The Relationship between Eating and Screen Viewing Behavior with Nutritional Status of Adolescents in Medan City

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Abstract. Adolescents are vulnerable to experiencing malnutrition issues, both overnutrition and undernutrition. This study's objective was to determine the relationship between eating and screen viewing behaviour and with nutritional status of adolescents. This study used a cross-sectional design with 145 adolescents chosen through the purposive sampling method. The samples were divided into three categories: early adolescents, middle adolescents, and late adolescents, and data on eating behaviour were obtained by using Adult Eating Behavior Questionnaire (AEBQ). The screen viewing behavior variable had two categories: low screen time and high screen time. Adolescent body mass index z-scores measured nutritional status. This study was conducted from June to August 2022. Results showed 5.5% underweight participants, 18.6% subject overweight participants, and 22.8% obese participants of the total participants. Spearman's tests showed that there was a significant relationship between eating behaviour and nutritional status ($p<0.05$) only on two subscales of appetite traits (emotional overeating and food responsiveness) in early adolescents. Likewise, in late adolescents, there was a significant relationship between eating behaviour and nutritional status ($p<0.05$) only with emotional undereating. There was no significant relationship between screen viewing behaviour and nutritional status in all categories of adolescents. The highest prevalence of obesity was found in early adolescents, and it influenced the adolescent's eating behavior such as emotional overeating. While in late adolescents, malnutrition cases were more or less common due to emotional undereating.

1 Introduction

Adolescence is the phase of life between childhood and adulthood from ages of 10 to 19 years. It is an important stage of human development that determines one's health [1]. Adequacy of adolescent's nutrition will also affect the future life such as the level of

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intelligence [2]. A previous study reported that adolescent's nutritional status was influenced by diet, pocket money, and knowledge. One of the alternatives to increase the nutritional status of adolescents is by improving their eating patterns [2]. The other factors that can influence the adolescent's nutritional status are physical activities, body image, psychology, and gender [3].

Nowadays, adolescents are more exposed to nutritional risks, harmful behavior, lack of physical activity, smoking and substance use, sexually transmitted diseases, and other risks as facing new challenges in the changing technological development [4]. Obesity is currently the most common health problem in adolescents [5]. In 2018, the Basic Health Research showed that 11.2% of Indonesian adolescents aged 10 to 15 years were overweight, and 4.8% of them were obese; while 9.5% of adolescents aged 16 to18 years were overweight, and 4.0% of them were obese. In North Sumatra, 12.9% of adolescents aged 13-15 years were overweight, and 4.8% of them were obese (13 to 15 years). There were 10.9% of underweight adolescents and 4.0% of obese adolescents aged 16-18 years. Other nutritional status problems in Indonesian adolescents are thinness and severe thinness. The proportions of severe and severe thinness cases in Indonesian adolescents was 6.7% and 1.4%, respectively [6].

The nutritional issues in adolescents are mostly linked with lifestyle factors, especially food choice decision, eating habits and physical activities. Nowadays, adolescents have less time for physical exercise and spend more time for sedentary leisure activities or screen time with electronic devices (television, gadget, computer, video game). Previous research supported the phenomena that some Luwuk City adolescents had nutritional problems and unhealthy food consumption [7]. The other key determinants of eating behavior are appetite characteristics [8], which relates to food preferences. Appetite characteristics are defined as persistent predispositions towards food [9]. They include sub-components of food approach (hunger, food responsiveness, emotional overeating, enjoyment of food) and avoidant food intake behavior (satiety responsiveness, emotional undereating, food fussiness, and slow eating) [10]. Another study showed that nutrition level of college students had a significant relationship between eating behavior and nutritional status with two sub-components of appetite traits (hunger and satiety responsiveness) [11]. Based on the background of issues above, this study aimed to evaluate the relationships between eating behavior and screen viewing behavior with the nutritional status of adolescents in Medan City.

2 Materials and Methods

This study was conducted on 145 adolescents who met the criteria in Medan city and were willing to become participants by signing informed consent forms. Participants were divided into three categories: early adolescents (11-14 years old), middle adolescents (15-17 years old), and late adolescents (18-21 years old) [12]. The participants were selected using the purposive sampling technique. The study was conducted from June to August 2022 and started by collecting primary data with the cross-sectional method. Data were collected through weight and height measurements as well as interviews using questionnaire. Researchers along with enumerators carried out data collection.

