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NUTRITIONAL ASSISTANCE THROUGH DIARY *NUTRIME* APPLICATION ON ENERGY AND FAT INTAKE IN OVERWEIGHT AND OBESE ADOLESCENTS AT MAN TANJUNG BALAI

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ABSTRACT

Overweight or obese adolescents tend to consume food without noticing its nutritional content, which results in food selection defects. Adolescent food intake requires full support from the media for nutritional assistance. This study aimed to determine the difference in energy and fat intake before and after nutritional assistance through Diary NutriMe application. This study applied a quasi-experimental method using a One Group Pretest-Posttest design. The participants in this study were 36 high school students from MAN Tanjung Balai who were overweight or obese and were selected by purposive sampling. All data were analyzed using a Paired Sample t-test for energy intake (distributed data were normal) and the Wilcoxon test for fat intake (distributed data were non-normal). This study found that the average energy intake after receiving nutritional assistance was 1440.9 ± 195.2 kcal, while the average fat intake was 36.8 ± 10.8 g. According to the paired sample t-test, a significant decrease (p = 0.000) in energy intake was observed after nutritional assistance through Diary NutriMe application. Similarly, the Wilcoxon test showed a significant decrease (P = 0.000) in fat intake after the intervention. Therefore, the Diary NutriMe application is suitable as a nutritional assistant to reduce energy and fat intake in overweight and obese adolescents in MAN Tanjung Balai. Word count: 3,251 words, excluding references.

Keywords*: adolescents, application, assistance, energy, fat*

INTRODUCTION

Adolescents experience rapid growth, including muscle mass, fat tissue, and elevated hormonal transformation. These changes in growth can affect their nutritional needs (Susetyowati, 2016), making them vulnerable to nutritional problems. The biggest nutritional problem among adolescents (15-19 years old) is overnutrition or obesity (Pertiwi & Niara, 2022).

Overweight or obesity is a condition in which a person's weight exceeds normal limits owing to fat accumulation. This occurs because the energy consumed tends to be greater than the energy expended. Adolescents with a higher energy intake have a 2.97 times risk of obesity. In addition to energy intake, excessive fat intake also contributes to obesity. The high-fat content in consumed food poses a 6.5 times greater risk of obesity (Telisa et al., 2020).

Being overweight or obese in adolescents is a major nutritional problem that can have consequences later in life. The disease risks posed by overweight and obesity in the future include degenerative diseases, such as diabetes mellitus, cancer, and ischemic heart disease (Direktorat Pencegahan dan Pengendalian Penyakit Tidak Menular, 2017). Based on Basic Health Research results, the prevalence of obesity among Indonesian adolescents increased from 2013 to 2018. Increased overweight status in adolescents (13-15 years old) in 2013 and 2018 was 0.4%, while obese nutritional status was 2.3% (Kementrian Kesehatan Repuiblik Indonesia, 2018). In addition, overnutrition status in 16-18-year-old adolescents was 3.8%, and obese nutritional status was 2.4% (Kementrian Kesehatan Repuiblik Indonesia, 2018).

Further observations in October 2023 in Madrasah Aliyah Negeri Kota Tanjung Balai found that 12.03% of adolescents were overnutrited and 8.29% were obese. The overnutrition in the school had a fairly high prevalence (10–15%), while the

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obesity rate was moderate (5–<10%) (De Onis et al., 2019). Based on the observation results, the high overweight and obesity rates in schools were triggered by high snack consumption. Teenagers in these schools tend to consume snacks, such as fried foods, instant noodles, and meatballs. Hafiza et al. (2021) stated that adolescents are more accustomed to putting interest in fried snacks and fatty foods, as they are more interested in the good taste of the food. A lack of nutrition education can cause poor proper food consumption among adolescents, resulting in food selection defects (Az-zahra & Ratih Kurniasari, 2022).

Food intake can improve if knowledge is increased through direct assistance and nutritional education. WhatsApp-based nutrition assistance with e-booklet and e-leaflet media by Yanti et al. (2022) significantly affected changes in knowledge levels and energy and protein intake in pregnant women with Chronic Energy Deficiency. In addition, the use of Android application-based media in nutritional counseling, namely, the *Nutri Diabetic Care* application, has been proven to generate dietary compliance in patients with diabetes mellitus (Winaningsih et al., 2020).

