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Original Research

Differences in Knowledge, Attitudes, and Eating Patterns Before and After Counnseling Using the Vitanutrihealth Application Media on Overweight Adolescents at SMA Negeri 2 Malang

Perbedaan Pengetahuan, Sikap, dan Pola Makan Sebelum dan Sesudah Penyuluhan menggunakan Media Aplikasi Vitanutrihealth pada Remaja Overweight di SMA Negeri 2 Malang

Kamilatur Rohmah[1], I Nengah Tanu Komalyna[2*], B. Doddy Riyadi[3]

[1]Applied Bachelor of Nutrition and Dietetics Study Program, Malang Polytechnic of Health, Malang, Indonsia
[2]Professional Education Study Programs for Dietitians, Malang Polytechnic of Health, Malang, Indonsia
[3]D III Nutrition Study Programs , Nutrition Department, Malang Polytechnic of Health, Malang, Indonesia
* Email corresponding author: i_nengah@poltekkes-malang.ac.id

Abstract: Overnutrition in adolescents needs attention because it can cause disturbances in adolescent body functions which tend to continue into adulthood and old age. Overweight in adolescents can be caused by an imbalance between energy intake and expenditure, a history of high-calorie diets, and a lack of knowledge about nutrition. Digital health technology has the potential to be a source of learning for adolescents and has an important influence on adolescent knowledge and behavior. Nutrition counseling using application media can be a means to develop knowledge and strengthen healthy behavior, especially for overweight adolescents. The study aimed to determine the differences in knowledge, attitudes, and eating patterns before and after counseling using the *Vitanutrihealth* application media for *overweight* adolescents in SMA Negeri 2 Malang . The research method used is a *pre-experimental* research type with *a one group pre-test post-test design*. The statistical test used to determine the difference in knowledge and attitudes of adolescents before and after counseling was given using the *paired sample t-test,* while the adolescent eating patterns used the *Wilcoxon signed test.* The results of the study showed that the average score of adolescent knowledge before counseling was 60.53 , included in the sufficient category, after counseling it increased to 81.32, included in the good category. The average attitude of adolescents before counseling was 26.84, included in the category of unsupportive attitudes, after counseling it increased to 28.82, included in the category of supportive attitudes. The average eating pattern of adolescents before counseling was 348.4, included in the category of less diverse, after counseling it increased to 559.7, included in the category of diverse eating patterns. In addition, there were differences in knowledge, attitudes, and eating patterns between before and after counseling using the *vitanutrihealth application media* ($p < 0.05$).

Key word: knowledge, attitude, eating pattern, overweight adolescents

1. INTRODUCTION

Adolescence is time prone to nutrition, Where need energy And substance nutrition other increase along with need growth. In addition improvement need energy And substance nutrition other, teenager Also prone to experience problem nutrition like anemia, KEK (lack energy chronic), nutrition bad, excess heavy body (*overweight*), and obesity. *The World Health Organization* (WHO) states that excess heavy body has

become epidemic global and until now still become threat for all over public And increase rapid in a number of country [20]. In Indonesia, the prevalence of overweight in the 16-18 year old adolescent group in 2013 was 1.6% increasing to 4.0% in 2018 [9] . East Java Province is one of the provinces with a higher overweight rate (11.5 %) compared to the national (10.8%). The East Java Health Service reported that the overweight rate in Malang City in 2015 was 39.95% and increased to 42.53% in 2016 .

Overweight adolescents are at higher risk of developing degenerative diseases, such as coronary heart disease, hypertension, cancer, diabetes mellitus and other cardiovascular diseases which are currently still major health problems in Indonesia. *Overweight* in adolescents is influenced by various interrelated and multifactorial factors. Some of these factors include changes in energy balance that trigger obesity such as increased consumption of fast food , low physical activity, genetic factors, psychological factors, socioeconomic status, diet programs, age, and gender. Excess weight in adolescents is caused by an imbalance between energy expenditure and intake in the body and is related to a history of eating patterns and frequency of consumption of high-calorie foods, as well as low nutritional knowledge in adolescents.

Good nutritional knowledge is an important factor in determining a person's attitude and behavior towards food. The higher a person's knowledge, the wiser they are in choosing the type and quality of food to be consumed. Therefore, nutritional counseling is needed to improve adolescent knowledge and attitudes. Digital health technology has the potential to be a source of learning for adolescents and has an important influence on health knowledge and behavior. In addition, nutritional education applications allow for further interventions to change health behaviors to support the maintenance of healthy living behaviors in the long term [14] . Previous research has stated that the use of nutritional applications can improve adolescent knowledge and influence adolescent attitudes and behavior in choosing food.

