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Consumption of 'kue Ku' Modified Sweet Potato Flour to Overcome Constipation In Adolescents Aged 12-13 Years in SMP Negeri 1 Tahuna

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Abstract

Background: Constipation has a negative impact on the health and socio-economic well-being of families. Adequate fiber intake can overcome constipation. Purple sweet potato flour is classified as a high-fiber food product because in 100 grams it contains 12.6% fiber.

Aim: This study to determine the effect of consumption of purple sweet potato flour modified ku cake to overcome constipation in adolescents aged 12-13 years at SMP Negeri 1 Tahuna.

Methods: This type of research is a quasi-experiment with the form of pretest-posttest with nonequivalent control group design conducted on 60 samples in total sampling and consists of 2 groups, namely 30 treatment group samples and 30 control group samples. Data collection was obtained from the results of your organoleptic test Rome IV Constipation questionnaire. Data analysis used Wilcoxon and Mann-Whitney tests with a significance of $\rho < 0.05$.

Results: The number of constipation in adolescents aged 12-13 years in SMP Negeri 1 Tahuna before the intervention was 60 people and after the intervention was 29 people. There is an effect on the consumption of purple sweet potato flour modified cake to overcome constipation in adolescents aged 12-13 years at SMP Negeri 1 Tahuna ($\rho < 0.05$). So it can be influenced that there is a significant difference between constipation before and after consumption of purple sweet potato flour modified ku cake.

Conclusion: The incidence of constipation in adolescents aged 12-13 years at SMP Negeri 1 Tahuna before the intervention was 60 people and after the intervention was 29 people. There is an effect of purple sweet potato flour modified cake consumption to overcome constipation in adolescents aged 12-13 years at SMP Negeri 1 Tahuna ($\rho<0.05$).

Keywords: Ku cake; Purple sweet potato flour; Constipation; Adolescents

Introduction

One of the health problems that can be experienced by children is constipation. This does not only happen in Indonesia, but also throughout the world. However, constipation is often ignored. Constipation in children results in a high number of visits to health facilities for treatment. In addition to affecting health, this negative impact can also have an impact on the family's socio-economic sector [1] (Kadim, 2021). Adequate fiber intake is one of the ways to deal with constipation. However, the percentage of Indonesian people who consume vegetables and fruits is below the Nutritional Adequacy Rate [2]. The proportion of less fruit/vegetable consumption per day in a week in Indonesia and in North Sulawesi respectively is 96.7% and 94.6%. The proportion for the age range of 10-14 years is 97.7% [3] (Indonesian Health Survey, 2023). The high percentage of Indonesians who consume less than 5 servings of fruit/vegetables per day is a sign of inadequate fiber intake [2].

Based on data obtained from Liun Kendage Tahuna Hospital, constipation data in 2023 in female patients aged 10-19 years who were treated as outpatients was 6 people. The needs of adolescents are different from elementary school children. A number of changes have begun to occur even in their eating patterns [4]. Early adolescents are children aged 10-13 years. The results of a preliminary study at SMP Negeri 1 Tahuna in 2024 showed that adolescents aged 12-13 years who experienced constipation were 60 students out of 67 respondents who

filled out the questionnaire. The data was dominated by female adolescents with 31 students (51.7%). The dominant age was 12 years old with 41 students (68.3%).

Purple sweet potato is one of the food sources of fiber. This potato is also found in abundance in Tahuna, therefore in this study the researcher is interested in utilizing purple sweet potato flour to make ku cake. The selection of ku cake is based on direct observation in the field which shows that ku cake is a popular cake and always sells well in Tahuna City. High-fiber food is food with a fiber content of 6 grams per 100 grams or 6% [5]. Based on the Indonesian Food Composition Table (TKPI), purple sweet potato flour is classified as a high-fiber food product because 100 g contains 12.6 g of fiber [6]. The purpose of this study was to determine the effect of consuming modified purple sweet potato flour cake to overcome constipation in adolescents aged 12-13 years at SMP Negeri 1 Tahuna. This research was conducted with the approval of the Health Research Ethics Commission of the Manado Ministry of Health Polytechnic No. KEPK.01/10/411/2023.

