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NUTRITION EDUCATION MEDIA FOR DIABETES MELLITUS PATIENTS: VIDEO OF *DAFTAR BAHAN MAKANAN PENUKAR* (DBMP)

Media Edukasi Gizi untuk Penderita Diabetes Melitus: *Video Daftar Bahan Makanan Penukar* (DBMP)

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ABSTRAK

Prevalensi penderita diabetes melitus (DM) di Jawa Timur menurut Survei Kesehatan Indonesia tahun 2023 meningkat (0,1%) dari sebelumnya tahun 2018, yakni 2,7%. Penelitian ini bertujuan untuk mengembangkan media daftar bahan makanan penukar sebagai media edukasi diet DM pada penderita DM. Penelitian ini menggunakan metode Research and Development (R&D) dengan model Analyze, Design, Development, Implementation, Evaluation (ADDIE) untuk mengembangkan media edukasi dan pada tahap implementation dilakukan dengan metode quasy experimental dengan rancangan pre post-test with a control group. Penelitian ini melibatkan partisipasi tiga validator ahli dan 10 penderita DM sebagai calon pengguna. Pengumpulan data melalui wawancara dan kuesioner penilaian media. Jumlah subjek pada tahap implementation terdiri atas 40 penderita DM. Analisis data menggunakan teknik deskriptif. Hasil penilaian kelayakan media oleh ahli diperoleh skor rata-rata 91.03% dengan kategori sangat layak dan uji coba media pada kelompok calon pengguna diperoleh skor rata-rata 92.5% dengan kategori sangat layak. Video DBMP dapat digunakan sebagai media edukasi gizi diet DM pada penderita DM. Uji beda skor pengetahuan diet DM menggunakan analisis statistik Paired Sample T-Test. Dari hasil penelitian diperoleh nilai p=0.031 pada kelompok intervensi di tahap evaluation dan nilai p=0,648 pada kelompok kontrol. Hal ini menunjukkan bahwa terdapat perbedaan skor pengetahuan yang signifikan pada kelompok intervensi setelah 3 kali pemberian konseling gizi diet DM. Tahap akhir evaluasi dianalisis menggunakan post hoc Mann Whitney u test, menunjukkan bahwa ada perbedaan yang signifikan (p=<0.001) antara kelompok kontrol dan kelompok intervensi (video DBMP).

***Kata Kunci**: edukasi gizi, media edukasi pasien DM, video daftar bahan makanan penukar (DBPM)*

ABSTRACT

The prevalence of DM patients in East Java, according to the 2023 Indonesian Health Survey, increased by 0.1% from the previous year in 2018, which was 2.7%. This study aimed to develop a food exchange list as an educational tool for DM diets for DM patients. This study employed the Research and Development (R&D) method with the ADDIE model to develop the educational media. During the implementation stage, a Quasi-Experimental method with a pre-posttest control group design was employed. The study involved the participation of three expert validators and 10 DM patients as prospective users. The data were collected through interviews and media assessment questionnaires. The sample size at the implementation stage consisted of 40 DM patients. Data analysis used descriptive techniques. The feasibility assessment of the

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media by experts resulted in an average score of 91.03% in the very feasible category, and the media trial on the prospective user group resulted in an average score of 92.5% in the very feasible category. The DBMP videos can be used as a nutrition education medium for DM diet for DM patients. Test of differences in DM diet knowledge scores using Wilcoxon statistical analysis in the intervention group at the evaluation stage obtained a *p*-value of <0.001, while the control group had a *p*-value of 0.648. This indicates a significant difference in knowledge scores in the intervention group after three sessions of DM diet nutrition counseling. The final stage of evaluation was analyzed using a post hoc Mann Whitney u test, showing that there was a significant difference (p=<0.001) between the control group and the intervention group.

