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The Influence of Digital Literacy Classes with QR-Code Media on Fast Food Eating Habits in Obese Adolescents

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Abstract

Nutritional problems can affect cognitive ability, productivity, and performance in adolescents. Therefore, it is crucial to address obesity among adolescents.

Aims: This study explores the impact of digital literacy interventions using QR-Code media on changing fast food consumption habits among obese adolescents at SMAN 6 Bengkulu City.

Methodology: This study uses a pre-experimental method with the *One Group Pre-Test and Post-Test method*. It involves student classes X and XI using purposive sampling (n=41). The Wilcoxon Signed Rank test and McNemar test were used for analysis.

Results: Research results show that existence influences significant digital literacy toward understanding obesity and eating habits (p-value = 0.0001).

Scientific Novelty: This research is unique in that it applies digital literacy interventions using QR-Code media to enhance understanding and awareness of healthy dietary choices, aimed at changing fast food consumption habits among obese adolescents.

Conclusion: Digital literacy significantly impacts understanding and habits of teenager obesity.

Keywords: teenagers obesity, QR Code, habits eat, food fast serving.

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Introduction

Adolescence is a critical transitional phase from childhood to adulthood, with significant physical, emotional, and social changes. According to the Regulation of the Minister of Health of the Republic of Indonesia Number 25 of 2014, adolescents are defined as individuals aged 10 to 18 years [1]. During this period, nutritional issues can significantly affect performance, productivity, and cognitive abilities. Nutritional status is a crucial factor in determining health outcomes; undernutrition increases susceptibility to diseases, while overnutrition and obesity are linked to degenerative conditions [2]. Recent data from the SSGI in 2022 indicates that 16% of children aged 13-15 years and 13.5% of those aged 16-18 years are classified as overweight or obese [3]. The 2018 Basic Health Research identified multiple contributors to adolescent obesity, including inadequate physical activity, genetic

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predispositions, environmental influences, hormonal changes, and psychological factors. A major contributor is excessive caloric intake without corresponding energy expenditure, leading to unhealthy weight accumulation.

Obesity among adolescents is a significant concern, as studies show that 80% of obese adolescents are likely to remain obese into adulthood. This condition increases the risk of serious health issues, such as hypertension and type 2 diabetes, which are traditionally associated with older populations. Additionally, obese adolescents face heightened risks for heart disease, stroke, diabetes, and even neurodegenerative conditions like Alzheimer's disease [4]. A shift in dietary patterns, particularly the increased consumption of fast food high in calories, fats, and cholesterol, reflects a broader transition to Western dietary habits. The appeal of fast food, bolstered by targeted advertising, has led to its widespread popularity among adolescents [5].

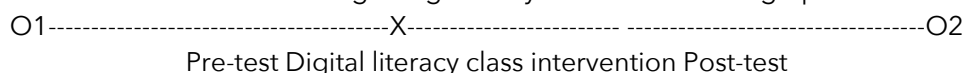
In Bengkulu City, the prevalence of obesity among adolescents is concerning, with rates reaching 6.27%, making it the second highest in Bengkulu province. This issue is compounded by adolescents' limited understanding of the health impacts of fast food consumption and a lack of effective digital literacy for health education. Consequently, the central research question arises: How does participation in digital literacy classes utilizing QR-Code media influence fast food consumption habits among obese adolescents at SMAN 6 Bengkulu City?

Obesity prevention can be done by providing education. To increase knowledge, health education must be provided through media that is interesting for the target group to understand and behave. Lectures, print, audio, visual, and audiovisual are several health education media [6]. Understanding the use of digital literacy requires educational delivery media through QR-Code; QR is addressed to be translated quickly; QR stands for Quick Response. One type of barcode is a QR-Code, which can be read by a cellphone camera [7]. QR-Code can store information in the form of a URL link, which can be used for open documents, images, advertisements, and other websites. People who have a reader and camera application on their cellphones can use this capability to scan and access certain websites without typing the URL address. With that, digital literacy is needed for obese adolescents to change their habit of eating fast food using QR-code media. Understanding of diseases and their prevention, improved access to healthcare services, enhanced adherence to treatment, and involvement in health decision-making [8].

The objective of this study is to investigate the impact of digital literacy interventions, specifically through QR-code media, on the eating habits of obese adolescents at SMAN 6 Bengkulu City. By enhancing understanding and awareness of healthy dietary choices, this research aims to promote better eating habits and reduce the prevalence of obesity among adolescents in the target population.