Based on the background above, the reason researchers want to innovate and prove whether nutritional applications can be attractive and efficient for teenagers. The existence of the *Vitanutrihealth* application is expected to be a means to develop knowledge and strengthen healthy behavior, especially for overweight teenagers.

2. METHODS

This study is a type of *pre-experimental research* with *a one group pre-test post-test design.* In this design there is no comparison group (control), but the first observation (pre-test) and the second observation (post-test) are carried out which allow researchers to test the benefits that occur after the intervention is given, namely counseling. This research was conducted at SMAN 2 Malang in November 2024. The population of the study was all students of grade X-XI at SMAN 2 Malang, Klojen District, Malang City. The sampling technique used *purposive sampling* where the sampling was based on certain characteristics that had been previously known, as stated in the inclusion criteria, namely 1) Students who are *overweight* or obese, namely with a BMI> 23- ≥ 30, 2) Students who have smartphones *and* are able to access the *vitanutrihealth application* , 3) Students who are willing to follow the entire series of research until completion, totaling 38 respondents. Nutrition counseling was conducted once a week for 3 weeks with a duration of 20-30 minutes each. In the first week, before the counseling was conducted, it began by providing a knowledge, attitude questionnaire, and an interview regarding consumption patterns using the FFQ form, followed by explaining the material related to how to use the application and the contents of the

application. Before distributing the questionnaire, validity and reliability tests were first conducted. In this study, validity testing was conducted using Pearson correlation between each question item and the total score, both in the pre-test and post-test. After conducting validity testing on the instrument, a reliability test was conducted to determine whether the questions were reliable. In the second week, the education reviewed the material in the first week and continued with an explanation of the material related to the definition of *overweight* , impacts, causes, treatment efforts, and a balanced diet. In the third week, the education reviewed the material that had been presented in the first and second weeks. After that, a knowledge and attitude questionnaire was given after counseling and interviews regarding consumption patterns using the FFQ form. Data analysis was conducted univariately and bivariately. Univariate analysis only describes the distribution and percentage of each variable studied, the results are presented in the form of a table and contain a description of knowledge, attitudes, and eating patterns before and after nutrition counseling. Bivariate analysis was conducted to determine significant differences in variables before and after counseling. The analysis method used to determine differences in knowledge and attitudes before and after counseling was the *paired sample t-test,* while the analysis of eating patterns used *Wilcoxon signed rank* test because it is a nonparametric test and does not require the assumption that the data is normally distributed.

3. RESULTS

In this results and discussion sub-chapter, the main findings related to differences in knowledge, attitudes and eating patterns of adolescents before and after the intervention will be presented.

Table 1. **Frequency Distribution of Respondent *Characteristics***

Characteristics	n	%
Gender		
- Man	8	21.1
- Woman	30	78.9
Amount	**38**	**100**
Age		
- 15 years	12	31.6
- 16 years	19	50.0
- 17 years	7	18.4
Amount	**38**	**100**
Nutritional status		
- Overweight	31	81.6
- Obesity	7	18.4
Amount	**38**	**100**

Table 1 shows that the respondents in this study were mostly female, namely 30 students (78.9%), while there were 8 male students (21.1%). The age of respondents ranged from 15-17 years with an average age of 16 years. A total of 12 students (31.6%) were 15 years old, 19 students (50%) were 16 years old, and 7 students (18.4%) were 17 years old. The nutritional status of respondents in this study who were overweight was 81.6% and obesity was 18.4%.

Table 2. **Frequency Distribution of Respondent Based on Knowledge**

Knowledge	Before		After	
	n	%	n	%
Good	6	15.8	29	76.3
Enough	17	44.7	7	18.4
Not enough	15	39.5	2	5.4
Amount	**38**	**100.0**	**38**	**100.0**

Based on table 2, it shows that before the counseling, most respondents had sufficient knowledge, which was 44.7%. While after the counseling, the respondents' knowledge increased to a good category of 76.3%. The results of the respondents' pre-test and post-test, as many as 14 respondents (36.84%) experienced an increase from the sufficient category into a good category , indicating that most respondents only need a little encouragement to improve their knowledge . Meanwhile, respondents who were initially in the less category as many as 9 respondents (23.68%) increased to a good knowledge level category, and 4 respondents (10.52%) increased to a sufficient category. Overall, it shows that the counseling that has been carried out can improve respondents' knowledge even though there are still a small number who do not experience significant changes.