Keywords: Daftar Bahan Makanan Penukar (DBMP) video, DM patients education media, nutrition education

INTRODUCTION

The International Diabetes Federation estimates that the prevalence of diabetes mellitus has increased by 51% globally, including around 74% in Southeast Asia International Diabetes Federation (IDF) 9th Edition 2019 [1]. The 2014 Riskesdas results showed that the prevalence of diabetes mellitus diagnosed by doctors in Indonesian residents aged ≥15 years was 1.5%, and the prevalence in 2018 was 2%, an increase of 0.5%[2]**.** In the 2023 Indonesian Health Survey, the prevalence of diabetes mellitus diagnosed by doctors was 2.2%, a rise of 0.2% from the 2018 Riskesdas results [3]. The prevalence diabetes mellitus diagnosed by doctors in East Java Province in the population aged > 15 years was 2.7% and 0.5% higher than the prevalence in Indonesia (The prevalence of DM in Indonesia is 2.2%).

The four pillars of diabetes mellitus management according to the Indonesian Endocrinology Association, include knowledge, balanced diet, physical activity, and medication adherence. Type 2 diabetes mellitus generally occurs due to lifestyle and behavioral patterns, inferior diet, and lack of activity. A diet high in sugar combined with a lack of activity can lead to type 2 diabetes mellitus [4]. Therefore, knowledge is crucial in the process of controlling diabetes mellitus.

Non-compliance with the recommended diet can be a major cause of increased blood sugar levels in diabetes mellitus patients. Diabetes patients need to maintain a controlled diet to avoid spikes in blood glucose levels that could potentially harm their health. Failure to follow a low-sugar and low-carbohydrate diet can increase the risk of hyperglycemia, which can lead to various health complications such as heart disease, kidney disease, and nerve damage. Additionally, consuming foods high in sugar and carbohydrates tends to place an extra burden on the insulin system, potentially worsening insulin resistance in diabetes patients [5].

Education can increase the knowledge of diabetes mellitus patients and strengthen their active role in managing and controlling the disease. One form of nutrition education is nutrition counseling, a two-way communication process between nutritionists and patients to help patients address their nutritional problems [6]. Barriers in the counseling process can arise from communication factors, particularly the counselor, patient or client, environment, physical and psychological conditions of the counselor, and the use of media. Health information media/literacy is often difficult to read and understand because the text is too long and too small [7].

Nutrition counseling requires the media to clarify the messages conveyed and facilitate the reception of health messages so that the counseling can run well. Research shows that 56.5% of subjects responded very well to nutrition counseling using media such as leaflets and food photos. Subjects would better understand the types of foods they consume daily, especially the size (dimensions) and weight of the ingredients [6].

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Patient compliance with diet principles and plans often becomes a challenge in the nutritional management of diabetes mellitus patients.

The success of education in terms of behavioral change is influenced by the teaching methods used. Teaching that involves more senses affects the success of understanding educational goals [8]. Diet compliance in Ani Retni's study showed a significant increase with *p=0.039* for the treatment group, which received education using visual and audiovisual representations related to nutrition and diabetes mellitus complications [9].

Nutrition education media plays a crucial role in assisting nutrition counselors in addressing issues during counseling sessions. Attractive and communicative media are more effective and efficient for helping healthcare facilities provide health services. The exchange food ingredient list (DBMP) is a list of food ingredient groups consisting of 8 food ingredient groups which are used as a guide in selecting food ingedients when compiling a menu. Diabetes mellitus patients can choose a variety of food items with the help of (Food Exchange List) videos as an appealing nutrition education medium that is easy to understand and comprehend, as it engages multiple senses in the nutrition education process for diabetes mellitus patients. Nutrition counseling using DBMP videos can be conducted in various ways, including question and answer (Q&A) games in small groups of fellow diabetes mellitus patients or individually with a counselor. This research aims to develop a list of exchangeable food ingredients into a DBMP video so that it is more interesting to use as a nutritional education medium.

METHODS

The method used in this study was the Research and Development (R&D). This research method was used to produce products and test the effectiveness of a product [10]. Research and development were used to produce a learning medium that meets the criteria of consistency and internal effectiveness [22]. The development of DBMP (Daftar Bahan Makanan Penukar/Food Exchange List) nutrition education media (diabetes mellitus diet education videos) employed a Research and Development (R&D) approach with the ADDIE model, structured systematically to produce an effective product focused on development [11]. The goal was to design a new product, test the effectiveness of an existing product, and develop and create new products. Once a new product was tested, its use in work settings would make tasks easier, and faster, and improve the quantity and quality of work output [23]. This study received ethical approval from the Ethics Committee of dr. Moewardi Hospital , Approval letter number : :855/III/HREC/2024 on 28 Maret 2024. This study was conducted from May to July 2024 in Jombang Regency carried out at 3 Community Health Centers, starting with determining the population and sample, then testing the validity and reliability of questionnaire and testing the suitability of media on a small group of potential media users, before being given an informed consent form as a research sample containing an explanation of the treatment actions that the researcher would carry out on the research subjects. Analysis of media needs was also carried out at the community health center involving 10 DM patients and 2 Nutritionist. Implementation of nutritional education interventions using DBMP video media is carried out every week for 3 times a month.

