

# Nutrition Knowledge and Healthy Food Choices After Participating in Online Nutrition Education in Overweight Adolescents

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**Abstract**— The prevalence of overweight in adolescents can occur due to unhealthy food choice behavior. Nutrition knowledge in adolescents is an important factor for shaping behavior in healthy food choices. Increased nutrition knowledge can be achieved by conducting nutrition education. This study aimed to analyze the effectiveness of nutrition education through whatsapp, lecture and online game on nutritional knowledge, healthy food choices before and after treatment. This study was a quasy experiment research with two group pretest-posttest design. Sampling in the study used purposive sampling technique and obtained 32 subjects in each treatment, so that the total subject was 64 students aged 15-17 yearsold. Nutrition knowledge and healthy food choice data were obtained from structured questionnaires that had been tested for validity and reliability. T test used in this study was the Mann Whitney U test. The results indicated that the number of adolescents with good knowledge after participating in nutrition education increased to 56.3% (whatsapp group) and 65.6% (lecture and online game group). While the number of adolescents with healthy food choice also increased to 62.5% (whatsapp group) and 65.6% (lecture and online game group) after participating in nutrition education. The results of Mann Whitney U test on knowledge indicated p-value = 0.015 and healthy food choice obtained p-value = 0.003. There was a difference between nutrition knowledge and healthy food choice among overweight adolescents participating in nutrition education through WhatsApp and lecture and online game.

**Keywords**— online nutrition education, nutrition knowledge, healthy food choice, overweight adolescents

## I. INTRODUCTION

Indonesia is a developing country with a sizeable population. A large number of adolescents will be prone to degenerative diseases when they reach adulthood and old age if they do not apply healthy lifestyles properly. Transitional period in adolescence is often a factor that causes health problems, especially nutrition problems in adolescents. The transitional period from childhood to adolescence indirectly requires adolescents to regulate their eating habits and diet, the importance of adopting healthy eating habits during this period can be a key in preventing nutritional problems such as overweight and obesity[1].

The problem of overweight and obesity in adolescents is closely related to poor eating habits. Based on health research conducted by the Indonesian Ministry of Health (2018) [2], Indonesian adolescents aged 15-19 years old commonly consume sweet foods (41.0%), sweet drinks (56, 43%), salty foods (30.5%), and fatty foods (43.8%) more than once a day which is a predictor of overweight in adolescents. In Indonesia, the prevalence of overweight in adolescents aged 15-19 years old in 2018 was 9.5%, while that in Central Java was 7.9%.

Prevalence of overweight and level of consumption of sugar, salt and fat are high among adolescents, indicating that there is a lack of knowledge about healthy eating patterns so that provision of nutrition education is important to improve knowledge about nutrition, improve diet and choose healthier foods [1,3]. Nutrition education is effective if it is carried out using appropriate media and methods to facilitate the delivery and understanding of materials presented [4].

Research by Pakhiretal, stated that the delivery of nutrition education materials by lecture method and flipchart media has been effective in increasing nutrition knowledge [5]. Similar study using smart ball game and socialization methods indicated significant differences in nutrition knowledge, but the nutrition knowledge value after participating in nutrition education is higher in adolescents participating in nutrition education through games than through socialization [6]. At present, most nutrition education are delivered conventionally and only a few people use online media as a means of delivering educational material.

Adolescents are in a transitional period from childhood to adulthood. Delivery of education through games will be learned more effectively by them, but in the current globalization era, adolescents are more likely to use mobile phones as a device for playing games, chatting, using social media and searching for information [7]. Thus, in this study, the researcher was interested to examine the effectiveness of nutrition education using online media (whatsapp and lecture followed by online game) that can be accessed through mobile phones for overweight adolescents.

**II. MATERIAL AND METHOD**

The research design use dwasquasy experiment with two group pretest-posttest design. Sampling in this study used purposive sampling technique with the following criteria: adolescents aged 15-17 years old and attending school in Surakarta, have overweight nutritional status (>1 SD to 2 SD), can use and have an android phone, and have not been ill in the last three months. Based on these criteria, 32 subjects were obtained in each treatment, so that the total subjects was 64 students aged 15-17 years old.

This study was conducted at SMAN 05 and SMAS Batik 1 Surakarta. Research locations were selected based on the highest prevalence of overweight adolescents in Surakarta, namely Jebres and Banjarsari Sub-districts, and the schools represented public and private schools. Before conducting the study, a screening process was conducted (measurement of body weight and height) to obtain subjects with overweight nutritional status and assess their nutritional status using the WHO AnthroPlus software (Z-Score, BMI/U). Z-Score values obtained were categorized based on growth categories from the World Health Organization (2007), consisting of normal (-2 SD to 1 SD), overweight (>1 SD to 2 SD), obesity (> 2 SD). The distribution of treatment groups was carried out randomly [8]. A total of 32 subjects were grouped for nutrition education through whatsapp treatment by providing materials in the form of an explanation of balanced nutrition in adolescents through whatsapp group and 32 respondents were grouped for nutrition education through lecture and online game treatment once. The online game used in this study was an online time-based interactive quiz game available on google page called Quizziz. Quizziz link can be accessed and developed according to quiz questions that have been created on the internet. The technical implementation of online game starts from making questions adjusted to the material presented. Furthermore, the researcher created a quizziz account to host the quizzes, so that when the link was shared to research subjects, the researcher can get immediate feedback on getting the subjects' answers correct or incorrect. The total correct answers were ranked and the winner was selected from the game and given a reward at the end of the game.