Technology is deeply integrated into teenagers' lives today, particularly through smartphones and their installed applications. One salient example is a study by Antawati et al., which reports that 73% of participants used smartphones with very high intensity, specifically for more than three hours per day (Antawati et al., 2024). Furthermore, a significant number of teenagers in Indonesia reported high smartphone usage, with approximately 64.4% of individuals aged 12–34 years frequently using these devices frequently (Zuhriyah, 2024).

Recognizing this, we developed an Android application called Diary NutriMe as a tool to help adolescents enhance the quality of their diet, especially for those who are overweight. This application was designed to raise awareness and motivate teenagers to improve their dietary habits by effectively monitoring and managing their food intake, specifically targeting a reduction in energy and fat consumption.

Therefore, this study aimed to examine the differences in energy and fat intake before and after nutritional assistance through the Diary NutriMe application among overweight adolescents.

METHODS

This study applied a quasi-experimental method using a one-group pretest-posttest design. This study was previously submitted to Ethical Clearance (EC) with No: 065/KEP/VI/2024 from the Faculty of Medicine, Maranatha Christian University Ethics Committee. This study was conducted in Madrasah Aliyah Negeri Kota Tanjung Balai in June 2024. A purposive sampling technique was also applied in this study with the following criteria: (1) a student of MAN Tanjung Balai City; (2) 15–17 years old; 3) overweight or obese; 4) Using Android-based smartphone; and 5) willingness to become a study object. The sample consisted of 36 participants.

Data on students' energy and fat intake before and after receiving nutritional assistance through the *Diary NutriMe* application were collected using a 24-hour food recall form. The stages of nutrition assistance included: 1) Pre-assistance, namely nutritional status screening to determine respondents, development, and expert validation of the *Diary NutriMe* application, Ethical Clearance (EC) feasibility test; 2) Pre-test of energy and fat intake, before nutritional assistance through the *Diary NutriMe* application; 3) implementation of nutritional assistance by providing education and nutritional assistance with the *Diary NutriMe* application for 8 days; 4) Post-test of energy and fat intake after nutritional assistance through the *Diary NutriMe* application. The NutriMe Diary has been developed in advance to ensure the validity of the application for use by adolescents (Haryana et al., 2024).

The data characteristics were descriptively analyzed. The student age data were divided into three groups of 15-17-year-olds. Gender data were divided into two groups: male and female students. The number of pockets per day for students was divided into three groups: low (IDR 2,000–5,000), medium (IDR 5,500–10,000), and high (> IDR 10,000). The student parents' occupations are quite diverse, namely entrepreneurs, military/civil servants/police, private employees, laborers, fishermen, farmers, joblessness, and others. The

last educational background of the parents was categorized as ungraduated from elementary school, elementary school, junior high school, senior high school, or bachelor's degree graduates.

The variables in this study were fat and energy intakes. Energy intake was categorized as follows: (1) extremely low < 70%; (2) low 70–<100%; (3) normal 100–<130%; and 4) high ≥ 130%, based on the Total Diet Survey (SDT) (Badan Penelitian dan Pengembangan Kesehatan, 2014). Adequacy of fat intake was categorized as (1) low (< 20%), (2) adequate 20-30% of total, and (3) high (>30%) of total energy needs (Kemenkes, 2014).

All data were processed using *Microsoft Excel 2010* and *SPSS 25.0*. First, the data were analyzed for normality using the Shapiro-Wilk test. Distributed data of energy intake was normal, so Paired Sample t-test was used for analysis, while distributed data of fat intake was non-normal, so it was analyzed using the Wilcoxon test.

RESULTS AND DISCUSSION

As shown in Table 1, most respondents were 16 years old (41.7%) from the 10-th and 11-th grades. According to Suha and Rosyada (2022), adolescents are vulnerable to overweight or obesity due to poor food selection, which is influenced by individual and environmental factors, leading to food selection defects and failure to maintain a proper diet. Most of the respondents were female (75%). Women are easily overweight or obese because of their different body composition. In addition, the percentage of body fat in women is also higher owing to hormonal differences from men, which causes the body's metabolism to run more slowly (Suha & Rosyada, 2022).