Method

The type of research is quasi-experimental research with a pretest-posttest with nonequivalent control group design. This type of research uses pretest and posttest and has a control group, but it does not function to control all external variables of the research [7]. Nonequivalent control group design describes similarities between groups only in certain components [8]. This research was conducted at SMP Negeri 1 Tahuna in January-February. The independent variable in this study was the fiber content of the modified purple sweet potato flour cake, while the dependent variable was constipation. The population of this study was adolescents aged 12-13 years at SMP Negeri 1 Tahuna who experienced constipation. The population consisted of classes 7A, 7B, and 7C. The number of samples was as many as the population, which was 60 people (total sampling). The number of samples in each treatment and control group was 30 people. The determination of the treatment and control groups was random. The treatment group consisted of 26 people from class 7A and 4 people from class 7B. The control group consisted of 6 people from class 7B and 24 people from class 7C. The instruments used were organoleptic test forms and constipation criteria rome IV questionnaires. The intervention was given for 8 (eight) days. Organoleptic data will be obtained from the organoleptic test form. Constipation data will be obtained from the constipation criteria rome IV questionnaire. The data analysis used was frequency distribution, Wilcoxon test, and Mann-Whitney test.

Results

Respondent Overview

The respondents in this study were students of SMP Negeri 1 Tahuna aged 12-13 years and experiencing constipation. The respondents numbered 60 students who were divided into two groups, namely the treatment group which was given ku cake. Modification purple sweet potato flour and a control group that was not given any treatment. The general description of the respondents includes gender, age, and class.

a. Respondents Overview by Gender

The frequency distribution of respondents in the treatment and control groups shows that 51.7% of the study respondents were female with a total of 31 people. For more details, see Table 1.

b. Respondents Overview by Age

The frequency distribution of respondents in the treatment and control groups showed that 68.3% of the study respondents were 12 years old with a total of 41 people. For more details, see Table 2.

Organoleptic Test

Organoleptic testing is a description of consumer assessment of taste, namely flavor, aroma, color and texture of a product.my cake modification of purple sweet potato flour.

a. Flavor

Table 1. shows the frequency distribution of the taste test. my cake purple sweet potato flour modification. As many as20 panelists chose like (80%). For more details, see Table 3.

b. Aroma

Table 4 shows the frequency distribution of the aroma test. my cake modification of purple sweet potato flour. A total of 11 panelists chose to like (44%). For more details, see Table 4.

c. Color

Table 5 shows the frequency distribution of the color test.my cake flour modification purple sweet potato. A total of 15 panelists chose to like (60%). For more details, see Table 5.

d. Texture

Table 6 shows the frequency distribution of the texture test. my cake modification of purple sweet potato flour. A total of 17 panelists chose to like (68%). For more details, see Table 6.

Early and Late Constipation Overview in the Treatment Group

The number of students in the treatment group who experienced and did not experience constipation at the beginning and end of the study in Table 7 shows that 100% of respondents in the treatment group experienced constipation at the beginning of the study, while 80% no longer experienced constipation at the end of the study. For more details, see Table 7.

Early and Late Constipation Overview in the Control Group

The number of students in the control group who experienced and did not experience constipation at the beginning and end of the study in Table 8 shows that 100% of respondents in the control group experienced constipation at the beginning of the study, while 76.7% still experienced constipation at the end of the study. For more details, see Table 8.

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Table 1: Frequency Distribution of Respondents Based on Gender.

Gender	n	%
Man	29	48.3
Woman	31	51.7
Total	60	100

Table 2: Frequency Distribution of Respondents Based on Age.

Age	n	%
12 years old	41	68.3
13 years old	19	31.7
Total	60	100

Table 3: Distribution of Organoleptic Tests for Taste.

Flavor	n	%
Do not like	0	0
Kinda dislike	0	0
Neutral	2	8
Kinda like it	3	12
Like	20	80
Total	25	100

Table 4: Distribution of Organoleptic Tests for Aroma.

Aroma	n	%
Do not like	0	0
Kinda dislike	0	0
Neutral	7	28
Kinda like it	7	28
Like	11	44

Table 5: Distribution of Organoleptic Tests on Color.

