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FOREWORD

By giving thanks to God Almighty, volume 8, issue 4 of December 2024, Amerta Nutrition can finally be published. Amerta Nutrition (Amerta Nutr.) is a scientific journal published every three months, and starting in 2023, our journal will be published all articles in bilingual (English Version and Indonesian Version). Amerta Nutrition functions as communication for disseminating scientific information from research results and literature reviews. Amerta Nutrition is targeted to become a source of scientific information for lecturers, researchers, students, and the general public interested in nutrition and health. Amerta Nutrition tries to always present a variety of scientific articles in the scope of Health Nutrition that are interesting and up-to-date.

In this edition of December 2024, Amerta Nutrition presents several articles with various topics in the health sector, clinical nutrition, community nutrition, public health, dietary, food management, and technology. With the publication of issue volume 8, issue 4, Amerta Nutrition has reached a significant milestone in publishing six consecutive years of 7 volumes with 32 issues. The scientific journal Amerta Nutrition is expected to be a leverage for developing a communicative writing culture and scientific studies and attracting readers and writers to participate in the upcoming issue of Amerta Nutrition. Hopefully, the thoughts presented by Amerta Nutrition can benefit and enrich readers' knowledge base.

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RESEARCH STUDY

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Adolescents' Unhealthy Eating Behavior and Customer Engagement on Social Media in Sub-Urban Areas

Perilaku Makan Tidak Sehat Remaja dan Customer Engagement pada Sosial Media di daerah Sub-Urban

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ABSTRACT

Background: Social media exposure is one of the effective strategies for digital marketing of food and beverage products in this present era. In addition, adolescents are the dominant users of social media (75.5%), which affects their behavior and health status.

Objectives: This study aimed to describe adolescent eating behavior and customer engagement with food, beverage, and drink-related content on social media in sub-urban areas and to analyze the relationship with their eating behavior.

Methods: The procedures were carried out using a descriptive observational method with a cross-sectional approach at SMA XX in the sub-urban areas in Depok City. The participants comprised class X aged 15-16 years (n=277) who were selected using the total sampling method. In addition, adolescents' healthy eating behavior was measured by AFHC (Adolescent Food Habits Checklist). The data obtained were then analyzed using an independent T-test with a Confidence Interval (CI) of 95%.

Results: The results showed that the majority of the participants had unhealthy eating behavior. In addition, two aspects of customer engagement behavior showed a significant relationship with healthy eating in adolescents. This behavior includes liking and commenting on food and drink advertisements/promotions on social media (p-value=0.051), sharing, reposting, or tagging someone in food and drink content, reviews of places to eat, or viral food trends (p-value=0.025).

Conclusions: Customer engagement on social media significantly affected eating behavior of adolescents in sub-urban areas, particularly behavior of liking and sharing/reposting food adverts.

INTRODUCTION

A report from the World Health Organization (WHO) stated that adolescents face double burden of malnutrition, including both undernutrition (such as stunting, wasting, and micronutrient deficiencies) and overnutrition (overweight and obesity). In 2022, the global burden of malnutrition was significant, with millions being affected by inadequate vitamin and mineral intake¹. In South Asia, the prevalence of thinness among females (15-19 years) was approximately 7%, while in East Asia and the Pacific, 4% were overweight or obese^{2,3}. Several studies have shown that adolescents' eating behavior phenomenon currently comprises the consumption of insufficient amounts of protein, fruit, and vegetables. Eating behavior has the potential to continue into adult life, leading to various health complications that affect current and future health⁴. Similar results were also reported in a systematic review where adolescents in various regions, including Asia, had low intake levels of fruits and vegetables, causing dietary imbalances⁵. This condition is worsened by the high

consumption of sodium and fast food among adolescents⁶. Fast food consumption has been reported to cause an increased risk of obesity and related health issues due to the high calorie, fat, and sodium content in the food⁷.

In low- and middle-income countries (LMIC), the condition is exacerbated by rapid urbanization, which exposes adolescents to increasingly obesogenic environments characterized by energy-dense and ultra-processed diets and low levels of physical activity⁸. As a result of scoping literature reviews, data from low- and middle-income countries across various UNICEF-defined global regions showed environments more conducive to obesity. These environments were associated with higher consumption of processed and junk foods, an increased tendency to eat out, and a greater risk of overweight and obesity⁹. This is also consistent with Indonesia's nutritional status as one of LMIC, where data from health report showed that the cases of obesity among adolescents (16-18 years old) have increased from 7.3% (2013) to 13.5% (2018)¹⁰. Cases of obesity are more

prevalent in females, particularly during childhood and transition through puberty and beyond. As supported by previous studies, this may in part be because females consume foods higher in fat and sugar¹¹. The nutritional status of adolescents has been reported to have an important role in their health status and menstrual circle¹².