Most respondents had pocket money > IDR 10,000.00 (63.9%). High pocket money in adolescents affects food purchasing power (Arisdanni & Buanasita, 2018). In the father's occupation, entrepreneurs are the most category at 52.8% (19 people), while the mother's occupation is housewife at 66.7% (24 people). Parental occupation is insignificantly related to overweight or obese adolescents, but it can affect the economic ability of parents to provide healthy food to their children (Ramadhany et al., 2023).

Table 1. Respondent Characteristics

Variable	n	(%)
Age		
15 year-old	2	5.6
16 year-old	19	52.7
17 year-old	15	41.7
Gender		
Male	9	25
Female	27	75
Pocket money/day		
IDR 2,000 – 5.000	2	5.6
IDR 5.500 – 10.000	11	30.6
> IDR 10.000	23	63.9
Father's occupation		
Entrepreneurs	19	52.8
Military/civil servant/police	6	16.7
Private employees	0	0.0
Laborers	1	2.8
Fishermen	4	11.1
Farmers	1	2.8
Jobless	0	0.0
Others	5	13.9
Mother's occupation		
Entrepreneurs	3	8.3
Military/civil servant/police	4	11.1
Private employees	0	0.0
Laborers	0	0.0
Fishermen	0	0.0
Farmers	0	0.0
Housewife	24	66.7
Others	5	13.9
Father's educational background		
Ungraduated from elementary school	0	0.0
Elementary school	4	11.1
Junior high school	3	8.3
Senior high school	22	61.1
Bachelor degree	7	19.4
Mother's educational background	0	0.0
Ungraduated from elementary school	5	13.9
Elementary school	4	11.1
Junior high school	17	47.2
Senior high school	10	27.8
Bachelor degree	0	0.0

Additionally, a significant proportion of respondents had parents who were high school graduates, with 61.1% (22 individuals) of high school graduate fathers and 7.2% (17 individuals) of high school graduate fathers. Ramadhany et

al. (2023) found that the father's educational background was insignificantly associated with the incidence of obesity and overweight in children. However, the mother's educational background influenced the incidence of obesity and overweight in the children. Mothers with a better education will have a broader insight into health information and understand the importance of balanced nutrition for children.

Nutritional assistance through *Diary NutriMe* application was carried out for 8 days on June 16-23, 2024. The respondents recorded their food intake from waking up until bed at night. The entries made in the *Diary NutriMe* application were saved. Respondents can also see the input food content. Both energy and fat intake fluctuated for 8 days, as shown in Figures 1 and 2. During nutritional assistance with the *Diary NutriMe* application, students can control their intake and follow directions from the researchers. Therefore, energy and fat intake were better after nutritional assistance through the *Diary NutriMe* application than before nutritional assistance.

When nutritional assistance was implemented using the *Diary NutriMe* application for eight days, the students' average energy and fat intake decreased. However, on the 2nd day, increased energy and fat intake occurred, which coincided with Eid al-Adha 1445 H. One of the limitations of this study was the timing of data collection, which coincided with Eid al-Adha. During this

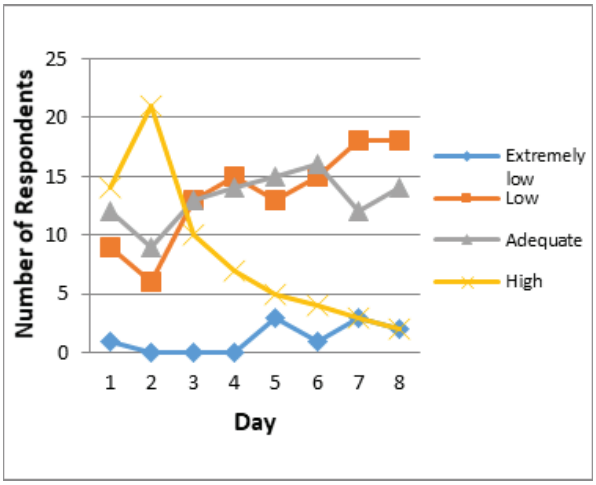

Figure 1. Distribution of Respondents based on Energy Intake for 8 Days after Nutrition Assistance through Diary NutriMe Application

