THE EFFECT OF EDUCATION USING DIGITAL COMIC MEDIA ON HEALTHY FOOD CHOICES IN ADOLESCENT GIRLS WITH PRIMARY DYSMENORRHEA

Pengaruh Edukasi Menggunakan Media Komik Digital Terhadap Pemilihan Makanan Sehat Pada Remaja Putri Dengan Dismenorea

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ABSTRAK

Remaja merupakan masa peralihan dari anak-anak menuju dewasa ditandai dengan terjadinya menstruasi pada wanita. Sebagian besar remaja merasakan nyeri menstruasi yaitu dismenorea primer. Prevalensi dismenorea di dunia tertinggi terdapat pada remaja putri yaitu sekitar 20-90% dan di Indonesia sebesar 60-75%.Kurangnya pengetahuan gizi dan kecenderungan untuk mengikuti faktor emosional dan sosial menyebabkan remaja memilih makanan yang kurang sehat dan bergizi, sehingga berdampak pada asupan gizi. Penelitian ini bertujuan untuk menganalisis pengaruh komik digital terhadap pemilihan makanan sehat terhadap remaja yang menderita dismenorea primer. Penelitan ini menggunakan metode campuran (R&D dan true eksperimen dengan rancangan p*re-post test with control group)*. Penelitian ini melibatkan tiga validator ahli yaitu ahli materi, ahli bahasa dan ahli media. Pengumpulan data melalui kuesioner penilaian media dan wawancara. Subjek penelitian 100 remaja putri di sekolah sasaran penelitian yang memenuhi kriteria inklusi yaitu siswi SMA Negeri Kelas X dan XI, riwayat menstruasi teratur selama 6 bulan terakhir, usia 15-18 tahun, memiliki *smartphone* pribadi dan belum pernah mendapatkan edukasi terkait dismenorea. Kriteria eksklusi yaitu tidak hadir saat penelitian dan tidak mengisi kuesioner secara lengkap. Pengambilan sampel menggunakan *multistage random sampling* terdiri dari 2 tahap yaitu *cluster random sampling* dan *proportional random sampling*. Instrumen data pemilihan makanan sehat menggunakan formulir *healthy food choices quetionarre.* Hasil uji Wilcoxon menunjukkan pada kelompok intervensi didapatkan nilai p-value = <0,001 dan pada kelompok kontrol didapatkan nilai p-value = <0,001. Hasil ini menunjukkan komik digital yang dirancang memiliki pengaruh terhadap skor pemilihan makanan sehat.

Kata kunci: dismenorea, edukasi, gizi, komik, media, remaja

ABSTRACT

Adolescence is a transition period from childhood to adulthood and is marked by the menstruation occurrence in women. Most teenagers experience menstrual pain, namely primary dysmenorrhea. The dysmenorrhea prevalence in the world is highest in adolescent girls, namely around 20-90% and in Indonesia it is 60-75%. Lack of nutritional knowledge and a tendency to follow emotional and social factors causes adolescents to choose unhealthy and nutritious foods, thus impacting nutritional intake. This study aimed to analyze the influence of digital comics on healthy food choices in adolescents with primary dysmenorrhea. This research used mixed methods (R&D and true experimentation with pre-post-test design with control group). This research involved three expert validators: material, language, and media experts. Data were collected using media assessment questionnaires and interviews. The research subjects were 100 adolescent girls in target schools of study that met the inclusion criteria, namely female

students of State High School Classes X and XI, history of regular menstruation for the last 6 months, aged 15-18 years, and who never received education related to dysmenorrhea. The exclusion criteria are not present during the study and did not fill out the questionnaire completely. Multistage random sampling consists of two stages: cluster random sampling and proportional random sampling. The data instruments for healthy food choices used a healthy food choice questionnaire form. Wilcoxon test result showed in the intervention group obtained p-value=<0.001 and in the control group obtained p-value=<0.001. These results showed that the digital comics designed influence the score for choosing healthy foods.