Nutrition knowledge and healthy food choice data were obtained from structured questionnaires that had been tested for validity and reliability. Data analysis was performed using the Mann Whitney U test because the data are not normally distributed. This study has obtained ethical approval from Health Research Ethics Commission (KEPK) of Universitas Sebelas Maret No.035/UN27.06.6.1/KEPK/EC/2020.

**III. RESULT AND DISCUSSION**

TABLE I. DISTRIBUTION OF CHARACTERISTICS OF RESPONDENTS BY TREATMENT GROUP

Variable	Group	
	Nutrition Education through Whatsapp	Nutrition Education through Lecture and Online Game
Age		
15	9 (28.1%)	0 (0%)
16	22 (68.8%)	13 (40.6%)

17	1 (3.1%)	19 (59.4%)
Total	32 (100%)	32 (100%)
Gender		
Male	17 (53.1%)	8 (25%)
Female	15 (46.9%)	24 (75%)
Total	32 (100%)	32 (100%)
Allowance		
<Rp 10.000	2 (6.3%)	2 (6.3%)
Rp 10.000-20.000	20 (62.5%)	25 (78.1%)
>Rp 20.000	10 (31.5%)	5 (15.6%)
Total	32 (100%)	32 (100%)

**Peer influence**

Positive	11(34.4%)	16(50%)
Negative	21(65.6%)	16(50%)
Total	32 (100%)	32 (100%)

The subjects in this study were over weigh thigh school adolescents ranging in age between 15-17 years old. A total of 64 respondents were selected and divided into two treatment groups namely nutrition education through whatsapp and through lecture followed by online game on mobile phones. Table 1 shows the distribution of respondents' characteristics by gender. The number of female students is higher than male students. This is because female sex hormones influence body weight. Based on the distribution of allowance, the average allowance of 64 subjects ranges from Rp10,000 - Rp20,000 a day. This can affect amount and types of food consumed. Based on Arisdanni & Buanasita's study, the amount of allowance can be a factor in the prevalence of overweight and obesity [9].

High school adolescents commonly show unstable trait and are easy to be influenced by the environment. If adolescents are not provided with proper understanding, it can lead to errors in various ways, including in the healthy food choices. Based on table1,it can be seen that negative peer influence is higher than positive peer influence. Some studies stated that higher negative peer influence will affect the habits in choosing unhealthy snacks and daily foods [9][10].

TABLE II. CHARACTERISTICS OF NUTRITION KNOWLEDGE AND HEALTHY FOOD CHOICES BEFORE AND AFTER PARTICIPATING IN NUTRITION EDUCATION

Variable	Nutrition Education through Whatsapp		Nutrition Education through Lecture and Online Game	
	n	%	N	%
Nutrition knowledge				
Before Good	4	12.5	4	12.5
Before Poor	28	87.5	28	87.5
After Good	18	56.3	21	65.6
After Poor	14	43.8	11	34.4
Healthy Food Choices				
Before Good	20	62.5	16	50.0
Before Poor	12	37.5	16	50.0
After Good	20	62.5	21	65.6
After Poor	12	37.5	11	34.4

Table 2 shows an increasing number of adolescents in nutrition knowledge and healthy food choices before and after participating in nutrition education. The results indicate that the number of respondents with good nutrition

knowledge in nutrition education through WhatsApp treatment increases to 18 (56.3%) and the number of respondents with good nutrition knowledge in nutrition education through lecture and online game treatment increases from 4 (12.5%) to 21 (65.6%). Healthy food choices variable after treatment also increases towards better food choices, the number of respondents with good food choices in nutrition education through lecture and online game increases from 16 (50%) to 21 (65.6%) respondents. However, there is no change in healthy food choices when seeing from the number of respondents in nutrition education through WhatsApp treatment even though the number of adolescents with good food choices is higher.

Based on table 2, it can be seen that social media is an attractive media in intervening adolescents so as to increase nutrition knowledge and provide positive results in every treatment [11]. However, intervention conducted through social media such as WhatsApp cannot ensure that all participants read and understand the material provided [12] so that the behavior is formed according to the individual needs. If they need to obtain information, then they will pay attention and provide good feedback and vice versa. Because adolescence is a transitional period, a game can be the fastest means to absorb information and can change behavior for the better. Gambir & Nopriantini's study, stated that increased knowledge is proven to be higher in nutrition education intervention using lecture and game compared to intervention using socialization [6].