The nutritional status of adolescents was obtained from the results of anthropometric measurement. Weight was measured using digital scales, and height was measured using microtoise. Anthropometric indicators used in this study were the nutritional status of early and middle adolescents measured using BMI for age (z-score) and late adolescents measured using BMI (kg/m2). According to the Decree of the Ministry of Health Indonesia Anthropometry 2020, these are the standard nutritional status categories [13]. Eating habits in the form of appetite traits were measured using the Adult Eating Behavior Questionnaire (AEBQ) with 35 questions divided into two sections about appetite traits/indicators, four

sections about sub-components of food approach, as well as four sections about avoidant food intake behavior [14,15]. Screen time is the total amount of time spent each day playing social media and video games; watching TV; and using electronic devices such laptops, computers, tablets, and smartphones. Data on screen viewing behavior was obtained from interviews using a valid and reliable questionnaire. The duration of the screen viewing was recorded in units of minutes per day. Low screen time is for the duration of ≤120 minutes/day, and high screen time is for the duration of > 120 minutes/day [16].

The first step taken by the research team was to measure the weight and height of participants to determine their nutritional status based on body mass index (BMI) for age. The next step was to identify their eating habits and delve further on their use of gadgets through in-depth interviews. Then, the primary data i.e., measurements and interview data were passed to coding process and analyzed using SPSS. To find out the relationship between variables, Spearman's test and chi-square test were performed. The Ethical Committee approved the study of Maranatha Christian University (approval number: 062/ KEP/VI/2022).

3 Results and Discussion

3.1 Characteristics of respondents

This study showed that early and middle adolescents were equally balanced by sex, while most of the late adolescents were females. Viewed from the family income, the results showed that in all categories of adolescents, mostly parents had income above the minimum wage rate. The percentages of parents with above-minimum-rate income were 84.3% of early adolescents, 89.8% of middle adolescents, and 62.2% of late adolescents. Their parents of all adolescent groups had jobs, while their mothers of all adolescent groups were mostly housewives. More than a half of parents of all adolescent groups graduated from universities, and more than a third attended high schools. Likewise, most of their mothers were university and high school graduates.

Table 1. Adolescent Respondents" Characteristics

Respondents' Characteristics	Early Adolescence N (%)	Middle Adolescence N (%)	Late Adolescence N (%)
Gender			
Male	25 (49%)	20 (40.8%)	3 (6.7%)
Female	26 (51%)	29 (59.2%)	42 (93.3%)
Family income			
< Regional Minimum Wage	8 (15.7%)	5 (10.2%)	17 (37.8%)
>= Regional Minimum Wage	43 (84.3%)	44 (89.8%)	28 (62.2%)
Father's education			
Elementary school	1 (2%)	0	3 (6.7%)
Middle school	0	3 (6.1%)	3 (6.7%)
High school	19 (37.3%)	9 (18.4%)	26 (57.8%)
Diploma, Bachelor’s degree	31 (60.8%)	37 (75.5%)	13 (28.9%)

Mother's education			
Not in elementary school	0	0	5 (11.1%)
Elementary school	0	2 (4.1%)	5 (11.1%)
Middle school	0	0	0
High school	23 (45.1%)	15 (30.6%)	22 (48.9%)
Diploma, Bachelor's degree	28 (54.9%)	32 (65.3%)	13 (28.9%)
Father's occupation			
Civil servant	12 (23.5%)	13 (26.5%)	10 (22.2%)
Private employee	11 (21.6%)	13 (26.5%)	9 (20%)
Entrepreneur	15 (29.4%)	7 (14.3%)	12 (26.7%)
Labor and farmer	13 (25.5%)	16 (32.7%)	14 (31.1%)
Mother's occupation			
Civil servant	4 (7.8%)	7 (14.3%)	5 (11.1%)
Private employee	10 (19.6%)	6 (12.2%)	5 (11.1%)
Entrepreneur	10 (19.6%)	6 (12.2%)	9 (20%)
Housewife	27 (52.9%)	30 (61.2%)	26 (57.8%)

Furthermore, the results showed that the nutritional status of the early, middle and late adolescents was mostly normal. Malnutrition status was more found in late adolescents (13.3%) compared to middle adolescents (4.1%) due to changes in eating behavior to be undereating, in which food intake and appetite decrease from the needs (Table 2). This finding is in line with research conducted on adolescents in Palu city who did not meet their nutritional intake sufficiently and did not follow the Recommended Dietary Allowances (RDA) [17].