Keywords: *dysmenorhhea, education, nutrition, comics, media, adolescents*

INTRODUCTION

Adolescence is the transition stage from the period of children to adolescents which is marked by rapid changes such as physical, emotional, psychosocial and hormonal changes, namely the emergence of primary sex characteristics, namely the development of reproductive organs. This process of reproductive development is called puberty which is marked by the occurrence of menstruation in women. Menstruation is a normal and natural condition, but many teenagers experience menstrual disorders, one of which is in the form of complaints of pain during menstruation called dysmenorrhea. Adolescents most often experience the incidence of primary dysmenorrhea while secondary dysmenorrhea is most commonly found in reproductive age Adolescents more often experience primary dysmenorrhea because at this age there is nerve optimization so that the secretion of prostaglandins increases, which results in discomfort felt during activities such as lack of concentration that can interfere with the learning process [1].

According to WHO data, the incidence of dysmenorrhea in the world is around 90% and 10-15% of them experience severe dysmenorrhea. The highest prevalence of dysmenorrhea is found in adolescent girls, which is around 20-90%[2].In Indonesia, the prevalence of primary dysmenorrhea is quite high, which is 60-75% in young women [3]. A preliminary study conducted by the author in four State High Schools in Padang City obtained results from 845 students, 678 students or 80.2% experienced primary dysmenorrhea.

Primary dysmenorrhea can be affected by several factors, namely menarche age (the age of first menstruation), body life index, length of menstruation, menstrual cycle, pelvic inflammatory disease, depression, nutrient intake, poor diet or diet [4]. The nutrient content in food has an effect on the production of sex hormones. Increased estrogen production can cause a higher estrogen ratio of progesterone so that there is a thickening of the endometrial lining and increase the production of prostaglandins and increased vasoconstriction and myometrium contractions which can cause pain during menstruation [5]. Consumption of healthy foods is expected to stimulate balanced production of estrogen and progesterone hormones so that an increase in prostaglandins can be avoided, abnormal production of prostaglandins can trigger vasoconstitivity and contractions in the myometrium which has an impact on dysmenorrhea

Wrong information and taboos regarding menstruation in the community need to be considered and should be explained about choosing a healthy diet, a regular lifestyle, exercise and adequate rest can prevent or reduce pain during menstruation [6]. Efforts that can be implemented to deal with students' lack of knowledge are by means of health education or nutrition education [7]. Nutrition education is a continuous stage to increase knowledge about nutrition, form attitudes and behaviors of healthy living and pay attention to eating behavior and commit to improving health and nutritional status [8].

Nutrition education can provide knowledge related to cognitive learning to choose healthy foods, affective teaching in dietary changes and behavioral components. Some

studies have shown that this type of intervention is more effective than general health education [9].

Health education can be carried out using various methods, namely counseling, training, consultation, and with the media. The use of media in delivering material of various types such as through audio (sound), electronic and print media. Print media that are considered effective in presenting information and nutrition education include posters, leaflets, pocket books and comics [10]. The nutrition education method that is generally given is through lectures, but this method is considered less effective in providing education because this method is less interesting and monotonous in its delivery. The success of the lecture method is determined by the mastery of the speaker's material so that it can affect the delivery of messages to the recipients of education. Providing education using media is considered more effective in increasing the knowledge of adolescents. Previous research stated that nutrition education through lectures accompanied by *online games* had an effect on increasing nutritional knowledge closely related to healthier food choices [11].

Digital comics are visual media that are developed as a nutrition education media, because they can have a meaningful impact on the knowledge and abilities of young women. The rapid development of technology today, has great opportunities in the world of education, for example mobile phones and almost all teenagers have android mobile phones. This encourages the provision of information technology-based nutrition education by using digital comics made using software *Cartoon Story Maker*.

Digital comics as a medium for nutrition education for adolescents have not been widely used. Therefore, the author needs to conduct education using digital comic media and analyze its effectiveness in improving the selection of healthy foods and overcoming primary dysmenorrhea. This study aims to analyze the influence of nutrition education using digital comic media on healthy food choices in adolescents with primary dysmenorrhea.