Table 3. **Average Score of Adolescent Knowledge Before and After Counseling**

Knowledge	Mean	Std. Deviation	Δ	p-value
Before	60.53	14.32	20.79	,000
After	81.32	12.77		

Based on table 3, it is known that the average knowledge score of adolescents before counseling using the *Vitanutrihealth application media* was 60.53 which was included in the sufficient category, increasing after being given counseling to 81.32 and included in the good category. The standard deviation before counseling was 14.32 which showed a fairly large variation in knowledge scores. After counseling, the standard deviation decreased to 12.77 indicating a slightly smaller variation in scores. Thus, it can be concluded that there was an increase in the average knowledge score of 20.79 after being given counseling. The results of the statistical test using the Paired Sample T-Test showed a p-value of 0.000 (<0.05), which means that there is a significant difference between the knowledge of *overweight adolescents* before and after being given counseling using the *Vitanutrihealth application media.*

Table 4. **Frequency Distribution of Respondent by Attitude**

Attitude	Before		After	
	n	%	n	%
Support	26	68.4	29	76.3
Does not support	12	31.6	9	23.7
Amount	**38**	**100.0**	**38**	**100.0**

Based on table 4, it shows that before the counseling, most respondents had a supportive attitude, namely 26 respondents (68.4%). After the counseling, there was an increase where the number of respondents who supported increased to 29 respondents (76.3%), while respondents who had an unsupportive attitude decreased to 9 respondents (23.7%). Although only a few experienced changes, the counseling showed a positive impact so that it could change the respondents' attitudes from unsupportive to supportive.

Table 5. **Average Score of Adolescent Attitudes Before and After Counseling**

Attitude	Mean	Std. Deviation	Δ	p-value
Before	26.84	1.78	1.98	,000
After	28.82	1.25		

Based on table 5, it shows the average value of respondents' attitudes before being given nutritional counseling, which was 26.84 and increased to 28.82. The standard deviation value decreased from 1.78 to 1.25 after being given counseling, this indicates that the data is more homogeneous or there is a smaller variation in the attitude scores of adolescents after being given education with the help of the *Vitanutrihealth application media.* There was an increase in the average attitude value before and after being given counseling by 1.98. The results of the statistical test using the Paired Sample T-Test test obtained a p-value of 0.000 (<0.05) which means that there is a significant difference between the attitudes of *overweight adolescents before and after being given counseling using the Vitanutrihealth* application media . This shows that after being given counseling, it not only increases knowledge but is also accompanied by an increase in attitudes.

Table 6. **Frequency Distribution of Respondent Based on Eating Patterns**

Dietary habit	Before		After	
	n	%	n	%
Good/Various	10	26.3	30	78.9
Lack of Diversity	28	73.7	8	21.1
Amount	**38**	**100.0**	**38**	**100.0**

Based on table 6, it shows that respondents before being given counseling had a diet that was included in the category of less diverse, which was 73.7%. After counseling, respondents' diets increased to be diverse (78.9%). Based on the results of the pre-test and post-test, 20 respondents (52.6%) experienced an increase from the category of less diverse to diverse, indicating a positive change in their diet . In addition, 10 respondents (26.3 %) still maintained a diverse diet and 8 respondents (21.1%) remained in the category of less diverse diets. This means that there was an improvement in respondents' diets after being given counseling for the better, although it did not change the respondents' overall diet.

Table 7. **Average Score of Adolescent Eating Patterns Before and After Counseling**

Dietary habit	Mean	Std. Deviation	Δ	p-value
Before	348.4	122.4	211.3	,000
After	559.7	155.7		

Based on table 7, it shows the average value of respondents' eating patterns before being given nutritional counseling, which is 348.4, is included in the less diverse category. There was an increase in the average value of eating patterns before and after being given counseling by 211.3 to 559.7, so it is included in the diverse category. The results of statistical tests using the non-parametric Wilcoxon Sign Rank Test obtained a p value of 0.000 (<0.05) which indicates that there is a significant difference between adolescent eating patterns before and after counseling using the *vitanutrihealth application media.*

4. DISCUSSION

The results of the study showed that the majority of respondents in this study were female. Based on Riskesdas 2018 data, the prevalence of obesity in women reached 29.8 % , much higher than men which was only 14.7%. This data indicates that women have a greater risk of obesity compared to men. Research conducted by Lubis, et al. (2020) revealed that women tend to have higher levels of total cholesterol and triglycerides, accompanied by a significant increase in body fat with age [11] . The respondents' ages ranged from 15-17 years with an average age of 16 years. Riskesdas data shows that adolescents over 15 years have a prevalence of central obesity reaching 31.0%, while in the 16-18 age group the prevalence of obesity is 13.5%. If left untreated, obesity in adolescents has the potential to continue into adulthood . The age of 15-18 years is the middle adolescence period where the adolescent's personality still shows childish traits, but awareness of themselves and life begins to emerge. At this stage, adolescents begin the process of searching for identity and developing personal maturity [19].