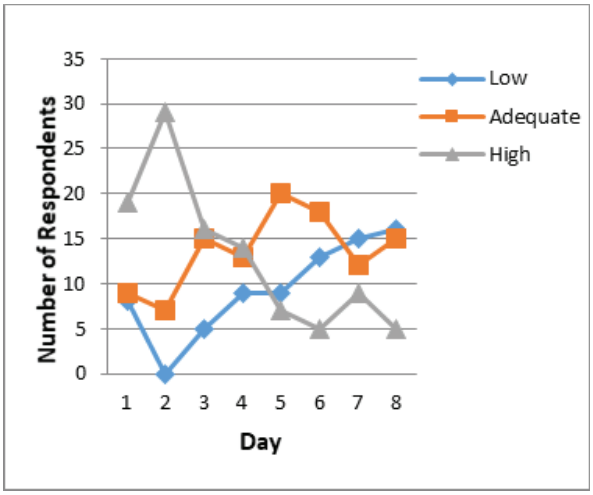

Figure 2. Distribution of Respondents based on Fat Intake for 8 Days after Nutrition Assistance through Diary NutriMe Application

celebration, students consumed a variety of traditional foods that were typically high in energy and fat, such as rice with vegetable soup, *sambal pecel*, satay, and various meat dishes, including beef jerky, rendang, and beef soup.

This cultural event led to an increase in energy and fat intake on the 2nd day of the intervention, which may not reflect participants' usual dietary habits. Therefore, the influence of Eid al-Adha on food choices could have introduced bias in the measurement of dietary intake. Future studies should consider avoiding data collection during cultural or religious celebrations to minimize this potential bias and obtain a more accurate assessment of habitual dietary intake.

Similar to the second day, students still tended to consume various beef dishes on the third day but not as much as on the second day. Additionally, the portion sizes of food consumed by some students, such as *lontong*, were smaller than those on the second day. Furthermore, students' intake on the fourth day also consumed various types of processed meat, but not as much as on the third day, and some students consumed side dishes such as chicken and fish.

During the implementation period, students had a main meal schedule only twice a day. When the researchers observed this condition further, the students stated that breakfast could only make their stomachs feel sick, so the main food schedule was only in the afternoon and evening. In addition,

other students stated that the main meal scheduled twice a day emerged because of a habit factor that only consumed food in the morning and evening.

As shown in Table 2, energy intake before receiving nutritional assistance through the *Diary NutriMe* application tended to have a higher value of 94.5% (34 people). In addition, 5.5% (2 respondents) had normal energy intake. Based on energy intake after receiving nutritional assistance through the *Diary NutriMe* application, respondents tended to have low and normal energy intake, namely 50% (18 people) with less energy intake and 38.8% (14 people) with normal energy intake.

The respondents' average calorie intake decreased by 1,025 kcal. This substantial reduction may be attributed to the researchers' consistent reminders for the participants to record their food intake after each meal. Additionally, researchers provided daily guidance on which foods should be avoided, particularly high-energy and high-fat foods.

Awareness plays a crucial role in modifying dietary habits, particularly among adolescents who frequently consume high-calorie foods, without considering portion sizes or nutritional quality. Recording food intake not only helps monitor consumption, but also fosters mindful eating, which can reduce excessive caloric intake and mitigate obesity risks, as highlighted by Aguirre et al. (2023). Daily reminders to record meals help adolescents rethink their food choices and encourage healthier, lower-calorie options. Moursi et al. (2023) found that maintaining a dietary record is linked to reduced intake of high-calorie foods, which is important for managing weight. By tracking meals, adolescents gain control over their eating habits and become more resistant to unhealthy influences. Keeping a meal journal also acts as a barrier to impulsive eating driven by social pressure (Kelly et al., 2020).