Table 2. Nutritional Status of adolescent

	Early Adolescence N (%) (N=51)	**Middle Adolescence N (%) (N=49)**	**Late Adolescence N (%) (N=45)**	**N Total**
Underweight	0 (0)	2 (4,1%)	6 (13,3%)	8 (5.5%)
Normal	25 (49%)	31 (63,3%)	21 (46,7%)	77 (53.1%)
Overweight	13 (25,5%)	8 (16,3%)	6 (13,3%)	27 (18.6%)
Obesity	13 (25,5%)	8 (16,3%)	12 (26,7%)	33 (22.7%)

In addition, the overnutrition status (overweight and obesity) was fairly in high percentage in each adolescent group. The incidence of overweight and obesity was more common in early adolescents (51%) and late adolescents (40%) compared to middle adolescents (32.6%). Their eating behavior tends to lead to overeating, in which a person consumes more calories than the energy needed, causing overweight and obesity. Early adolescents dominantly have concrete thinking, egocentrism, and impulsive behavior. Reasoning abilities are not yet developed to a great extent in most adolescents, limiting their ability to understand complex health and nutrition issues [12].

3.2 The relationship between AEBQ indicator scores and Body Mass Index (BMI)

Table 3 demonstrates eating behavior of all adolescent groups. The study's results showed that the enjoyment of food, emotional overeating, hunger, and food responsiveness in the early adolescent and late adolescent groups had higher scores than in the middle adolescents. The average scores for the avoidant food intake behavior and slow eating were higher than the early and middle adolescent groups. The average scores of emotional overeating (2.47±0.84) and food responsiveness (3.23±0.89) in early adolescents were higher compared to other groups. If associated with BMI, the prevalence of overweight and obesity cases was greater in the early adolescents than the other groups. In line with the research of Hunot (2016) which states that the average scores of the food responsiveness and enjoyment of food were higher in people with high BMI [10]. In addition, eating behavior could be threatened by stress which leads to emotional overeating. When the body is stressed, the cortisol hormone will increase the appetite and affect BMI [18]. In contrast, emotional undereating as a sub-component of avoidant food intake behavior (2.86±0.98) averaged higher in the late adolescents than in the early and middle adolescents because the late adolescent group had higher BMI than the other two groups.

Table 3. The relationship between AEBQ indicator score and Body Mass Index (BMI)

AEBQ Indicators	Early Adolescence		p-values	Middle Adolescence		p-values	Late Adolescence		p-values
	Mean	SD		Mean	SD		Mean	SD	
Food Approach									
Enjoyment of food	3.6922	0.67701	0.52	3.5327	0.52376	0.66	3.8111	0.61468	0.70
Emotional Overeating	2.4706	0.84553	0.03*	2.3551	0.77381	0.86	2.3778	0.82707	0.18
Hunger	2.8706	0.80381	0.26	2.9184	0.58441	0.30	3.1111	0.79836	0.66
Food responsiveness	3.2353	0.89640	0.03*	2.9510	0.57848	0.13	3.1889	0.71262	0.52
Avoidant Food Intake Behavior									
Emotional undereating	2.7020	0.88034	0.13	2.8286	0.92466	0.67	2.8622	0.98518	0.02*
Food fussiness	2.6471	0.56510	0.47	2.8735	0.33340	0.46	2.7956	0.56164	0.96
Slow eating	2.8922	0.75176	0.19	2.9592	0.54807	0.84	3.1111	0.64569	0.67
Satiety responsiveness	2.9235	0.81525	0.33	2.9694	0.58281	0.32	2.6689	0.71185	0.62