**TABLE III. DIFFERENCE IN NUTRITION KNOWLEDGE VALUES, HEALTHY FOOD CHOICES BETWEEN WHATSAPP GROUP AND LECTURE WITH ONLINE GAME GROUP**

Variable	Pre-Nutrition Education		p-value	Post-Nutrition Education		p-value
	Nutrition Education through Whatsapp	Nutrition Education through Lecture and Online Game		Nutrition Education through Whatsapp	Nutrition Education through Lecture and Online Game	
Nutrition Knowledge						
Minimum	35.00	27.50		42.50	25.00	
Maximum	65.00	70.00	0.736	72.50	87.50	0.015
Mean±SD	52.50±8.91	52.89±10.51		62.03±6.67	69.80±16.66	
Healthy Food Choice						
Minimum	46.00	89.00		50.00	94.00	
Maximum	160.00	126.00	0.001	162.00	129.00	0.003
Mean±SD	119.37±26.58	104.65±8.28		122.78±25.99	111.71±7.38	

Based on table 3, the results show that the mean of nutrition knowledge in pre-nutrition education through WhatsApp is 52.50 with the maximum value of 65.00 and the mean of nutrition knowledge in pre-nutrition education through lecture and online game is 52.89 with the maximum value of 70.00. In post-nutrition education through WhatsApp, the mean of nutrition knowledge increases to 62.03 with the maximum value of 72.50. Whereas the mean of nutrition knowledge in post-nutrition education through lecture and online game increases to 69.80 with the maximum value of 87.50. T-test results in post-nutrition education using the Mann Whitney U test obtain p-value = 0.015 (<0.005), meaning that H0 is rejected or there is a difference in nutrition knowledge between nutrition education through WhatsApp and nutrition education through lecture and online game.

Based on table 3, the results show that nutrition education through WhatsApp and lecture with online game have been effective in increasing nutrition knowledge in high school adolescents. This is because in the current globalization era, high school students frequently access social media and internet, both as a means of communication, searching for information or playing online games at home or in public

places [13]. High school students are in transitional period from childhood to adulthood and spend a lot of time playing video games, causing an increase in knowledge in lecture and online game treatment group which is consistent with the development of the millennial adolescents today. Holzmann et al study, stated that if adolescents play nutritional education digital game, their interest in nutritional information will increase which can be seen from their enthusiasm while playing the educational games provided [14]. The same finding can be seen in the results of this study. When adolescents participated in nutrition education through lecture and quizziz online game, they were enthusiastic and enjoyed the course of nutrition education. Thus, they can easily answer the nutrition knowledge questions provided.

Healthy food choice variable also shows a difference in the mean score. In table 3, it can be seen that nutrition education before intervention through WhatsApp had a higher mean score (119.37) compared to nutrition education through lecture and online game (104.65). Similar results were found in both treatments after nutrition intervention, nutrition education through WhatsApp had a higher mean score compared to nutrition education through lecture and online game treatment. P-value obtained after participating in nutrition education is p = 0.003 (<0.005), meaning that H0 is rejected or there is a difference in the mean score of healthy food choices between nutrition education through WhatsApp and nutrition education through lecture and quizziz online game.

Diferen case with nutrition knowledge variable, nutrition education through WhatsApp has greater effect on healthy food choices in overweight adolescents. Zaki & Sari's study (2019) stated that an increase in the response of knowledge in this case such as healthier food choices can occur when receiving information through infographics sent via WhatsApp during education. Brain is able to quickly process information conveyed visually so that information can be received more quickly compared to the delivery of information manually as in the delivery of nutrition education through lecture and online game [15]. Ahmad et al study (2018) also stated that the provision of intervention using WhatsApp can affect eating behavior to be better, so as to reduce the prevalence of overweight and obesity in adolescents [16].

Nutrition education through WhatsApp has better effectiveness in changing behavior because the control of receiving information delivered via WhatsApp depends on each individual. If there is a need to find out information about nutrition, then one will pay close attention to the material provided, as in this study, nutrition education through WhatsApp get feedback in the form of questions about nutrition and ways to reduce and prevent over weight from some research subjects that need to obtain nutritional information, while some other research subjects receive messages on WhatsApp without reading the material provided [12].

This study found that nutrition education through lecture and quizziz online game had no significant effect on healthy food choices compared to nutrition education through WhatsApp. This finding is consistent with Sen et al study, that there is no significant effect between nutrition education through game and behavior change [17]. Their study stated

that behavior can be formed properly if they participate in nutrition education through game and there is family support, so that knowledge gained through game can be applied in choosing healthy foods at home through the support of family members. The limitation of this study is that the researcher did not conduct intervention in nutrition education that included families in its implementation, so that the results of nutrition education could not represent success in choosing healthy foods in daily life, but had significant results in increasing nutritional knowledge in overweight adolescents.

#### IV. CONCLUSION

In this study, there was a difference in nutrition knowledge and healthy food choices between WhatsApp treatment and lecture and online game treatment before and after participating in nutrition education for over-weight adolescents. As seen in the results of this study, nutrition education through WhatsApp and through lecture and online game can improve nutrition knowledge and healthy food choices in over weight adolescents.

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