METHODS

This research was conducted from November 2023 to January 2024 at SMAN 2, SMAN 3, SMAN 9 and SMAN 12 Padang. The research used a mixed method between Research and Development (R&D) and quantitative research. The research began by designing digital comics as an educational medium using the Research and Development (R&D), which is a method that includes analysis or preliminary studies, designing and developing models and media validation tests used to produce research products [12].

a. Preliminary Study

The preliminary study was carried out by analyzing data on the need for digital comics for nutrition education needed in the research by distributing questionnaires in the form of *google forms* to students. This needs analysis is a reference in the development of digital comic products designed by researchers.

b. Model design and development

After the researcher conducted a needs analysis, the researcher made a draft of a digital comic model of nutrition education media that includes several things, as follows:

1. Formulating the purpose of digital comics as a nutrition education medium for students who experience primary dysmenorrhea. The purpose of this digital comic is to increase students' knowledge about choosing healthy foods and calcium intake that must be consumed daily to be able to overcome primary dysmenorrhea.
2. Prepare and compile digital comic material obtained from literature review. The material in this nutrition education digital comic contains about:

3. Develop a validation tool or instrument to measure the feasibility of using digital comics for nutrition education.

3. Product Validation

After the design of the digital comic media for final nutrition education, an assessment and validation was carried out by the validator team. Media validation is a step to assess the suitability of digital comics carried out by 3 experts, namely material experts, linguists, and media experts consisting of 1 nutrition lecturer for material expert validators, 1 language lecturer as a linguist validator and 1 education lecturer as a media expert validator.

a. Media expert validation

The aspects assessed in media validation are the display of writing, the display of images and the function of digital comic media that have been completed by the researcher.

b. Subject matter expert validation

The aspects assessed are the feasibility of content, feasibility of presentation, comic structure and language in the digital comic material that the researcher designs.

c. Linguist validation

The aspect that is assessed is the use of spelling and language contained in the content of the comic which is in accordance with the General Guidelines for Indonesian Spelling (PUEBI) which has been perfected.

The validator conducts an assessment of the nutrition education digital comic media by providing a check mark ($\sqrt{}$) on the validation sheet that has been provided. The validation sheet scoring guidelines provided to validators are as follows Table 1:

Table 1. Validation Sheet Score Guidelines

Alternative Answer	Score
Very valid	4
Valid	3
Quite valid	2
Less valid	1
Invalid	0

The value given by the three validators will be calculated and analyzed using the following formula:

$$R = \frac{\sum_{i=1}^{m} x}{m}$$

Information:

R = Validity of digital comic media
x = Average results of item validity assessment
Ke-j M = Many items

The results of the digital comic validation assessment obtained will be interpreted in several categories as follows:

Table 2. Interpretation of Validation Score

Criteria	Score
R ≤ 0.08	Invalid
0,08 < R ≤ 1,60	Less valid
1,60 < R ≤ 2,40	Quite valid
2,40 < R ≤ 3,20	Valid
R > 3.20	Very valid

4. Limited Trial

After the digital comic was validated by the three experts, a limited trial was carried out on a small group of 20 female students. Based on Branch's opinion in , product trials in small groups are declared optimal if the number of group participants [13] ranges from 10-20 people. In this trial, students were asked to assess the digital comic model given through a questionnaire containing interests, materials, and the language used. The purpose of this activity is to review that the comics designed meet the practical criteria for use as a nutrition education medium.

The assessment of the practicality of nutrition education comics is carried out by the students by providing a check mark (√) and comments or suggestions on a form prepared in the form of a Likert Scale. The results of the assessment given will be analyzed and improvements will be made if the students provide supportive comments or suggestions. The calculation of the results of the practactability assessment of the nutrition education digital comic media is carried out using the following formula:

$$\text{Assessment percentage } \frac{Score\ obtained}{Maximum\ score} \ x\ 100\%$$

The results of the calculation of the practicality of digital comics for nutrition education will be categorized as follows [14].:

Table 3. Limited Trial Score Category

Criteria	Interpretasi
0-54	Impractical
55-59	Less practical
60-74	Quite practical
75-84	Practical
85-100	Very practical

The next stage is to carry out quantitative research, namely *true experiment* with research design *pre-post test with control group* to analyze the influence of nutrition education using digital comics on healthy food choices in adolescent girls with primary dysmenorrhea.