The results of the study showed that the counseling that had been carried out could increase the knowledge of respondents, although there were still a small number who did not experience significant changes. The results of the knowledge questionnaire that had been given, before the counseling, it was found that 65.7% of respondents answered incorrectly to questions regarding the definition of *overweight* and how to handle *overweight.* After being given counseling, the number of respondents who answered incorrectly to the question decreased to 42.1%. In addition, there were still many respondents who answered incorrectly to questions regarding the definition of eating patterns, namely 55.2%, and decreased to 18.4% after the counseling. This shows that respondents had not previously received specific information about *overweight* and eating patterns*.* One of the preventive efforts that has been proven to have a positive impact is providing counseling using application media. Through this approach, teenagers not only get relevant and easily accessible information through the application, but also a deeper understanding of the interactions in counseling. The evaluation results showed a significant difference between before and after the intervention. This confirms the importance of a systematic and technology-based educational approach in overcoming *overweight* in adolescents.

The results of the statistical test using the Paired Sample T-Test showed a p-value of 0.000 (<0.05), which means that there is a significant difference between the knowledge of *overweight adolescents* before and after being given counseling using the *Vitanutrihealth application media.* The increase in knowledge among respondents proves that this application media can be used periodically to support the learning process. The use of new media in the form of an Android application aims to attract respondents' interest as an effort to educate health related to *overweight* so that it can increase knowledge. The application enables adolescents to learn independently and repeatedly access the materials. This supports deeper and more sustainable learning, resulting in a significant increase in knowledge after the intervention. In addition, adolescents with a high intrinsic motivation toward a healthy lifestyle tend to be more active in exploring the application and understanding its content. In line with the research of Ririn, et al. (2022) stated that there is an influence of using the *Smart Teenagers application* for early detection and education of potential obesity in adolescent girls which is expected to increase awareness of adolescent girls to prevent obesity independently [16]. In addition, it is supported by research (Susindra, 2023) which shows a p-value of 0.000, which means that there is an influence of providing an

Android application on respondents' knowledge about obesity [17]. The increase in knowledge is significant because respondents show enthusiasm and can easily understand the information conveyed through the Android application media regarding obesity.

Knowledge plays a major role in shaping attitudes, but it is not the only determining factor**.** After counseling, increased knowledge successfully pushed many respondents to a supportive attitude. The increase in respondents' attitude values was because they were able to capture the positive things obtained from the counseling. This is shown from the results of the study that before the counseling, the number of respondents who had supportive and non-supportive attitudes had the most sufficient knowledge, namely 12 respondents and 5 respondents. Meanwhile, only 3 respondents were included in the good knowledge category who had a supportive attitude. After being given counseling, there was an increase in the good knowledge category to 23 respondents who had a supportive attitude. However, respondents in the good knowledge category also contributed the largest number of respondents who had a non-supportive attitude, namely 6 respondents.

Respondents with high knowledge who have negative attitudes indicate that behavioral interventions require a broader and more sustained approach, including addressing environmental aspects, personal motivation, and comfort in adopting change. This greatly influences how the individual interprets and responds to information. given in the application . Respondents tend to be unable to understand the reasons behind the importance of behavioral change or do not understand the benefits of the nutritional recommendations given. Based on the results of the attitude questionnaire before being given counseling, it was found that 42.1% of respondents who had inappropriate attitudes were in the statement regarding how to prevent overweight related to diet. After being given counseling, there was a decrease in the number of respondents who had inappropriate attitudes in the statement to 15.8%. This shows that respondents have not received information about the material so that respondents have a negative attitude.

The respondent's attitude score after being given counseling increased because the respondents had captured the positive things obtained from the counseling about *overweight.* The results of the statistical test using the Paired Sample T-Test obtained a p-value of 0.000 (<0.05), which means that there is a significant difference between the attitudes of *overweight adolescents* before and after being given counseling using the *vitanutrihealth application media.* The results of this study are in line with the theory put forward by Azwar (2019) which states that nutritional knowledge is closely related to a person's attitude in their behavior and lifestyle [5] . Research conducted by Hingis Tennisa (2020) regarding the effect of nutritional education through an Android-based balanced nutrition application on knowledge and attitudes in early adulthood at SMAN 6 Bandung, where the results of the study showed that there was an increase in the average attitude score before treatment in the balanced nutrition application group was 77.40 after treatment to 83.65 [18]. This significant increase indicates that the intervention in the form of nutritional counseling has not only succeeded in increasing knowledge, but has also been able to bring about positive changes in adolescent attitudes. When individuals have a better understanding of something, they tend to improve their attitudes as they become more aware and understand the importance of the change.