Color	n	%
Do not like	0	0
Kinda dislike	0	0
Neutral	5	20
Kinda like it	5	20
Like	15	60
Total	25	100

Table 6: Distribution of Organoleptic Tests on Texture.

Texture	n	%
Do not like	0	0
Kinda dislike	3	12
Neutral	3	12
Kinda like it	2	8
Like	17	68
Total	25	100

Table 7: Frequency Distribution of Initial and Final Constipation Features in the Treatment Group.

Constipation Category	Beginning		End	
	n	%	n	%
Constipation	30	100	6	20
No constipation	0	0	24	80
Total	30	100	30	100

Table 8: Frequency Distribution of Initial and Final Constipation Features in the Control Group.

Constipation Category	Beginning		End	
	n	%	n	%
Constipation	30	100	23	76.7
No constipation	0	0	7	23.3
Total	30	100	30	100

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Table 9: Results of Analysis of Differences in Initial Constipation in the Treatment and Control Groups.

Statistical analysis	Test	N	Mean	ρ
Early constipation	Mann Whitney	30		0.462
Treatment group			3.77	
Control group			3.57	

Table 10: Results of Analysis of Differences in Final Constipation in the Treatment and Control Groups.

Statistical analysis	Test	N	Mean	ρ
Late constipation	Mann Whitney	30		0,000
Treatment group			0.93	
Control group			2.8	

Table 11: Results of Analysis of Differences in Early and Late Constipation in the Treatment Group.

Statistical analysis	Test	N	Mean	ρ
Control group				
Early constipation	Wilcoxon	30	3.77	0,000

Differences in Early and Late Constipation in the Treatment and Control Groups

To determine the difference between early and late constipation in the control and treatment groups, an alternative test was conducted using the Mann-Whitney test with a value of $\rho < 0.05$. Table 10 shows that there is no significant difference ($\rho > 0.05$) between early constipation in the treatment and control groups. Table 11 shows that there is a significant difference ($\rho < 0.05$) between late constipation in the treatment and control groups. For more details, see Tables 9 and 10.

Differences in Early and Late Constipation in Treatment Groups

To determine the difference between early and late constipation in the treatment group, the Wilcoxon test was performed with $\rho < 0.05$. Table 11 shows that there is a significant difference ($\rho < 0.05$) between early and late constipation in the treatment group. For more details, see Table 11.

Discussion

Before the study, subjects were asked to fill out a questionnaire to find out how many subjects experienced constipation based on symptoms in the week before the study. Of the 67 students, there were 60 students who experienced constipation. The students were divided into treatment and control groups, each consisting of 30 students. After 6 days of observation, the group given purple sweet potato flour fortified cookies was asked to fill out a final questionnaire. The results of the final questionnaire showed that 80% (24 people) were no longer constipated. The lowest score was 0 (5 people) and the highest score was 1 (19 people). Meanwhile, 20% (6 people) were still constipated. The subjects who were still constipated were R1, R4, R12, R16, R17, and R22. The lowest score was 2 (3 people) and the highest score was 4 (1 person).

There was a decrease in the average score from 3.77 to 0.93. The questionnaire results showed that the six respondents still had the behavior of holding feces or retention behavior. Defecation is the process of removing feces or digestive metabolic waste from the body. Defecation can be delayed by tonic contractions. Tonic contractions come from the internal and external anal sphincters. The internal anal sphincter is a smooth muscle, while the external anal sphincter is a striated muscle. The internal anal sphincter is located in the proximal part of the anus, while the external anal sphincter is located in the distal part.

The movement of the external anal sphincter can be controlled so that defecation can be delayed. The desire to defecate will reappear when there is a new mass of feces entering the rectum. If the desire to defecate is delayed repeatedly, the reflex for defecation will decrease. This can also cause constipation. Constipation is generally characterized by pain during defecation so that a person will delay defecation, but this causes the feces to become harder than before because the large intestine continues to absorb water from the feces [1]. Not a few parents misinterpret children who are holding feces as the child's attempt to expel feces. The behavior of holding feces or retention behavior that is most often done by the 6 respondents in the initial questionnaire is holding on to furniture (46.7%), while in the final questionnaire it is avoiding quiet places (66.7%).