Case Presentation

This study uses a pre-experimental method with the *One Group Pre-Test and Post-Test method*. The independent variable is the digital literacy class with QR-Code media and the dependent variable is the habit of eating fast food in obese adolescents. This case study explores the impact of digital literacy interventions using QR-Code media on changing fast food consumption habits among obese adolescents at SMAN 6 Bengkulu City, highlighting the urgent need for effective health education in addressing rising obesity rates in this demographic.



Information:

O1: Habit of eating fast food before attending digital literacy class.

X: Providing digital literacy class interventions with QR-code media about habits fast food consumption in obese adolescents at SMAN 6 Bengkulu City.

O2: The habit of eating fast food after taking a digital literacy class.

This study employs a purposive sampling technique [9], a non-random sampling method aimed at selecting participants who meet specific criteria aligned with the research objectives and are responsive to the research questions [10]. The minimum sample size for this study is 41 participants. The participants in this study are students from grades X and XI (n=41) at SMAN 6 Bengkulu City, selected through purposive sampling. This approach ensures that the sample is representative of adolescents experiencing obesity-related issues, which is the primary focus of the research. Demographic information collected from participants includes ages 16 years old until 17 years old. These characteristics will provide context for understanding the population under study and allow for a more nuanced analysis of the intervention's effectiveness. The intervention involves digital literacy training using QR-code media. Participants will receive education on healthy eating habits and the negative impacts of fast food consumption, facilitated through interactive QR-Code resources. These resources may include links to informative articles, videos, and infographics that participants can easily access using smartphones.

The study will follow a pre-test and post-test methodology. Initially, participants will complete a pre-test questionnaire assessing their current eating habits, knowledge about nutrition, and frequency of fast food consumption. A post-test will be administered after the intervention to evaluate any changes in these areas. Data analysis will be conducted using non-parametric tests, specifically the Wilcoxon Signed Rank and McNemar tests. The Wilcoxon Signed Rank test will be used to analyze differences in continuous data (such as changes in knowledge scores before and after the intervention). The McNemar test will be employed to evaluate changes in categorical variables, such as the frequency of fast food consumption. These statistical tests are appropriate given the study's sample size and the nature of the data, providing robust insights into the effectiveness of the digital literacy intervention. This study has received approval from the Research Ethics Committee of the Ministry of Health of Bengkulu Health Polytechnic no KEPK.BKL/097/03/2024.

Table 1. QR-Code Media Development Test Results

Test subjects	Validity Results	Information
Media expert test	80.8%	Worth a try

Table 1 shows the results of the validity test of the media that has been developed and evaluated based on effectiveness and efficiency, consistency, maintainability, ease of use, documentation, usability, communication, creativity and innovation, images, colours, and designs. The results of the media validity test using the media validity test formula of 80.8% indicate that the QR-Code media is worthy of being tested. This is said to be worthy of being tested based on media test standards with a classification of media validity assessment aspects, namely very valid (90% -100%), valid (80% -89%), quite valid (65% -79%), very invalid (55% -64%), and invalid ($\leq 55\%$). Development of promotional media that is more healthy and easily accessible, including health promotion media through social media, in line with the research "The Role of Digital Media in Health Promotion Efforts to Improve Public Health: Literature Review" States that this will improve public health. Knowledge about diseases and their prevention, better access to health services, increased adherence to treatment, and participation in health decision-making [8].

Table 2. Characteristics Teenager Obesity at SMAN 06 Bengkulu City School

Respondent characteristics	Frequency	Percentage (%)
Gender		
Man	22	53.65
Woman	19	46.35
Age		
16 years	16	39.03
17 years	25	60.97
Pocket money		
$\leq$ Rp 10,000	10	24.39
Rp. 11,000-Rp. 25,000	24	58.54
> Rp. 25,000	7	17.07
Access to Information		
social media	39	95.12
print media	1	2.44
Electronic Media	1	2.44
Work		
Private (traders, farmers, etc.)	36	87.80
Civil servants		
Indonesian National Armed Forces/Indonesian National Police	4	9.75
	1	2.45
Nutritional status (BMI)		
Obesity	12	29.27
Obesity	29	70.73

