely from 8 studies in a systematic review conducted by Suryoadji and Nugraha¹⁰ showed that during the COVID-19 pandemic there was a significant decrease in physical activity and an increase in sedentary activity in children and adolescents. A decrease in physical activity will result in a decrease in energy expenditure which has the potential to cause obesity¹¹.

Consumption of junk food in adolescents can also affect nutritional status, so it must be a concern¹². Research by Dunford *et al.*¹³ revealed that more than 70% of the total calorie intake and 90% of the total sugar intake of children and adolescents in America comes from junk food. Junk food is high in white sugar, wheat flour, trans fat, saturated fat, salt and various food additives such as MSG and tartrazine, but low in protein, vitamins, minerals and fiber. Consumption of junk food on average 770 kJ/day can result in weight gain of 2.7 kg/year in children¹⁴.

Overweight adolescents, especially those with obesity, are at higher risk of developing hyperlipidemia, hypertension, and type 2 diabetes mellitus as adults than adolescents with normal weight¹⁵. Palembang has the highest prevalence of hypertension and diabetes mellitus among all cities and regencies in South Sumatra in 2018, while the highest incidence of hypertension and diabetes mellitus in Palembang is in Sukarami sub-district, namely there are 26,406 people with hypertension and 1,128 people with diabetes mellitus^{8,16}. Seeing the high incidence of this disease in Palembang and in the Sukarami sub-district proves that nutritional problems, especially over nutrition, need to be concern and must be handled properly as an early prevention of non-communicable diseases in the future. This study aims to determine the relationship between screen time, physical activity, and consumption of junk food with the nutritional status of adolescents.

Methods

This type of research is descriptive analytic with cross sectional design. This study used 68 subjects selected by purposive sampling method. The inclusion criteria used were adolescents aged 13-15 years, having access to screen time (mobile phones, televisions, computers, laptops, video game consoles), and not suffering from infectious diseases (diarrhea, DHF, tuberculosis, typhus, pneumonia, etc.) in the last 1 month. The research was conducted in two junior high schools that had conducted face-to-face learning in the Sukarami sub-district, Palembang city, namely Junior High School 11 Palembang and Junior High School 40 Palembang in January 2022. The data collected included nutritional status data as measured using digital scales and a stadiometer, screen

time data with the Questionnaire for Screen Time of Adolescent (QueST), physical activity data with the Physical Activity Questionnaire for Adolescent (PAQ-A), and data on consumption of junk food with the Food Frequency Questionnaire (FFQ). The test used in this study is the chi-square test. This research has obtained a research ethics permit from the Health Research Ethics Committee, Faculty of Public Health, Sriwijaya University with Number: 343/UN9.FKM/TU.KKE/2021.

Results

The descriptive characteristics of the subjects analyzed are shown in Table 1 which shows that there were 22 subjects (32.3%) who were male and 46 subjects (67.7%) who were female. The majority of subjects were 13 years old, namely 47 subjects (69.1%) and there were 16 subjects (23.5%) aged 14 years and 5 subjects (7.4%) subjects aged 15 years. There were 35 subjects (51.5%) receiving pocket money of \geq Rp. 10,000 daily and 33 subjects (48.5%) received pocket money $<$ Rp. 10,000 every day. The subject's father's occupation was dominated by labour, namely a number of 32 people (47.1%) of the subject. The majority of subject fathers (47.1%) have income \geq Rp. 2,000,000 per month, followed by 25 subject fathers (36.8%) who earn Rp. 1,000,000 – 1,999,999 per month. The majority of the last education of the subject's father and mother were \geq Senior High School/equivalent, namely 48 subject fathers (70.6%) and 43 subject mothers (63.2%). There were 20 subject fathers (29.4%) and 25 subject mothers (36.8%) who had education below Senior High School/equivalent. The majority of the subject's mothers, as many as 55 people (80.9%) did not work.

Table 1 also shows that the majority of the subjects were not overweight, namely 54 subjects (79.4%) and there were 14 subjects (20.6%) who were overweight. Not overweight status in this study was defined as normal nutritional status and undernourished status. The majority of subjects had high screen time, namely 54 subjects (79.4%). There were 39 subjects who were not active in physical activity (57.4%) and 29 subjects who were active in physical activity (42.6%). The majority of subjects rarely consumed junk food, namely as many as 37 subjects and there were 31 subjects who often consumed junk food (45.6%).