If done continuously, retention behavior will become automatic. Retention behavior can cause fecal incontinence. Fecal incontinence is a condition when liquid feces from the large intestine spread around hard feces and pass through the rectum without being realized. After 6 days of observation, the control group was asked to fill out the final questionnaire. The results of the final questionnaire showed that 73.3% (22 people) were still

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constipated. The lowest score was 2 (7 people) and the highest score was 5 (5 people). Meanwhile, 23.3% (7 people) were no longer constipated. Subjects who did not experience constipation were R31, R34, R36, R43, R46, R54, and R56. The score of the seven respondents was 1. The average score decreased from 3.57 to 2.80.

Constipation is a condition of difficulty in defecating (BAB). This is caused by irregular digestion. Constipation is categorized if the frequency of defecation is less than three times a week; hard stools; pain when straining [9], a person has a bowel movement frequency of between three times a day to three times a week [10]. Other research [9] states that low fiber consumption will cause constipation. The ability of fiber to retain water is thought to stimulate bowel movements, resulting in an increase in the volume of feces, intestinal microbiota and bacterial metabolic products; thus, fiber can stimulate pushing movements in the colon, reduce food transit time, and result in defecation or bowel movements [11]. Fiber allows feces to absorb water so that feces become soft and large in volume. This can prevent injuries to the walls of the large intestine during the defecation process [12].

Researchers used the Rome IV constipation questionnaire with the determination of results in the form of giving a value of 1 to each question that indicates constipation symptoms. If the total value is ≥ 2, then the respondent is declared to be constipated. Conversely, if the total value is <2, then the respondent is declared not to be constipated. The results of the study showed that there was a significant difference ($\rho < 0.05$) between the final constipation in the control and treatment groups using the Mann-Whitney test. In addition, there was also a significant difference ($\rho < 0.05$) between the initial and final constipation in the treatment group with the Wilcoxon test. Twenty-nine people had a final questionnaire score lower than the initial questionnaire with an average decrease from 3.77 to 0.93, while 1 person had the same final and initial questionnaire scores.

The research results are in line with research by [13], the average frequency of defecation before giving black sticky rice pie and purple sweet potato was 2x a week (63.2%), while the average frequency of defecation after giving was 3x a week (78.9%). The study showed an increase in the average frequency of defecation after giving the product. One of the tubers that can be used as an alternative ingredient for making snacks is purple sweet potato. The fiber content in purple sweet potato can maintain digestive health and prevent constipation [14]. The fiber content in purple sweet potatoes can help prevent constipation and smooth the digestive tract [15]. Fiber from purple sweet potatoes can improve the balance of gut bacteria and bowel function for digestive tract health [16].

High fiber foods are foods with a fiber content of 6 grams per 100 grams or 6% [5]. Purple sweet potato flour is classified as a high-fiber food product because it contains 12.6 grams of fiber per 100 grams. Ku cake fortified with purple sweet potato flour is classified as a high-fiber food because it contains 3.3 grams of fiber per 38 grams of ku cake. Three ku cakes can meet the total fiber needs of 35.4% in the group of 12-year-old male adolescents, 29.1% in the group of 13-year-old male adolescents, 36.7% in the group of 12-year-old female adolescents and 34.1% in the group of 13-year-old female adolescents. Snacks, at one time, should contain 10% of the total nutritional content of the daily menu. Snacks can be consumed at 10 am and 4 pm so that the total nutritional content of the two snacks is 20% of the total nutritional content of the daily menu. Three pieces of my cake can meet the fiber needs of snacks by 174.1% in the group of 12-year-old male adolescents, 143.4% in the group of 13-year-old male adolescents, 180.5% in the group of 12-year-old female adolescents and 168.1% in the group of 13-year-old female adolescents.

Conclusion

The number of constipation cases in adolescents aged 12-13 years at SMP Negeri 1 Tahuna before the intervention was 60 people and after the intervention was 29 people. There is an effect of consuming modified purple sweet potato flour ku cake to overcome constipation in adolescents aged 12-13 years at SMP Negeri 1 Tahuna ($\rho<0.05$).

Conflict of interest: The authors declare no conflict of interest.

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