Adolescents' eating behavior are currently influenced by a variety of factors, including social media. One of the effects of social media is digital marketing for food and beverages. Adolescents are highly active on these platforms, which can significantly affect their eating behavior¹³. Studies conducted in developed nations have shown that attitudes and behavior toward certain hazardous commodities can linked to exposure to digital marketing. With a ratio of 75.50%, adolescents are the dominant users of social media. People use social media at three different times of the day: 1-3 hours (43.89%), 4-7 hours (29.63%), and more than 7 hours (26.48%). Facebook is the most popular platform, used by 54% of people, followed by Instagram (15%), YouTube (11%), Google (6%), Twitter (5.5%), and LinkedIn (0.6%)¹⁴. Social media interactions are believed to have a greater impact than other marketing channels because the content shared through young people's online interactions often blurs the line between marketers of food and beverage products and user-generated content¹⁵.

Several studies have also shown that social media influences food choices^{16,17} and food purchases, which affect the intake of energy and protein in adolescents¹⁸ and body mass index (BMI)¹⁹. Khayat et al study showed that there were several unhealthy behavior in sub-urban areas, such as a lack of food diversity in the population²⁰. Therefore, this study aims to describe the adolescent eating behavior and customer engagement with food, beverage, and drink-related content on social media in sub-urban areas and to analyze the relationship with their eating behavior.

METHODS

The study design was descriptive observational with a cross-sectional approach at SMA XX in the sub-urban area of Depok City. The selection of schools was carried out based on their location which could represent sub-urban student groups. These included (1) a residential buffer area (not industrial buffer), (2) located on a mass transportation route (3) fast economic growth (4) middle- and lower-income population, and the total sample in this study was 277 respondents. The minimum sample size required was based on the calculation formula for testing the hypothesis of a difference in 2 proportions based on the Lemeshow formula (205 respondents). Additionally, the sampling technique used was total for class X aged 15-16 years.

The healthy eating behavior of the variable of

adolescents was measured by the AFHC (Adolescent Food Habits Checklist) questionnaire instrument developed by Johnson et al. in 2002²¹ and was translated into Bahasa. This consisted of 23 statements designed to measure healthy eating habits in adolescents, with answer options of 'yes' or 'no'. A total of 9 statements had the additional answer option 'does not apply to me', and subjects received one point when deemed to have a healthy eating habit response. The final score must be adjusted for responses that stated, 'does not apply to me' and statements that were not filled in using the formula. The higher the respondent's AFHC score, the healthier their eating behavior was.

The consumer engagement variable was measured by 5 questions prepared based on social media usage behavior related to respondents' eating behavior, including liking, sharing, reposting, accessing, and searching for information related to food, beverages, and drinks on social media. The questions included the frequency of that behavior for the past week, and this was categorized into 2 categories namely low and high. The low category was respondents with a frequency of never and rarely, and the high category was respondents with a frequency of often and always. Data analysis was univariate and bivariate analysis, and the test was an independent T-test with a Confidence Interval (CI) of 95%. This study was approved by the Health Study Ethics Committee of Purwokerto Muhammadiyah University with the register number: KEPK/UMP/249/VI/2023.

RESULTS AND DISCUSSIONS

Most respondents in this study were 165 women and 112 men, and the results of measuring adolescent eating behavior patterns using AFHC obtained an average of 8.73 with a standard deviation of 4.03. The results of AFHC measurements explained that the greater the score obtained, the closer it was to a healthy eating behavior pattern. The results of data processing showed that the total score obtained from the AFHC calculation in this study was 23 points. Additionally, there were 120 (43.3%) who had a score more than the same as the average value (> 8.73), and respondents 157 (56.7%) had a score less than the average (<8.73). The higher the score showed the healthier the respondent's eating behavior, conversely the lower the respondent's score showed unhealthy eating behavior. The comparison of the mean score with the maximum score was considered, which showed most respondents had unhealthy eating behavior of not avoiding eating fried foods (72.9%), and often buying pastry/croissants or cakes (65.3%). Others included buying food from outside the home (78.3%), adding cream to food dessert or drink (78.4%), adding some chocolate and/or biscuits to lunch (59.2%). More information and details of eating behavior were shown in Table 1.