Table 1. Characteristics of Respondents

Variables	n	%
Sex		
Male	22	32.3
Female	46	67.7
Age		
13	47	69.1
14	16	23.5
15	5	7.4
Pocket Money		
≥Rp 10.000	35	51.5
<Rp 10.000	33	48.5
Father's Education		
≥Senior High School	48	70.6
<Senior High School	20	29.4
Father's Occupation		
Doesn't work	3	4.4
Labour	32	47.1
Entrepreneur/trader	18	26.5
Private sector employee	10	14.7
Government employee/Indonesian armed forces/Indonesian national police	5	7.4
Father's Income		
≥Rp 2.000.000	32	47.1
Rp 1.000.000 - 1.999.999	25	36.8
Rp 500.000 – 999.999	8	11.8
<Rp 500.000	3	4.4
Mother's Education		
≥Senior High School	43	63.2
<Senior High School	25	36.8
Mother's Work Status		
Work	13	19.1
Doesn't work	55	80.9
Nutritional Status		
Overweight	14	20.6
Not overweight	54	79.4
Screen Time		
High	54	79.4
Low	14	20.6
Physical Activity		
Not active	39	57.4
Active	29	42.6
Junk Food Consumption		
Often	31	45.6
Rarely	37	54.4

It was found that subjects with high screen time and overweight status were 13 people (24.1%) and subjects with high screen time and not overweight status were 41 people (75.9%), while subjects with low screen time and overweight status were 1 person (7.1%), and subjects with low screen time and not overweight status were 13 people (92.9%). In the results of the chi-square statistical test, it was found that there was no relationship between screen time and the nutritional status of adolescents ($p>0.05$).

Table 2. Relationship between Screen Time, Physical Activity, and Junk Food Consumption with Nutritional Status

	Nutritional Status				Total		p-value	PR (95%CI)
	Overweight		Not Overweight		n	%		
	n	%	n	%				
Screen Time								3.370
High	13	24.1	41	75.9	54	100	0.270	(0.481-
Low	1	7.1	13	92.9	14	100		23.622)
Physical Activity								4.462
Not Active	12	30.8	27	69.2	39	100	0.035	(1.081-
Active	2	6.9	27	93.1	29	100		18.416)
Junk Food Consumption								1.194
Often	7	20.6	24	77.4	31	100	0.944	(0.470-
Rarely	7	18.9	30	81.1	37	100		3.033)

It was found that 12 subjects (30.8%) were not active in carrying out physical activities with overweight status and subjects who were not active in physical activity were not overweight as many as 27 people (69.2%), while subjects who were active in physical activity with overweight status were 2 people (6.9%), and subjects who were active in doing physical activity with not overweight status were 27 people (93.1%). The results of the chi-square statistical test showed that there was a significant relationship between physical activity and the nutritional status of adolescents ($p < 0.05$).

Table 2 also shows an analysis of the relationship between junk food consumption and the nutritional status of adolescents. It was found that subjects who often consumed junk food with overweight status were 7 people (20.6%) and subjects who often consumed junk food with not overweight status were 24 people (77.4%), while subjects who rarely consumed junk food with overweight status were 7 people (18.9%), and subjects who rarely consumed junk food with not overweight status were 30 people (81.1%). The results of the chi-square test analysis showed that there was no significant relationship between junk food consumption and the nutritional status of adolescents ($p > 0.05$).

Discussion

In the results of the chi-square statistical test, it was found that $p\text{-value} = 0.270 (> 0.05)$ which means that there is no relationship between screen time and the nutritional status of adolescents. The same thing was also found in other studies which stated that there was no significant relationship between screen-based activity and children's nutritional status ($p = 0.151$)¹⁷. Although in this study no significant relationship was found between screen time and the nutritional status of adolescents, the proportion of overweight adolescents with high screen time (24.1%) was greater than more malnourished adolescents with low screen time (7.1%).

The high screen time in adolescents can be caused by more and more interesting entertainment that can be accessed through gadgets. Currently mobile phones have many functions

such as alarms, diaries, cameras to applications that can be downloaded such as WhatsApp, Instagram, Twitter, Youtube, games, and others^{18,19}. This high screen time can also be affected by the COVID-19 pandemic. Research Schmidt *et al.*²⁰ proved that during the COVID-19 pandemic, total screen time for recreational activities for children and adolescents increased by 61.2 minutes/day. A number of reasons explain how COVID-19 can affect screen time, including the desire to be more connected with family/friends, keep abreast of news developments, maintain distance, and reduce boredom^{21,22}.

Different things were found in the study of Kumala *et al.*²³, the study stated that there was a significant relationship between screen time and the nutritional status of adolescents. Food advertisements that appear while watching can affect food preferences and food intake of adolescents²⁴. Eating while watching can also affect eating behavior such as extending the duration of eating (eating until the program being watched is finished, not until full), triggering the desire to eat, and diverting feelings of fullness²⁵. Excessive screen time is also associated with lower sleep quality²⁶. Lack of sleep can cause changes in the hormones leptin and ghrelin which will result in an increase in hunger and a decrease in satiety, in addition to sleeping late because watching or playing smartphones can also increase snacking habits and eating outside normal meal times such as snacking at night²⁷.