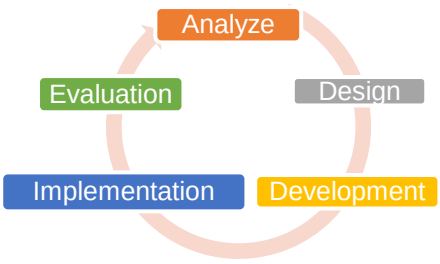

Figure 1. ADDIE Model

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1. **Analyze**

The initial stage in media development involves analyzing the needs and effectiveness of the media used to find a media solution that meets the target audience's needs [12]. This is done by observing the use of the Daftar Bahan Makanan Penukar/Food Exchange List (DBMP) media during nutrition education and interviewing both the nutrition education targets and counselors about the implementation of DBMP in preparing a diabetes diet menu at home.

2. **Design**

The design stage involves creating DBMP media based on the existing material in the DBMP and presenting images and dimensions of food items according to the DBMP. Photos of food items, measured in standard grams converted to household measurement units (spoon, glass, bowl,etc), are designed into food photos packaged in a video using animaker application, a video design and visual communication platform. The selection of food exchange items is based on discussions with counselors/nutritionists from the research location's health centers, focusing on frequently used and available food items in Jombang Regency.

3. **Development**

The design of the media is then validated by three experts: a nutrition material expert (a Nutritionist or Lecturer of nutrition), a media expert (brand consultant and communication designer) and a language expert(an Indonesian language teacher with more than 10 year's experience) [13]. The nutrition material expert assesses the validity of the nutritional content in the DBMP videos, the media expert evaluates the suitability of the media substance, and the language expert examines the language validity and provides suggestions for improvements. Data collection involves interviews and the completion of media validation/assessment forms. Revisions suggested by the experts are implemented to improve the DBMP videos. The DBMP videos are also tested on a small target user group as a preliminary survey, involving a minimum of 6-9 participants; this study used 10 research subjects with media evaluation questionnaires to assess media effectiveness [13]. The media evaluation questionnaire for potential research subjects contains 11 questions: 4 questions on DBMP content, 2 questions on language substance, 4 questions on media appearance, and 1 question encompassing all aspects of the DBMP videos. The questionnaire for small group validation uses a Likert scale, with options: 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree [21].

This study employs quantitative descriptive analysis techniques. The quantitative descriptive method processes data by systematically organizing it into numbers or percentages to obtain general conclusions [14] :

$$NP = \frac{R}{NM}\ x\ 100\%$$

Where:
P : Expected feasibility percentage
R : Score obtained
NM : Maximum score
100 : Constant [15]

The scores from expert validation are summed and averaged using the following formula [16] :

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$$x = \frac{\sum x}{n}$$

Where:
X : Mean
Σx : Total score
N : Number of evaluators

The average score from expert validation on aspects of nutritional content, language use, and media design is then interpreted based on the following feasibility criteria which can be seen table 1 as follows [17].

Table 1. Feasibility Interpretation Criteria

Percentage	Interpretation
81-100%	Very Feasible
61-80%	Feasible
41-60%	Moderate
21-40%	Not Feasible
0-20%	Very Not Feasible

4. Implementation

The implementation phase of using the DBMP video media employs a Quasi-Experimental Pre-Test and Post-Test with a Control Group Design method, and the research sample is selected through purposive sampling according to the inclusion criteria established by the researcher [18]. The inclusion criteria include DM patients who are members of the Prolanis club at the health center, BPJS participants, type 2 DM patients (based on medical records), male and female gender, age > 30 years and < 60 years, and those who own a smartphone.