The subject group first filled out a dysmenorrhea questionnaire using *google form*, then adolescents who experience primary dysmenorrhea are used as samples, then the degree of dysmenorrhea is measured using *numeric rating scale*, and data on healthy food selection measured using questionnaires *healthy food choice* which consists of 30 statements with an important healthy food selection score of > 90 [13]. Healthy food selection data is measured by calculating points based on the following scores:

Table 4. Healthy Food Selection Score

Score	Points
Very important	5
Important	4
Ordinary	3
Important	2
Very unimportant	1

If the number of points > 90, then a healthy selection is said to be important, and if the number of points ≤ 90, then the selection of healthy food is not important. Before nutrition education, samples were observed using *pre-test* and after the intervention is given *post-test* through *google form* and monitoring every week using *Whatsapp group*. The evaluation stage was carried out by analyzing the difference in healthy food selection scores before and after the intervention for 21 days obtained based on the results of filling out a valid and reliable healthy food selection questionnaire analyzed using SPSS.

Sampling was carried out *multistage random sampling*, the first stage was carried out *cluster random sampling* and four schools were obtained. The second stage was carried out by proportional *random sampling*. A total of 100 respondents were determined using

the Slovin formula with the criteria of female students aged 15-18 years who experienced primary dysmenorrhea and were divided into two groups, namely the intervention group and the control group. The intervention group was given treatment, namely education using digital comic media for 3 times in 1 month and monitoring using *Whatsapp Group* while the control group was given education with the lecture method for 3 times a month using power point. The provision of interventions should be carried out for 2 weeks or more so that the effects of nutrition media interventions can be seen directly.

This research has received ethical approval from the Research Ethics Committee of the Faculty of Medicine, Sebelas Maret University, Surakarta with the number Ethical Feasibility 194/02/09/2023. The activities in this study are also carried out after obtaining approval from the research subject through *informed consent* and all existing data is only used for research purposes and is confidential.

RESULT

The Characteristic of Research Subject

Table 5 showed a nutrition education program using digital comic media in 100 adolescent girls who experience dysmenorrhea. An overview of the research subjects' characteristics which included age, class, pocket money and primary dysmenorrhea pain scale.

Tabel 5. Characteristics Description of the Research Subject

Variable	Control (n=50)		Intervention (n=50)		(N=100) %	
	n	%	n	%	n	%
Age						
15 years	29	58	32	64	61	61
16 years	13	26	17	34	30	30
17 years	6	12	1	2	7	7
18 years	2	4	-	-	2	2
Grade Level						
Class X	44	88	39	78	83	83
Class XI	6	12	11	22	17	17
Pocket money						
< 20.000	24	48	10	20	34	34
≥ 20.000	26	52	40	80	66	66
Primary Dysmenorrhea Pain Scale						
Mild pain	20	40	20	40	40	40
Moderate pain	26	52	25	50	51	51
Severe pain	4	8	5	10	9	9

Based on Table 5, it can be seen that most of the respondents in the two groups of research are 15 years old, which is 61%. The class level of the respondents in the control group was the most, namely class X as much as 88% and 78% in the intervention group. Respondents mostly had an allowance of ≥ 20,000 as much as 52% in the control group and 80% in the intervention group. The study respondents experienced primary dysmenorrhea with a moderate pain scale as many as 51 female students.

Table 6. Distribution of Respondents Based on Healthy Food Selection

Variable	Control (n=50)				Intervention (n=50)			
	Pre		Post		Pre		Post	
	n	%	n	%	n	%	n	%
Healthy Food Selection								
Not Important	3	6	1	2	5	10	-	-
Important	47	94	49	98	45	90	50	100

Based on Table 6, it can be seen that in the control group, the variable of choosing important healthy foods increased from 94% to 98% after being given nutrition education. The intervention group also experienced an increase in the score of healthy food selection considered important from 90% to 100% after being given education using digital comics.

Development of Digital Comic Media
Results of Needs Analysis

The analysis of digital comic media needs was carried out to all high school students in Padang City. The researcher collected information about the experiences of female students when given nutrition education by previous health workers and the interest of female students if they were given nutritional education using electronic media, namely digital comics. The results of the needs analysis can be seen in the following Table 7.