Table 2 shows the characteristics of obese adolescents at SMAN 0 6 Bengkulu City based on gender, age, pocket money, access to information, and nutritional status. Based on gender characteristics, the proportion of male students is 22 people (53.65%), and female students are 19 people (46.35%). Likewise, characteristics according to age, the proportion of 16-year-olds is 16 students (39.02%) and 17-year-olds is 25 students (60.97%), characteristics of pocket money, the proportion of pocket money is dominated by the range of Rp. 11,000-Rp. Twenty-five thousand as many as 24 students (58.53%), characteristics according to access to information between social media, print media, and electronic media, but obese adolescents tend to have access to social media as many as 29 students (95.12%), with their parents' jobs 36 people (85.4%) are private workers. The characteristics of the nutritional status of obese adolescents according to BMI show that 29 students (70.73%) are obese adolescents.

Obesity in adolescents can be caused by many factors, namely genetic factors and other external factors. Excessive consumption of macronutrients, lack of physical activity, consumption of fast food, and unbalanced diet are the most common causes of obesity. There are important differences between men and women who are overweight [10]. Gender plays a role in obesity rates, as men and women have different tendencies to gain more nutritional space. Men are more likely to suffer from overnutrition and obesity than women [11].

In adolescence, the body requires more energy and nutrients due to accelerated growth and development related to age and fast food eating habits in obese adolescents at SMAN 0 6 Bengkulu City. This is in line with the study "Gender and Age at Risk of Obesity in Adolescents in Indonesia", which states that adolescents are at risk of obesity, which will continue into adulthood [12]. Another factor is that schoolchildren spend their pocket money on shopping inside and outside school. The cause may be because there is a relationship between the existence and amount of student pocket money with higher nutritional levels. Parents with high economic status can buy more expensive food and are more likely to consume fast food [13]. Adolescents who watch food or beverage advertisements often eat more than those who do not. If someone continues to consume fast food or foods high in saturated fat, it can cause health problems [14].

Table 3. Difference in Average Knowledge Before and After Digital Literacy Class with QR-Code Media in Obese Adolescents

Knowledge	n	Min-Max	X ± SD	p value
Before	41	13-67	36.05 ± 12.54	0.0001 °
After	41	40-100	76.56 ± 13.27	

° Wilcoxon Signed Rank

Table 3 shows the average pre-test literacy level of obese adolescents 36.0 5±12.54 and the average post-test literacy level of obese adolescents 76.5 7±13.24. Based on the test results with a *p-value* of 0.000 1≤0.05, it can be concluded that there is a difference in literacy before and after the intervention.

Table 4. Differences in Literacy Levels Before and After Digital Literacy Class Intervention

	Literacy Level	After		Amount	p- value
		Not good	Good		
Before	Not good	1	37	38	0.0001 °
	Good	0	3	3	
	Total	1	40	41	

° McNemar's Test

According to Table 4, the McNemar test results indicated that 1 obese adolescent showed no lasting improvement in their literacy level. Meanwhile, 37 adolescents improved from bad to good, and 3 adolescents in the good category became even better. No adolescents moved from the good category to a less favorable one. The McNemar test showed a *p-value* of 0.000 (less than 0.05), indicating a significant change in literacy levels before and after the intervention, with an overall improvement of 90.24%. Additionally, there was a 7.31% increase in understanding health-related topics among these adolescents. This finding aligns with the study "Health Literacy in a Complex Digital Media Landscape," which highlights how obese adolescents actively search for health information online, particularly about food and nutrition. As internet usage grows, research on how adolescents engage with online health information becomes more important. Therefore, the impact of digital literacy classes focused on health issues is crucial for enhancing knowledge and understanding among obese adolescents [15].

Table 5. The Influence of Digital Literacy on Fast food Eating Habits in Teenagers

Eating habits	n	Min-Max	X ± SD	p value
Before	41	20.0-29.0	24.58 ± 1.96	0.0001 ^a
After	41	13.50-23.50	18.32 ± 1.64	

^a Wilcoxon Signed Rank Test

Table 5 illustrates the impact of digital literacy classes on the eating habits of obese adolescents before and after intervention. The average score before the classes was 24.58 (± 1.96), while the average score after the classes dropped to 18.32 (± 1.64). This indicates a significant reduction in their eating habits. With a p-value of 0.0001 (which is less than 0.05), we can conclude that the digital literacy classes using QR-Code media effectively influenced the eating habits of obese adolescents.