The exclusion criteria are DM patients with complication for other diseases and DM patients who not willing to be a research subject. The population of this study is all DM patients who are members of the Prolanis club at the health center. The sample size is determined using the Lemeshow formula, with the sample size for both the treatment group and the control group totaling 40 people [19].

$$n = \frac{N}{1 + N\,(d)^2}$$

Keterangan :
n = besar sampel
N = besar populasi
d =tingkat kepercayaan atau ketepatan yang diinginkan (0,1) (*Lemeshow et al*., dalam [1].

Nutrition education/counseling using the DBMP video media is provided to the research subjects three times a month which was carried out every week in line with the study by Novina RM, et al., where DM diet education significantly addressed the knowledge deficit about DM diet, as evidenced by an increase in knowledge from a scale of 3 (moderate) to a scale of 5 (improved) [20]. Similarly, in Ranitia Ayu's study, patient knowledge levels increased, shown by patients correctly answering 13 out of 20 questionnaire, indicating a sufficient level of 75% in the study titled "Improvement of Knowledge About Diet in Patients with Diabetes Mellitus Through Health Education" [21] . The intervention group was given nutritional counseling, apart from using the DBMP leaflet media, they were

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also given DBMP video media, while the control group was given nutritional counseling only using the DBMP leaflet media.

5. **Evaluation**

The evaluation is conducted by analyzing the difference in knowledge scores before and after the DM diet education intervention using the DBMP videos, administered over three education sessions a month. The DM diet knowledge scores of the research subjects are assessed based on the results of a valid and reliable DM diet knowledge questionnaire. The differences in knowledge among the research subjects (DM patients) are tested using the parametric statistical analysis *Paired Sample T-Test* with SPSS 27.0 for Windows, followed by testing differences between treatment groups (control and DBMP video intervention) with Kruskal Wallis test for data that did not meet the assumption of normality [22].

RESULTS

The result of this study is the DBMP video media, developed from the Food Exchange List/Daftar Bahan Makanan Penukar (DBMP), designed as an educational tool to enhance the understanding of DM patients about how to compose a more varied diet menu by selecting different food items without reducing or increasing meal portions and the energy and nutrient values. The media development results according to the ADDIE model are described below:

1. **Analyze**

The analysis of the nutritional counseling media needs for the DM (Diabetes Mellitus) diet was conducted on 10 DM patients and 2 nutritionists at the health center. The initial interviews/surveys with DM patients and nutritionists, using DM diet leaflets and DBMP, indicated that DM patients paid little attention and had difficulty understanding the provided information. Nutritional education using appealing, illustrated, colorful, easy-to-read, and understandable media that can be easily practiced at home is essential for DM patients.

"The text on the paper/leaflet is too small, making it hard to read." (N. Atika, personal communication with informan A).

"The paper is easily torn and gets damaged by water." (N. Atika, personal communication with informan B).

"I am confused about how to substitute other food ingredients if it says egg but I am cooking something else, so I weigh it to match the weight of the egg mentioned by the nutritionist." (N. Atika, personal communication with informan B).

"DM patients are not very interested in the content of the DM diet and DBMP leaflets because the paper and text are too small." ((N. Atika, personal communication with informan C).

"DM patients impose food restrictions based on their perceptions and believe that eating small portions will improve their condition." (N. Atika, personal communication with informan D).

2. **Design**

Based on the interview analysis of needs, the researcher developed a nutritional education media for DM patients that is appealing, illustrated, colorful, sound, easy to understand, and can be practiced at home. The aim of developing the DBMP video media is to ensure the goals of DM diet nutritional counseling are met and that patients are interested in understanding and implementing the diet. The DBMP video media covers 8 food categories (carbohydrate sources, animal protein sources, plant protein sources, vegetables, fruits and sugars, milk, oils and fats, and non-caloric foods). The DBMP videos were designed using the Animaker platform. Figure 2 below shows the DBMP video design.