Table 7. Frequency Distribution Analysis of Digital Comic Needs

Variable	16 SMAN in Padang City (N=1655)	
	n	%
Previous nutrition education		
Ever	332	19,5
Never	1323	80,5
Desired educational media		
Print	375	22,7
Electronics	1280	77,3
Interested in using smartphones for nutrition education		
Ya	1439	87
No	216	13
Digital comic media in schools		
Already	762	46,1
Never	893	53,9
Students' interest in education using digital comics		
Interested	1467	88,7
Not interested	188	11,3

Based on Table 7 above, it can be understood that many Padang City High School students have never received nutrition education with a figure of 80.5%, as many as 77.3% of students want nutrition education using electronic media, and 87% of students are interested in using their personal smartphones for nutrition education. As many as 46.1% of students have received learning materials using digital comic media and more than half of students, namely 88.7%, expressed interest in participating in nutrition education provided using digital comic media. This shows that the use of digital comic media as nutrition education is an effective and practical medium for students in obtaining nutritional information.

Digital comics are developed using *cartoon comic strip software* and *flip PDF corporate edition* so that the media produced is in the form of *links*. Furthermore, the *link* was shared with the research respondents through *a whatsapp* group.

The front cover of the nutrition education digital comic is designed with a very attractive appearance and is equipped with images to provide a description of the material contained in the digital comic. The front cover is also equipped with the title, digital comic specifications, the name of the author and supervisor. The design of the cover of this digital comic can be seen in Figure 1 below.

Figure 1. Digital Comic Front Cover

Digital comics consist of 3 parts. Part 1 contains an introduction to primary dysmenorrhea to adolescent girls with primary dysmenorrhea. Part 2 contains the effect of healthy food choices on primary dysmenorrhea. Part 3 contains the effect of calcium intake and body mass index on primary dysmenorrhea**.** The design of digital comic education media can be seen in Figure 2.
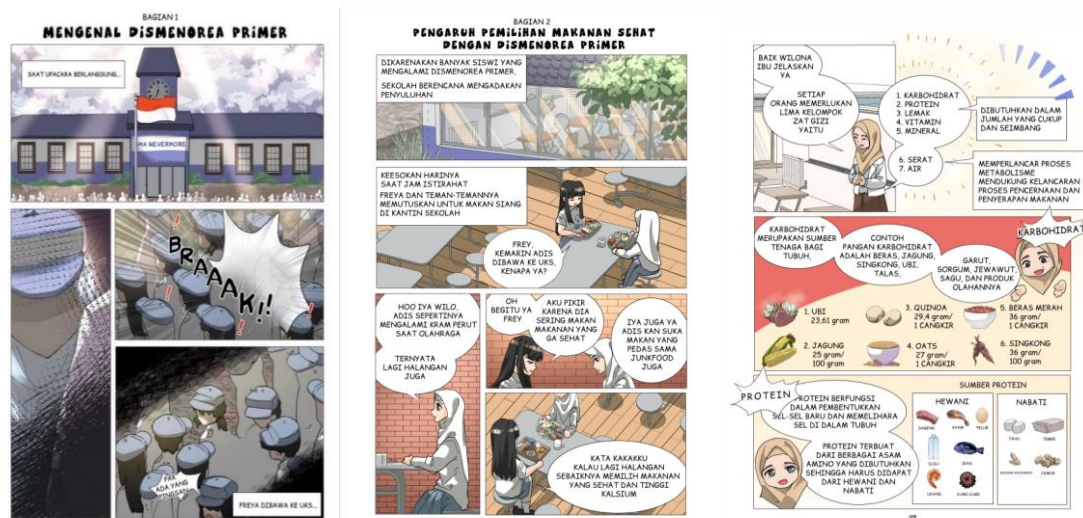

Figure 2. Digital comics design

Results of Digital Comic Media Validation
1. Validation Results by Material Experts

The validity test was carried out by lecturers/nutritionists of the Indonesian Ministry of Health in Padang regarding the nutritional material presented in the nutrition education digital comic designed by the researcher. The results of the assessment of the validity of nutrition education digital comics by material experts showed that the average validity value of nutrition education digital comics from the material aspect by lecturers/nutritionists was 3.57 with a very valid value category. The following results of the digital comic validity assessment can be seen in Table 8.