Based on the research results, it shows that there is an increase in the respondents' eating patterns after being given counseling to be better, although it does not change the respondents' eating patterns as a whole. Poor eating patterns diverse in adolescents due to the low frequency of consumption of several types of food ingredients. Food ingredients that are rarely consumed by adolescents include animal side dishes, vegetables, and fruits. Adolescents tend to prefer vegetable side dishes over animal side dishes because some of them feel that animal side dishes have an unpleasant fishy smell . Respondents who like to consume animal side dishes most often only eat chicken so it can be said that the diversity of animal side dishes is very lacking . In addition, the variety of vegetables consumed by them is very limited because they only consume certain types of vegetables . In addition, fruit consumption is also very rare. The types of fruit that are often consumed are also limited to certain fruits, such as bananas, melons, and papaya, so the diversity of fruit they consume is also relatively low.

Diversity plays an important role in maintaining ideal nutritional status. Adolescence is a period of rapid growth and development, so it requires adequate intake of nutrients in quantity and quality. Unfortunately, current adolescent consumption trends show a tendency towards a monotonous diet dominated by fast food, processed foods, high in sugar, salt, and fat, and minimal vegetables and fruits. This habit causes high energy intake but low nutritional quality, which can ultimately increase the risk of being overweight [12]. A diet that is not diverse is also often unable to meet the needs of fiber, vitamins, and minerals. Lack of fiber, for example, can interfere with the natural feeling of fullness and accelerate the emergence of hunger, thus encouraging increased frequency and amount of eating. In the long term, this condition will cause energy accumulation in the body and increase body fat, especially if not balanced with adequate physical activity.

The statistical test results obtained a p value of 0.000 (<0.05) which indicates that there is a significant difference between adolescent eating patterns before and after counseling using the *Vitanutrihealth application media* . Technological advances in the field of nutrition have brought changes to food consumption habits, especially among adolescents. One of the features of this application is its ability to help users choose food ingredients that suit their daily needs . With this feature, they can create their own daily food combinations that suit their preferences , and find out whether the food they consume is in accordance with their daily needs or is more or less than what is needed. In addition, this application provides materials containing standard portion sizes specifically for teenagers. This information helps them understand the ideal portion size for daily consumption. With clear guidance, teenagers can organize their diets in a more focused and balanced way.

Improving eating patterns is closely related to the level of individual knowledge, including understanding the importance of balanced nutrition. Good nutritional knowledge plays an important role in forming a healthy diet, because adolescents who understand the importance of balanced nutrition will be more likely to choose a variety of foods. Based on this study, it is known that most respondents who have a varied diet are included in the category of sufficient knowledge (60%), while respondents who have a less varied diet are mostly included in the category of less knowledge (46.4%). After counseling, respondents who have a good/varied diet are mostly included in the good knowledge category, namely 76.7%. The results of this study are in line with research conducted by Pratama (2009) at Assalam Surakarta High School, which showed a significant influence (p = 0.05) between the level of knowledge and the diet

of adolescent students who are overweight [15]. Meanwhile, adolescent attitudes also play a role in forming eating habits. The relationship between attitudes and diets shows that respondents before being given counseling who have supportive attitudes tend to have non-diverse diets. However, after counseling, it showed a change in respondents who have supportive attitudes to being mostly included in the category of good/varied diets. Although respondents show a supportive attitude towards something, in reality most of them have not implemented it in real action. Therefore, a simulation is needed to provide an overview and encourage its implementation.

5. CONCLUSION

Based on the results of the study, it can be concluded that the knowledge of respondents before counseling was included in the sufficient category with an average score of 60.53, changing after counseling to a good category with a score of 81.32. Respondents' attitudes before and after counseling were included in the supportive category with an average score before being 26.84 and after being 28.82. Respondents' eating patterns before counseling were included in the less diverse category with an average score of 348.4, changing after counseling to a good/diverse category with a score of 559.7. There was a significant difference between knowledge, attitudes, and eating patterns before and after counseling using *Vitanutrihealth media* with a p value = 0.000.

During the study, there were still respondents who did not understand about overweight prevention regarding a balanced diet and could not implement a balanced diet in everyday life. The suggestions that researchers provide to further research are expected to be able to modify existing applications so that interactive features can be developed in the application, such as quizzes, challenges, or gamification elements to increase user interest and involvement , as well as consultation or chatbot features to expand educational functions and help users get quick answers to questions asked.

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