Table 1. Frequency distribution of eating behavior on adolescents in sub-urban areas

No.	Eating Behavior on Adolescent Based AFHC questioner	Category	n	%	Mean ± SD (Min-Max)
1	If I am having lunch away from home, I often choose a low-fat option.	Yes	120	43.3	8.73 ± 4.03 (1 - 23)
		No	157	56.7	
2	I usually avoid eating fried foods.	Yes	75	27.1	

No.	Eating Behavior on Adolescent Based AFHC questioner	Category	n	%	Mean ± SD (Min-Max)
3	I usually eat a dessert or pudding if there is one available.	No	202	72.9	
		Yes	220	79.4	
4	I make sure I eat at least one serving of fruit a day.	No	57	20.6	
		Yes	169	61.0	
5	I try to keep my overall fat intake down.	No	108	39.0	
		Yes	183	66.1	
6	If I am buying crisps, I often choose a low-fat brand.	No	94	33.9	
		Yes	129	46.6	
7	I avoid eating lots of sausages and burgers.	No	148	53.4	
		Yes	187	67.5	
8	I often buy pastries or cakes.	No	90	32.5	
		Yes	181	65.3	
9	I try to keep my overall sugar intake down.	No	96	34.7	
		Yes	194	70.0	
10	I make sure I eat at least one serving of vegetables or salad a day.	No	83	30.0	
		Yes	195	70.4	
11	When I'm eating dessert at home, I try to stick to low-fat options.	No	82	29.6	
		Yes	217	78.3	
12	I seldom order food to go.	No	60	21.7	
		Yes	217	78.3	
13	I make an effort to consume a lot of fruits and veggies.	No	60	21.7	
		Yes	244	88.1	
14	I frequently indulge in sugary between meals.	No	33	11.9	
		Yes	67	24.2	
15	With my evening meal, I typically have at least one serving of salad or veggies (but not potatoes).	No	210	75.8	
		Yes	133	48.0	
16	Whenever I purchase a soft drink, I often go for a diet option.	No	144	52.0	
		Yes	129	46.6	
17	Usually, I spread butter or margarine very thinly over bread.	No	148	53.4	
		Yes	225	81.2	
18	Usually, when I pack a lunch, I include some chocolate or cookies.	No	52	18.8	
		Yes	164	59.2	
19	Fruit is usually what I pick when I have a snack in between meals.	No	113	40.8	
		Yes	117	63.9	
20	When I'm in a restaurant, I normally choose the healthiest pudding or dessert option.	No	100	36.1	
		Yes	182	65.7	
21	I frequently eat pastries with cream.	No	95	34.3	
		Yes	220	79.4	
22	Most days, I have three servings or more of fruit.	No	57	20.6	
		Yes	87	31.4	
23	I usually try to eat healthily.	No	190	68.6	
		Yes	238	85.9	
Total		No	39	14.1	
			277	100.0	

AFHC: Adolescent Food Habits Checklist

Social media that most respondents accessed were TikTok (33.9%) and Instagram (32.5%), with an access frequency of more than 3 hours per day (51.6%). The frequency distribution of customer engagement behavior for each item showed a low percentage. There were only a few customer engagement behavior items that showed quite high frequency, viewing and watching videos/photos from food content creators on social media and the appearance of food advertisements, food content (44.4%), and viral food appeared on your homepage/explore social media (45.5%). More information and details of customer engagement behavior were shown in Table 2.

The results of the bivariate analysis showed that

the mean score of healthy eating behavior was lower in the category of high customer engagement behavior compared to the low customer on the 5 customer engagement behavior items. However, only 2 behavioral items showed a significant difference in scoring healthy eating behavior in adolescents. These included liking and commenting on food/drink advertisements and food/food promotions on social media (p-value=0.051) and sharing/reposting/tagging a friend/someone on food/drink content, reviews of places to eat and/or viral food found on social media (p-value=0.025). More information and details of bivariate analysis of customer engagement and eating behavior in adolescents were shown in Table 2.

Table 2. Frequency distribution of customer engagement and bivariate analysis result of adolescents' unhealthy eating behavior and customer engagement at social media in sub-urban areas