This study did not find a significant relationship between screen time and the nutritional status of adolescents because screen time is an indirect causal factor that affects nutritional status. Screen time is a direct factor that affects physical activity where the more often you play gadgets, the lower your physical activity will be²⁸. A decrease in physical activity will result in a decrease in energy expenditure and has the potential to cause obesity¹¹. However, in this study, even though some subjects had screen time exceeding the recommendations, they were still active in carrying out physical activities. This is supported by research by Dahlgren *et al.*²⁹ who showed that the time children and adolescents spent on smartphones was not related to the time spent being physically active. In this context, an individual can be physically active, that is, meet the recommendations for moderate-to-strength physical activity and still have excessive sedentary time³⁰. Even though it has nothing to do with it, high screen time should be balanced with sufficient physical activity.

One of the other factors that caused no relationship was found between screen time and the nutritional status of adolescents was that this study did not delve further into the eating behavior of adolescents while watching, watching time, presence of food/junk food advertisements and other factors that might contribute to nutritional status. Previously it was explained that watching activities can affect eating preferences, food intake, and duration of eating which can lead to obesity. Al-Ghamdi's research³¹ stated that only children who watched TV late at night were more likely to be obese than those who watched television at other times ($p=0.026$).

The condition of the COVID-19 pandemic has an impact on adolescent physical activity.

Research by Ruíz-Roso *et al.*³² who analyzed the physical activity of adolescents before and during the COVID-19 pandemic on two continents (Europe and Latin America) found that the percentage of physical inactivity was quite high in the population before and during the COVID-19 pandemic, and was even higher with the implementation of the lockdown. Even though Face-to-Face Learning in the Palembang has been held again since October 2021, Face-to-Face Learning is only held 2-3 days a week so that students cannot carry out their physical activities to the fullest like before the COVID-19 pandemic. However, some other adolescents are still active in physical activities such as playing football with friends, cycling, playing badminton, self-defense and other physical activities.

The results of the chi-square statistical test showed $p\text{-value} = 0.035 (> 0.05)$, which means that there is a significant relationship between physical activity and the nutritional status of adolescents. The results of this study are supported by research by Rukmana *et al.*³³ which showed that there was a relationship between physical activity and nutritional status in adolescents ($p=0.008$). Adolescents who were not active in physical activity had 4.462 times (95% CI = 1.081-18.416) greater chance of having overweight status than adolescents who were active in physical activity.

Strasser³⁴ describes several mechanisms of physical activity in preventing obesity. Physical activity can increase energy expenditure so that it can help the individual to maintain energy balance, it can even help lose weight as long as we don't eat more than our body needs. Physical activity can also reduce the amount of fat around the waist and total body fat so that it can slow down the occurrence of central obesity. Doing physical activities that strengthen muscles, such as lifting weights and push-ups, can increase energy burn throughout the day even when body is resting, making it easier to control weight. Physical activity can also reduce stress. Stress increases the release of Neuropeptide Y. Neuropeptide Y can increase appetite which can encourage excessive food intake so that it leads to obesity³⁵.

There are several things that can influence the consumption of junk food in adolescents, including access to junk food, peer influence, and family environment. Several subjects rarely consumed junk food because the snack places were far from home and the school canteen was closed due to the COVID-19 pandemic so students got used to bring lunch from home. High access to fast food outlets around schools is associated with higher consumption of junk food during school breaks in middle school children³⁶. The condition of the COVID-19 pandemic has also made adolescents used to being at home and rarely leaving the house to play with friends. Adolescents tend to get used to snacking with their friends when playing out with friends. The influence of friends plays a role in adolescent consumption of junk food³⁷. In addition, some subjects were also restricted by their parents from consuming junk food. The family environment, such as parental regulations and the availability of food at home, is also a factor that influences adolescent eating

habits, because at home adolescents consume what is served to them³⁸. Subjects who often eat nuggets, sausages or instant noodles as their main food are caused by parents who provide these foods for their children to consume.

The results of the chi-square test analysis showed $p\text{-value} = 0.944$, which means that there is no significant relationship between junk food consumption and the nutritional status of adolescents. Different results were shown in the research of Susanti and Rusdani¹², who found a significant relationship between the frequency of eating junk food and the nutritional status of adolescents ($p=0.003$). Junk food is a high-calorie food with high amounts of refined sugar, starch, trans fat, saturated fat, salt and various additives, while having low nutritional value in terms of protein, fiber, vitamins and minerals³⁹. The high calorie contribution of these foods can result in an increase in total energy intake. Increased energy intake will spur a positive energy balance and increase fat stores in the body, this can lead to obesity¹¹.

The reason why no relationship was found between consumption of junk food and the nutritional status of adolescents was because the researchers did not explore the subject's overall food intake. Research by Azemati *et al.*⁴⁰ found a relationship between consumption of junk food and the incidence of overweight in adolescents, however, this study stated that there is a possibility that overweight in the population is caused by high energy intake from food sources other than junk food.

Conclusion

Adolescents who are not active in doing physical activities tend to have more nutritional status. Screen time and consumption of junk food are not significantly related to nutritional status of adolescents. The results of the study illustrate that there are still many adolescents who have high screen time, are not active in physical activity, and often consume junk food. Adolescents are expected to have screen time behavior, physical activity, and junk food consumption in accordance with the recommendations to achieve better nutritional status.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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