Table 8. Results of Digital Comic Validation Assessment by Material Experts

No	Assessed aspects	Value	Information
Eligibility Aspects of Content			
1	Suitability of the content of the material with the syllabus	4	Very Valid
2	Accuracy of the material	4	Very Valid
3	Novelty of the material	4	Very Valid
4	Benefits of material for increasing students' knowledge insights	4	Very Valid
5	Ease of understanding the material	3	Valid
6	The truth of substance in learning materials	4	Very Valid
Eligibility Aspects of Content			
7	Serving technique	3	Valid
8	Presentation of learning	3	Valid
9	Serving support	3	Valid
10	Harmony and collapse of the storyline	4	Very Valid
Aspects of Comic Structure			
11	Meaningfulness in learning materials	3	Valid
12	Suitability of learning materials with students' abilities	3	Valid
13	Clarity in learning objectives	4	Very Valid
14	Motivation for female students	4	Very Valid
15	Completeness of information in the presentation of material	4	Very Valid
16	The order of presentation in the material	4	Very Valid
Language Aspects			
17	Clarity in providing information	3	Valid
18	Readable	4	Very Valid
19	Effective and efficient use of language	3	Valid
20	The use of dialogue or text that is interesting and leads to an understanding of the concept	3	Valid
21	Communicative use of language	4	Very Valid
	Average	3.57	Very Valid

The results of guidance with the validator show that the designed nutrition education digital comic still needs a little improvement so that the researcher needs to revise until the nutrition education digital comic is declared valid by the validator. Validator suggestions and criticisms, the author uses to improve or revise nutrition education comics so that the material presented on becomes better, this can be seen in the following Table 9.

Table 9. Results of *Expert Review* of Material Experts

Revision Section	Repair
Added an explanation to the BMI section.	

In the table 9, it can be understood that there is a change in the body mass index where an explanation is added related to the factors that affect the body mass index. This is based on the advice given by experts with the aim of making it easier for research targets to understand the material presented.

2. Validation Results by Linguists

The validity test by linguists aims to provide an assessment of the use of Indonesian in nutrition education digital comics. The results of the assessment of the linguistic aspects of digital comics for nutrition education can be seen in Table 10 below.

Table 10. Results of Digital Comic Validation Assessment by Linguists

No	Assessed Aspects	Value	Category
1	Digital comics using good and correct Indonesian	4	Very Valid
2	Digital comics use clear and easy-to-understand language so that they do not cause double interpretation	3	Valid
3	Use punctuation marks that are in accordance with Indonesian grammar rules	4	Very Valid
4	The language used is communicative and adjusted to the level of understanding of students	4	Very Valid
5	How to write terms, symbols, equations and foreign languages accompanied by explanations so that it is easier for students to understand	4	Very Valid
6	Blurring and cohesion between paragraphs	4	Very Valid
	Average	3.83	Very Valid

Based on the Table 10, it can be understood that the average score given by linguists to the nutrition education digital comic is 3.83 with a very valid category.

3. Results Validated by Media Experts

The validity test of nutrition education digital comics by learning media experts aims to provide an assessment from the design and layout aspects *of* each image and video in the nutrition education e-module. Filling out the validation sheet of the nutrition education digital comic carried out by learning media experts illustrates that this nutrition education digital comic is included in the very valid category with an average score of 3.92. The results of the assessment by learning media experts on nutrition education digital comics can be seen in the following Table 11.

Table 11. Results of Digital Comic Validation Assessment by Media Experts

No	Assessed aspects	Value	Information
Aspects of Writing Display			
1	Title writing in comic media	4	Very Valid
2	Font size in comic text	4	Very Valid
3	Use of words in dialogue	4	Very Valid
4	Clarity of writing in comic media	4	Very Valid
5	Ease of understanding the storyline through the use of language	3	Valid
Image Display Aspects			
6	Image shape	4	Very Valid
7	Image size	4	Very Valid
8	Compatibility of the image with the writing	4	Very Valid
9	Image variations	4	Very Valid
10	Image composition		
Aspects of the Function of Comic Media			
11	Comic media as a source of learning	3	Valid
12	The language used in the delivery of comics can be understood as sisei (not verbalistic)	3	Valid
13	Comic learning media is able to support effective communication	4	Very Valid
14	Suitability of comic media to the conditions and strategies used	4	Very Valid
	Average	3.92	Very Valid

Based on the results of the validity assessment of the nutrition education digital comic conducted by material, language, and media experts on the revised nutrition education digital comic that the author has revised, the validity criteria can be determined by determining the average score of the three experts. The average value of nutrition education digital comics according to experts can be seen in the following Table 12.