No	Customer Engagement	Category	n	%	Health Eating Behavior on Adolescents (Mean \pm SD)	p-value
1	Duration of media social access	< 1 hour	39	14.1		
		1-3 hours	95	34.3		
		≥ 3 hours	143	51.6		
2	the frequentation of media social access	1 time a day	20	7.2		
		1-3 times a day	99	35.7		
		≥ 3 times a day	158	57.0		
3	Social media	TikTok	94	33.9		
		Twitter	18	6.5		
		Instagram	90	32.5		
		YouTube	75	27.1		
4	Like and comment on food/drink advertisements and food/food promos on social media	Low access	226	81.6	8.96 \pm 4.11	0.041*
		High access	51	18.4	7.69 \pm 3.49	
5	Share/repost/tag a friend/someone on food/drink advertisements and food/food promos found on social media	Low access	250	90.3	8.78 \pm 3.98	0.558
		High access	27	9.7	8.30 \pm 4.51	
6	Share/repost/tag a friend/someone on food/drink content, reviews of places to eat, and/or viral food found on social media	Low access	240	86.6	8.94 \pm 4.07	0.025*
		High access	37	13.4	7.35 \pm 3.50	
7	View and watch videos/photos from food content creators on social media	Low access	154	55.6	8.83 \pm 4.15	0.639
		High access	123	44.4	8.60 \pm 3.88	
8	The appearance of food advertisements, food content, and viral food appears on your homepage/explore social media	Low access	151	54.5	8.89 \pm 4.18	0.458
		High access	126	45.5	8.53 \pm 3.85	
Total			277	100.0		

*The Independent Sample T-test, significant if p-value <0.05

This study showed that certain social media and internet habits were linked to increased intake of harmful foods and drinks. These kinds of behavior such as "like and comment", the food and beverage advertising that appeared on social media and sharing, reposting, tagging someone in food and beverage advertising, or reviewing culinary places, or viral food and beverages in social media were associated with eating behavior. Additionally, several factors could be explained regarding the result. Adolescent who spent their time playing on social media for a long time could be more exposed to the kind of advertising that included food and beverages. This study found that 51.6% of adolescents spent their time on social media, which was more than 3 hours/per day, and mostly used TikTok and Instagram as their social media around 33.9% and 32.5% respectively.

This was consistent with a similar study by Dahlgren et al (2024) showing that Norwegian adolescents were within the age range of 16–19 years. One-fourth of the participants reported spending 4 hours or more on social media daily, while 80% of girls reported that social media, particularly Instagram and TikTok, had a negative influence on how the participants felt about their appearance. That study showed a pattern of associations between photo- and video-specific social media platforms, eating disorder pathology, internalization of body ideals, and perceived pressure. Furthermore, these girls exhibited significantly higher

levels of eating disorder pathology and appearance pressure from media, making adolescent girls vulnerable to the risk of unhealthy eating behavior¹³.

Based on the study customer engagement behavior included liking and commenting on food/drink advertisements and food/food promotions on social media and sharing/reposting/tagging a friend/someone on food/drink content reviews of places to eat, and/or viral food found on social media, significantly influenced health or unhealthy eating behavior on respondents. With that behavior, adolescents as social media users could interact with food-related content creators. These content creators in social media, namely influencers, were people or accounts with many inspiring people as their followers to try out new food items and their eating behavior. Influencers on social media frequently showed popular or trending foods, often by showing how many other people were enjoying the food. This social proof could convince followers that these foods could be part of the in-crowd by presenting these experiences as must-try or rare opportunities, and also induce FOMO (fear of missing out) in their followers, making the followers more likely to seek out and consume these foods to avoid feeling left out²².

Instagram and TikTok influencers used psychological tactics to influence their audience's behavior. This created a sense of friendship and trust with their followers, making their advice seem more credible.

This one-sided relationship led followers to view influencers as friends whose recommendations must be followed, including dietary suggestions²³. The influencers used narratives and storytelling about personal experiences related to their diet and fitness journeys. Additionally, these narratives made their advice more compelling and relatable, persuading followers to mimic their eating behavior²⁴. Another time influencers used visual appeal, carefully curated images and videos of healthy foods, often paired with aesthetically pleasing visuals, to make healthy eating appear more attractive and desirable, and this could significantly influence followers' food choices^{23,24}. These tactics combined created a powerful influence on eating behavior, particularly among adolescents who were more impressionable and spent significant time on social media platforms like Instagram and TikTok.

The problem was when adolescents preferred influencers who offered products and ate healthier behavior. Due to their growing purchasing power and substantial online presence, adolescents and young adults were a desirable market segment for digital marketers²⁵. However, just a few studies had examined the use of digital media by the food and beverage industries to market harmful commodities to these age groups²⁶. Young adults, for example, saw social media as a forum for sharing food-related knowledge. By talking and exchanging information on the food eaten, people could mutually affect each other's eating habits, and it was showed that among young individuals, the perception that their friends often consumed sugary drinks and pastries, for example, was predictive of the consumption of these goods²⁷. Additionally, social connections could affect the kind and quantity of food that young people choose to eat²⁸.