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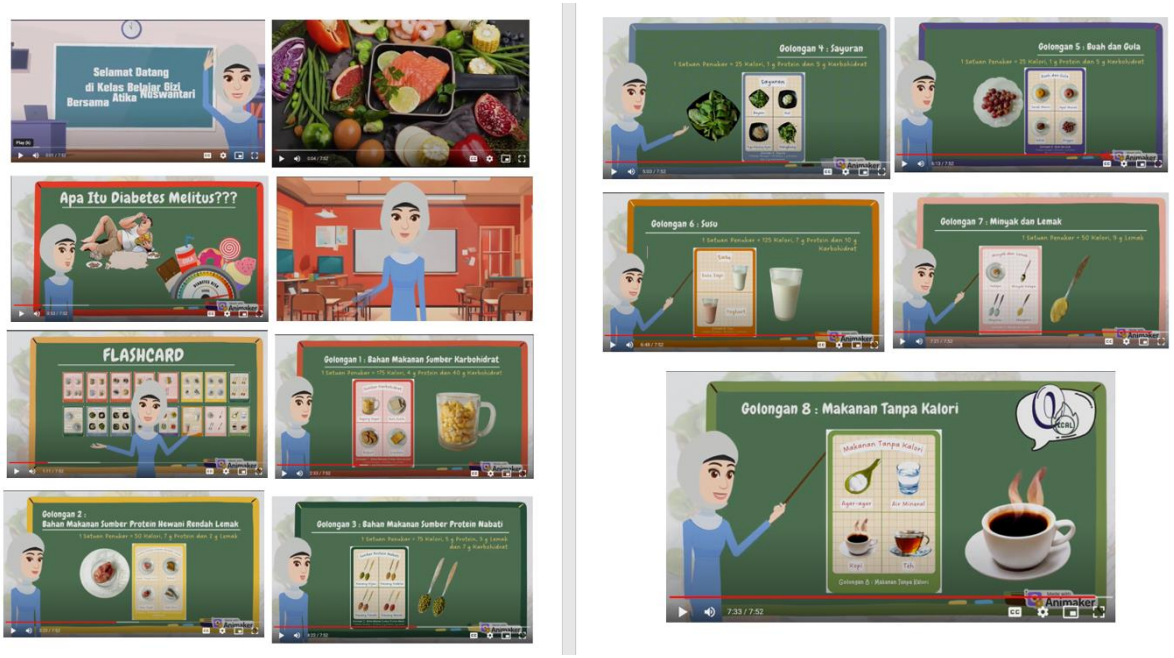

Figure 2. Food List Exchange Video Design

3. Development

The media development stage involved 3 validation experts, including a media expert, a material expert, and a language expert, with the following results:

A. Validation Results from Nutrition Material Expert, Language Expert, and Media Expert

The evaluation by the three experts resulted in a score of 91.03% in the very feasible category, but further revisions were made based on the experts' suggestions.

Table 2. Media Validation Results

Validator	Percentage	Interpretation
Nutrition Material Expert	97.5%	Very feasible
Language Expert	93.8%	Very feasible
Media Expert	81.8%	Very feasible
Total	**91.03%**	Very feasible

The percentage score calculation by the media expert for the DBMP videos resulted in 91.03% can be seen in the table 2, which was then converted according to the media feasibility criteria and interpreted as very feasible. However, media development continued with revisions, including that the images in the video are not large enough and the sound in the video does not coincide with the images displayed.

B. Media Trial Results

The DBMP videos were tested on a small group with characteristics similar to the research subjects.

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Table 3 shows the evaluation score from the user group trial, which was 88.4% with the interpretation of very feasible, with the suggestion to change the text color to black to make it more readable.

Table 3. Media Trial Results on Potential Users

Question Number	Total Maximum Score	Actual Total Score	Percentage (%)
1	40	35	87.5
2	40	33	82.5
3	40	32	80
4	40	36	90
5	40	40	100
6	40	32	80
7	40	32	80
8	40	38	95
9	40	35	87.5
10	40	40	100
11	40	36	90
Total	440	389	88.4

4. Implementation

Table 4 shows the general characteristics of the research subjects in the control group and the intervention group, which received nutritional counseling using DBMP flashcards. The control group consisted of 20 Prolanis DM patients who received nutritional counseling using DBMP leaflets, while the intervention group consisted of 20 Prolanis DM patients who received nutritional counseling using DBMP videos three times. All research subjects were diabetic patients, the majority of whom were over 40 years.

Most of the research subjects were female, and the nutritional status of the research subjects was obtained by weighing and measuring their height and most of the research subjects were obese. The education levels of the research subjects varied, with most having completed high school.