Table 12. Average Scores and Categories of Digital Comic Validation by Validators

No	Assessed aspects	Average grade	Category
1	Validity Test by material experts	3.57	Very Valid
2	Validity Test by linguists	3.83	Very Valid
3	Validity Test by media experts	3.92	Very Valid
	Average	3.77	Very Valid

Limited Trial Results

A limited trial was carried out on 20 students from schools with different needs analysis locations, namely for SMK 1 Padang students. The goal is to avoid bias in research [13]. The purpose of this limited trial stage is to find out the practicality of the designed nutrition e-module The results of the assessment of the practicality of digital comics can be seen in the following Table 13.

Tabel 13. The Practicality Result of Limited Try Out Step of Nutrition Comic Digital

Assesced Aspects	Practicality Percentage	Category
Usable	89.25	Very Practical
Easy to use	95.75	Very Practical
Appealing	96.75	Very Practical
Cost-effective	98	Very Practical
Average score	94.93	Very Practical

Table 13 showed that the easy-to-use assessment aspect has the highest score of 95.75% and the useful assessment aspect has the lowest score of 89.25%. The average

score or practicality level of digital comics as a whole is 94.33% with very practical criteria. Based on the results of the product validation research and the practicality of the digital comic model, it can be concluded that the digital comics designed by the researcher can be applied to the research group to determine the effectiveness of the media.

The Influence of Digital Comics on Healthy Food Choices

Table 14. Results of Analysis of Differences in Healthy Food Choices Before and After Intervention

	Mean ± SD	Average Differences	p-value
Control			
Pre-test	115,34 ± 12,525	-9,960	<0,001[b]
Post-test	125,30± 11,452		
Intervention			
Pre-test	115,78 ± 12,448	-11,3	<0,001[a]
Post-test	127,08 ± 12,843		

[a]: *Wilcoxon* [b]: *Paired Samples T-Test*

Table 14 showed that the median value of healthy food selection in the intervention group after education using digital comics is 127,08 higher than the median value before education which is 115,78. The difference in the median value was significant with the results of average differences is -11,3 and p-value = <0,001 which showed that education using digital comics had an influence on healthy food choices in adolescent girls with primary dysmenorrhea. The average difference in *the results of pre-test* and *post-test* healthy food selection in the control group is -9,960. In the table, it can also be understood that the value of t = -7,020 and p-value = <0,001 (p<0,05) which shows a significant difference between the *pre-test* and *post-test* results in the control group.

DISCUSSION

The Characteristic of Research Subject

This study was conducted on 100 adolescent girls who experienced primary dysmenorrhea consisting of 2 groups, namely the intervention group and the control group. The age of the research subjects is in the range of 15-18 years and experienced primary dysmenorrhea with a moderate pain scale as many as 51 female students. Adolescence is a transitional stage from the childhood period which is characterized by growth and development such as changes in muscle mass, body fat tissue and hormonal changes, namely the emergence of primary characteristics, namely the development of reproductive organs. This process of reproductive development is called puberty, marked by menstruation in women [15]. Menstruation is a normal and natural condition, but many adolescents experience menstrual disorders, one of which is in the form of complaints of pain during menstruation called dysmenorrhea. The class level of the respondents in the control group was the most, namely class X as much as 88% and 78% in the control group. Respondents mostly have pocket money ≥ 20,000 as many as 52% in the control group and 80% in the intervention group. Respondents' pocket money is influenced by family income, the higher the family income, the higher the ability to serve nutritious food [12].

Changes in puberty will affect the body's nutritional intake needs so that adolescents generally have difficulty choosing healthy foods. Decision-making to choose food is not based on good knowledge and rational thoughts but based on emotions without paying attention to the nutritional content [16]. Food choices plays an important role in forming a good and balanced diet, individuals usually make choices about what foods to consume. Healthy food selection is an individual preference in choosing healthy food according to his personal will. The content of nutrients in food has an effect on the

production of sex hormones. Consumption of healthy foods can stimulate the balanced production of estrogen and progesterone hormones so that increased production of prostaglandins that trigger vasoconstriction and contractions in the high myometrium can be avoided so that primary dysmenorrhea does not occur.