Some sub-components of food approach i.e., emotional undereating and food responsiveness had significant relationships with nutritional status of early adolescents ($p < 0.05$). Additionally, emotional undereating cases was found in the late adolescent group. Nevertheless, the other sub-components had no relationships. These findings are is in line with research conducted in Bogor City which showed the psychological state of actuarial students influenced eating habits including nutrition intake and a significant relationship between sub-components of food approach and avoidant food intake behavior [11]. The results differ from the initial AEBQ study by Hunot (2016) which found no significant

relationships between all sub-components of both indicators [14]. Several factors can cause the different results. This study only identified the relationship between data from the AEBQ and BMI for all three age groups without linking other covariates such as gender, pocket money, and physical activity. In addition, the post-pandemic period has changed their eating behavior. For example, people are more worried about food contamination. Obese or overweight people have more significant changes in eating habits, for instance, a decreased interest in reading food labels [19]. Overeating might be the result of boredom and loneliness, thereby potentially leading to a wrong diet [20].

3.3 Relationship between screen viewing behavior and nutritional status

The intensity of screen time was analyzed from three groups. Most of the adolescents had high screen time. In details, 72.5% in the early adolescents, 81.6% in the middle adolescents, and 86.7% in the late adolescents had long use of electronic devices (Table 4). This is in line with research conducted on adolescents in Banyumas where 88.5% of them showed very high screen time [16]. This indicates that electronic devices by the adolescents were used in more than 2 hours/day for watching television, playing games or playing social media such as TikTok, Facebook, Instagram, WhatsApp, and so on. Adolescents with high screen time may develop the possibility of obesity due to poor physical activities and snacking habits involving sugary foods, fast food, and snacks [21].

Table 4. The Relationship of Screen Time Habits with Adolescent Nutritional Status

Nutritional Status	**Early Adolescence** n (%)		**Middle Adolescence** n (%)		**Late Adolescence** n (%)	
	Low Screen Time	High Screen Time	Low Screen Time	High Screen Time	Low Screen Time	High Screen Time
Underweight	0	0	1 (2.04%)	1 (2.04%)	1(2.2%)	5 (11.1%)
Normal	6 (11.8%)	19 (37.2%)	7 (14.28%)	24 (48.9%)	1 (2.2%)	20 (44.44)
Overweight	6 (11.8%)	7 (13.7%)	1 (2.04%)	7 (14.3%)	2 (4.4%)	4 (8.8%)
Obesity	2 (3.9%)	11 (21.6%)	0	8 (16.3%)	2 (4.4%)	10 (22.2%)
p-values	0.92		0.07		0,42	

Moreover, screen viewing behavior and none of other variables were significantly related to nutritional status of each adolescent group. However, the results of cross-tabulation showed that adolescents with high screen time tend to be overweight and obese. For example, 35.3% of early adolescents with high screen time had overweight and obese issues, and so did 30.3% of middle adolescents and 40% of late adolescents. The results differ from other previous studies that showed a significant relationship between screen viewing behavior and nutritional status and between the duration of electronic device (gadget) use and nutritional status [16, 22]. Despite the aforementioned findings, previous studies and this current study also posed some weaknesses as they did not consider the covariate factors of physical activity, food intake, and sleep duration that could affect nutritional status [23, 24].

4 Conclusion

The average number of overweight early adolescents was 26%. Around a third of middle adolescents had normal nutritional status (31%), while 21% of the late adolescents had normal nutritional status, 18% of them were overweight, and 13.3% of them were underweight. There was a significant association between eating behavior and nutritional status of early adolescents ($p < 0.05$) with two sub-components of appetite traits (emotional eating and food responsiveness). Likewise, eating behavior and nutritional status of early adolescents ($p < 0.05$) were significantly related to emotional undereating. There was no significant association between screen viewing behavior and nutritional status of all adolescent groups.

Early adolescents and late adolescents were scored higher than middle adolescents in terms of enjoyment of food, emotional overeating, hunger, and food responsiveness. From the food approach analysis, early adolescents and late adolescents were more likely to experience an increase in BMI than middle adolescents. The highest prevalence of obesity was found in early adolescents, and obesity influenced eating behavior, and especially caused emotional overeating. While the late adolescents less experienced emotional undereating than the other groups.

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