As shown in Table 3, 100% of the respondents (36 people) had higher fat intake categories. After nutritional assistance through the Diary NutriMe application, respondents tended to have a good fat intake of 41.7% (15 people). However, 44.4% (16 people) still had low energy intake, and 13.9% (5 people) had high fat intake.

During the nutrition assistance process, the students attempted to control their food intake. Several students improved their diets. Previously, students consumed more fried foods, but changed their snack consumption to fruits, such as mangoes, papayas, and bananas, on the sixth and seventh days. Therefore, energy and fat intake decreased on the eighth day. In addition to changing snacks, other students also reduced the number of meal portions, which could have triggered an intake reduction.

Based on interviews with several students, they had a more regular eating schedule after using the *Diary NutriMe* application. In addition, other students stated that they became more aware of food content.

Furthermore, the successful implementation of this study was due to the routine monitoring of food intake entries in the *Diary NutriMe*. Previously, students were instructed to take pictures of their meals each time they ate, and send them through the Chat menu in the application. Researchers also routinely checked the food input provided by the students based on food photos. Researchers also provided feedback and encouragement to motivate students and improve their diets with low energy and fat

Table 2. Energy Intake Category Before and After Nutrition Assistance Through *Diary NutriMe* Application

Energy Intake	Before		After	
	n	%	n	%
Extremely Low	0	0	2	5.6
Low	0	0	18	50.0
Normal	2	5.5	14	38.8
High	34	94.5	2	5.6
Average ± SD (Kcal)	**2465.0±308.9**		**1440.9±195.2**	
Min-Max (Kcal)	**2004.7-3102.9**		**1051.4-1697.3**	

Table 3. Fat Intake Category Before and After Nutrition Assistance Through *Diary NutriMe* Application

Fat Intake Category	Before		After	
	n	%	n	%
Low	0	0	16	44.4
Adequate	0	0	15	41.7
High	36	100	5	13.9
Average ± SD (g)	**99.8±22.3**		**36.8±10.8**	
Min-Max (g)	**77.3-155.6**		**16.6-58.7**	

content. Therefore, students can be more compliant with controlling their diets. The *Diary NutriMe* application, as a mentoring tool, is beneficial for monitoring students' food intake. This aligns with previous research (Suyoto et al., 2020), which demonstrated the use of the '*Aplikasi Patuh*' that could help increase compliance among hypertensive patients in balanced nutritional diet implementation to reduce the risk of high blood pressure.

Energy intake data before and after nutritional assistance through *Diary NutriMe* application were tested using the Paired Sample t-test. Fat intake before and after nutritional assistance was assessed using Wilcoxon test. Both results obtained the same significance value, as seen in Table 4, where energy and fat intake before and after receiving nutritional assistance had a significance value of 0.000. Based on Dahlan (2011), if the significance value is smaller than 0.05 ($p < 0.05$), the data is concluded to have a significant difference before and after receiving nutritional assistance using the *Diary NutriMe* application.

Khaerani et al. (2020) found changes in a nutritionally balanced diet after receiving *Remind-Me* application media in 13-15-year-old adolescents. The *Remind-Me* application followed technological trends that fit adolescents' daily lives. In addition, another study by Likhitweerawong et al. (2021) found that the *OBEST* application aimed at obese 10-15-year-old adolescents could improve their healthy eating behavior. This application provides a self-monitoring food record feature to increase adolescents' awareness of improving healthier eating behaviors. Therefore, this study concludes that nutrition assistance using an application media can increase the success of changes in the knowledge and intake of nutrition assistance targets.

Table 4. Hypothesis Test of Energy and Fat Intake Before and After Nutrition Assistance through *Diary NutriMe* Application

Variable	n	Average ± SD		P
		Before	After	
Energy intake	36	2465± 308.9	1440.9± 195.2	0.000
Fat intake		99.8± 22.3	36.4±10.8	0.000

CONCLUSION

This study found a significant effect of Diary NutriMe application on energy and fat intake before and after nutritional assistance through the *Diary NutriMe* application. The *Diary NutriMe* application as a medium for nutritional assistance can help respondents control food intake, thus decreasing energy and fat intake after nutritional assistance through the application for 8 days.

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