Development of Digital Comic Media

Digital comics are a medium for delivering learning messages that have material with a clear flow so that the material can last a long time in memory and can form the right mindset about nutrition [13]. The design and development of digital comic media is a process of making a model design consisting of the formulation of objectives, the preparation and preparation of materials, and the preparation of validation instruments to measure the feasibility of digital comics. The display of digital comics is divided into 3 parts, namely the initial part, the content part, and the reference part. The content of nutritional material is obtained from various reference books and articles related to research problems. The results of the design of nutrition education media will be validated by experts.

Based on the results of the validity test conducted by experts, the average score was 3,77. Based on these results, it can be concluded that the designed digital comics are valid from the aspects of material, language and media. Several studies state that the use of digital comics as a learning medium is very effective and efficient, thus training students' independence.

A needs analysis was applied to all students in the study subject's school to allow the collection of information about the student's experience during the previous nutrition education session by health workers and to determine the interest of students in the offer of nutrition education through electronic media, namely digital comics. The results of the needs analysis show that there are still many students who have never received nutrition education about healthy food selection in adolescents and almost all students expressed interest in nutrition education through electronic media. Based on the results of the needs analysis, it can be concluded that the design and development of e-module media in nutrition education is one of the effective and practical educational media for students to get access to nutrition information [17].

The results of the calculation of the practicality of digital comics for nutrition education will be categorized by scores 0-54 is impratical, 55-59 is less pratical, 60-74 is quite pratical, 75-84 is pratical and 88-100 is very practical. The average level of practicality of digital comics as a whole is 94.93% with very practical criteria. Based on these results, it can be concluded that the digital comics designed by the researcher can be applied to research respondents to determine the influence of the media. Nutrition education using learning media can have a positive impact on adolescents' knowledge. The shift in adolescent behavior in a better direction will have an impact on attitudes and behaviors towards the choice of daily food consumption [18].

The Influence of Digital Comics on Healthy Food Choices

Statistical tests in the control group obtained results of the average difference in results *Pre-test* and *post-test* Healthy food selection of -9.960, value t = -7.020 and p-*value* = <0,001 (p<0,05) which indicates a significant difference between the results *pre-test* and *post-test* in the control group. Based on statistical analysis using tests *Wilcoxon,* The median value of healthy food selection in the intervention group after education using digital comics was 125.5 higher than the median value before education which was 118. The difference in the median value was significant with the results of Z= -5.037 and p-*value* = <0,001 which shows that education using digital comics has an influence on healthy food choices in adolescent girls with primary dysmenorrhea. These results are in line with research by Hemaswari (2016) which shows that education using comics

significantly increases students' knowledge regarding balanced nutrition guidelines [19]. Another study conducted by Nadya (2021) stated that the nutrition education carried out had a change in the direction for the better on the reasons for choosing healthy foods in adolescents *overweight* [12]. Providing nutrition education can reduce impulsive healthy food choices that will unconsciously become bad eating habits so that they do not consider aspects of health reasons, natural ingredients in food ingredients [20]. The provision of nutritional knowledge can increase a person's ability to apply their nutritional knowledge in choosing and processing food so that nutritional needs can be met [21]. Knowledge of nutrition is the foundation in determining individual food consumption which can improve a person's ability to choose and process food ingredients so that their nutritional needs can be met. The existence of nutrition education interventions can reduce impulsive food choices and can unconsciously become a bad eating habit such as not considering health and nutrition aspects, the natural content of food ingredients and other aspects. Adolescents who have self-efficacy will choose food ingredients that contain more nutrients than adolescents who have low efficacy. Good nutritional content in food can have an effect on the production of sex hormones so that with the consumption of healthy foods it is expected to stimulate the production of balanced hormones estrogen and progesterone, and there is no increase in postaglandins, which causes vasoconstriction and contractions in the myometrium, causing dysmenorrhea.

CONCLUSION

The designed nutritional digital comics were declared very valid for use with the average score or validation assessment obtained from material experts, linguists, and media experts was 94,93%. Meanwhile, the practical aspect of digital comics is 94,93% with very practical criteria. The use of nutrition education using digital comic media of the intervention group after education has a significant influence on the choice of healthy food in adolescent girls with primary dysmenorrhea.

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