Table 6. Changes in Eating Habits Before and After Digital Literacy Class Intervention

	Food fast serving	After		Amount	p value
		Often	Seldom		
Before	Often	0	36	36	0.0001 ^a
	Seldom	0	5	5	
	Total	0	41	41	

^a McNemar's Test

According to Table 6, the McNemar test results indicate that after participating in the digital literacy class, 36 teenagers reduced their fast food consumption, while 5 teenagers also ate fast food less frequently. The p-value of 0.0001 (which is less than 0.05) shows a significant change in the eating habits of obese teenagers before and after the digital literacy intervention. Specifically, there was an 87.8% decrease in the frequency of fast food consumption, with scores changing from 235 or higher to below 235, indicating a shift from "often" to "seldom." Additionally, 12.19% of participants went from "rarely" to "seldom" consuming fast food. It can be concluded that digital literacy classes affect fast food habits in obese teenagers after measurements were taken using the Semi-Quantitative Form Food Frequency (SQ-FFQ) before and after the intervention and calculated based on the score [16]. This is also in line with the research "Fast food consumption, emotional and behavioral problems in adolescents with overweight and obesity problems", which states that there is a relevant relationship between fast food consumption and obesity in Indramayu adolescents with a p-value = 0.0001, this digital literacy is expected to change the habits of adolescents who are obese and even change their eating habits [17-25].

Conclusion

The digital literacy class addressing adolescent obesity at SMAN 06 Bengkulu City significantly improved, with an increase of 90.24% in post-intervention scores. Students who initially fell into the "insufficient" category improved to "good," with a statistically significant p-value of 0.0001 ($p \leq 0.05$). This indicates a clear difference in digital literacy levels before and after the intervention. Additionally, there was a noticeable change in fast food consumption habits among obese adolescents at SMAN 06 Bengkulu City, as reflected in the Semi-Quantitative Meal Frequency (SQ-FFQ) results. The frequency of fast food consumption decreased significantly, with an 87.8% change in scores, highlighting the effectiveness of the digital literacy intervention in modifying eating habits. These findings suggest that implementing digital literacy programs can play a crucial role in education and obesity prevention among adolescents. Schools can foster healthier choices and promote long-term well-being by enhancing students' understanding of nutrition and the consequences of unhealthy eating habits. Educational institutions and public health organizations should consider integrating similar digital literacy initiatives into obesity prevention strategies to empower adolescents with the knowledge necessary to make informed dietary decisions. Despite the positive outcomes, this study has several limitations. While adequate for preliminary findings, the sample size may not fully represent the broader adolescent population in Bengkulu.

Additionally, the reliance on self-reported data for dietary habits may introduce bias. Future research could benefit from a larger, more diverse sample and the inclusion of objective measures of dietary intake to strengthen the findings. Furthermore, the study's duration was limited, making assessing the long-term sustainability of behaviour changes post-intervention difficult.

Suggestions for Future Research

Future research should expand on the findings of this study by exploring the long-term sustainability of behaviour changes induced by digital literacy interventions. Investigating a broader and more diverse sample across different geographic and cultural contexts will provide deeper insights into the universal applicability of such interventions. Moreover, incorporating objective measures of dietary habits and physical activity, such as wearable technology data, can enhance the reliability of findings. Future studies could also evaluate integrating other digital tools, like gamification or social media campaigns, to complement QR-code-based interventions. Exploring the psychological and emotional factors influencing adolescents' eating behaviours would add depth to understanding obesity-related habits. Additionally, longitudinal studies are necessary to assess the impact of digital literacy on adolescent health outcomes, including reductions in obesity prevalence and improvements in related health metrics over time. These advancements can guide more robust and effective public health strategies for combating adolescent obesity.

Declarations

Author Contributions

Conceptualization, Chairani Riski and Demsa Simbolon; methodology, Chairani Riski; software, Linda; validation, Chairani Riski, Demsa Simbolon, and Linda; formal analysis, Chairani Riski; investigation, Chairani Riski and Linda; data curation, Linda; writing—original draft preparation, Chairani Riski; writing—review and editing, Demsa Simbolon; visualization, Linda; supervision, Demsa Simbolon; project administration, Demsa Simbolon; funding acquisition, Demsa Simbolon. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

This study has received approval from the Research Ethics Committee of the Ministry of Health of Bengkulu Health Polytechnic no KEPK.BKL/097/03/2024.

Informed Consent Statement

Not Applicable

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies, have been completely observed by the authors.

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