The fact that it was getting harder for kids to discern between entertainment and commercial material was another issue with digital media advertising. This probably applied specifically to social media advertising that was interactive and specially integrated. That is conformity with this result showed 18.4% of adolescents frequently like and comment on advertisements for food and beverages, but 44.4% frequently viewed videos on social media featuring food content creators. Social media users, health organizations, and food and wellness bloggers all posted content related to food, nutrition, and overall well-being²⁹. Young adults were inundated with food, mostly junk food, and sponsored messages by food industry groups with a financial stake on social media in addition to posts about organic food³⁰.

Social media could be used to offer health promotion campaigns and interventions, increase public knowledge of evidence-based health messages, and inspire young adults to engage with and participate in initiatives. Young people used social media almost uniformly³¹, but it's unclear when interacting with or could like to interact with material on health promotion. Celebrities and the food industry competed for attention on social media, and it's doubtful that young people could use social media to engage with health-related initiatives run by medical professionals who could come across as dull and unattractive in this crowded space³². Additionally, food and beverage companies could leverage social

media as a new marketing avenue. These companies mostly relied on influencer marketing, in which celebrities worked with corporations to recommend and advertise products to their followers³³. Food and beverage influencer marketing was linked to several viewer behavior, including brand awareness, the desire to like and share posts, and product consumption³⁴.

Share or repost nourishment promotion in this inquiry appeared no noteworthy affiliation with eating behavior. This investigation was diverse with ponder from Holmberg and colleagues that shared pictures of nourishment in social media could reflect a way of life that juveniles needed or appreciate to advance. Positive surroundings of natural products and vegetables that were colorful and tastefully satisfying could be characteristic of a certain status worth sharing³⁵. These nourishing pictures or recordings that were seen as best by peers reflected support and could energize the probability of behavior selection. In a subjective ponder with Swedish youngsters, one 14-year-old member depicted her thinking for sharing a Starbucks picture as takes after: "Even in case one has never had a Starbucks refreshment or gone to the put, one still cherishes it, since one knows that everybody else adores it"³⁶.

This investigation moreover illustrated that observing or seeing video could impact eating behavior. Additionally, recordings and pictures permitted for inventive plans highlighted components that could increment engagement. Engaging recordings with engaging illustrations, relatable scenarios, and music were used successfully in Speedy et al's improvement of nourishment security recordings. These recordings expanded nourishment security hones among 332 preadolescent peer bunches in an exploratory plan pondered inside the Joined together States³⁷.

Viral food advertisements in this study also showed no significant association with eating behavior. This study was different from eating behavior study from the US that rapid dissemination allowed for viral marketing on social media. The emotion behind viral messages could influence a person's well-being including their eating behavior. Social media spread of hurtful thoughts could have negative results on pre-adult mental well-being, subsequently impacting nonpathological eating disarrangement. Social media disease passed between people could have mental well-being suggestions contributing to interesting social standards that influenced uneasiness levels due to viral informing of negative eating behavior³⁷. Furthermore, user experiences, preferences, and behavior were subject to change since social media platforms frequently modified their terms of service and advertising algorithms. The WHO and public health professionals had called for policies and interventions that protected children from exposure to food and beverage brand content on digital media, and this was already the case with television advertising, and the significant associations between online behavior and unhealthy consumption, despite the cross-sectional design, support these calls. Government regulations about digital and online marketing to minors were few on a global scale. Most voluntary codes that restricted food and beverage advertising to minors did not include social media advertising. This study

emphasized how crucial it was to include social media laws and guidelines meant to prevent kids from exposure to advertisements for unhealthy foods.

CONCLUSIONS

Eating behavior measured by AFHC explained that the greater the score obtained, the closer it was to a healthy eating behavior pattern. The majority of respondents had a score less than the average, showing the respondent had unhealthy eating behavior. This study found that more than half of adolescents spend their time on social media more than 3 hours/day. Most of these adolescents used TikTok and Instagram as their social media. The analyses showed that customer engagement by respondents made a significant difference in eating behavior of adolescents in sub-urban areas, specifically liking and commenting on food/drink advertisements and food/food promotions on social media and sharing/reposting/tagging a friend/someone on food/drink content reviews of places to eat, and/or viral food found on social media, significantly influenced health or unhealthy eating behavior on adolescents. Adolescent customers' intensity in using media made the respondent engage with social media, including eating behavior.

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CONFLICT OF INTEREST AND FUNDING DISCLOSURE

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AUTHOR CONTRIBUTIONS

ENA: conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, visualization, writing-original draft, writing-review and editing, M: formal analysis, writing-original draft, writing-review and editing, IA: conceptualization, methodology, writing-original draft.

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