Table 4. Characteristics of Research Subject

Variable	Control (n=20)		Intervention (n=20)		Total (n=40)	
	n	%	n	%	n	%
Gender						
Male	1	2.5	4	10	5	12.5
Female	19	47.5	16	40	35	87.5
Age						
<40	0	0	0	0	0	0
40-50	2	5	2	5	4	10
>40	18	45	18	45	36	90
Nutritional Status (BMT)						
Underweight	3	7,5	1	2.5	4	10
Normal weight	6	15	7	17.5	13	32.5
Overweight	4	10	0	0	4	10
Obese	7	17.5	12	30	19	47.5
Education						
No education	1	2.5	0	0	1	2.5
Elementary School	5	12.5	0	0	5	12.5
Junior High School	6	15	8	20	14	35
Senior High School	7	17.5	9	22.5	16	40
Higher Education	1	2.5	3	7.5	4	10

(Source: Primary Data, 2024)

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5. Evaluation

The evaluation stage of this research analyzed the impact of nutritional counseling using DBMP videos. The table 5 shows the table knowledge of research before and after intervention. The DM diet knowledge levels of the research subjects were categorized into three groups: low, medium, and high. Table 5 shows that before the nutritional education using DBMP videos (intervention group), 90% of DM patients had low knowledge levels and 10% had medium knowledge levels, which improved to 50% high knowledge and 50% medium knowledge after receiving nutritional education using DBMP videos three times over one month.

Table 5. Knowledge Levels of Research Subjects in Control and Intervention Groups Before and After Intervention

DM Diet Knowledge	Control Group (n=20)				Intervention Group (n=20)			
	Before		After		Before		After	
	n	%	n	%	n	%	n	%
Low (score < 60)	13	65	12	60	18	90	0	0
Medium (score 60-75)	6	30	7	35	2	10	10	50
High (score > 75)	1	5	1	5	0	0	10	50

The table 6 shows the table of result of analysis of differences in knowledge between intervention groups after intervention.

Table 6. Analysis Results of Differences in DM Diet Knowledge After Intervention

Group	Mean ± SD	*p*
Control		
Pre-test	47.4 ± 12.67	0.648
Post-test	51.2 ± 14.19	
Intervention		
Pre-test	46 ± 8.75	0.031
Post-test	73.6 ± 4.6	

The Paired Sample T-Test analysis results in Table 6 show a significant difference (*p=0.031*) between the intervention group and the control group (*p=0.618*) after receiving DM diet nutritional counseling using DBMP videos three times over one month. These results indicate a significant increase in knowledge in the intervention group and no significant increase in the control group.

The result of the analysis of differences in DM diet knowledge after intervention between intervention groups with post hoc Mann Whitney u test shows significant differences (p<0.001).

DISCUSSION

To our knowledge, this is the first research to developing a List of Exchange food ingredients (DBMP) which was developed into a video and evaluates implementation of the use of DBMP video media. This research found that the results of the media trial conducted on a small group of DM patients in the previous media development stage, it is evident that the DBMP videos are highly feasible for use as a visual aid in nutritional counseling for DM diets. The appealing images of food items accompanied by information on the nutritional content of each food and a voice explaining the contents of the images are effective in increasing DM patients' interest in reading and understanding this media content. The advantage of this pictorial media is that it can clarify a problem by seeing images that are clear and appropriate to the subject matter [23].

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The DBMP videos can be viewed anytime and anywhere, this is very useful in preparing the diet for DM patients. In contrast, the DBMP leaflet is limited to text, making it less attractive and harder for respondents to understand the message, and it also has the disadvantage of being easily folded, damaged, and lost [24]. According to Khoiri et al. (2015), most respondents did not read the leaflet fully, citing that it contained too much text, making it uninteresting and easily lost [25].

The DBMP videos media is suitable for use as a media for nutrition education than implemented on 20 research subjects and results were obtained the knowledge of research subjects in the intervention group improved from 90% in the low category and 10% in the medium category to 50% in the medium category and 50% in the high category. This is in line with research by Legi, et.al., where most of the samples knowledge increased after being given the test nutritional counseling using food videos is 64.7%[26].

The DBMP videos media proven to be a significant in increasing research subject knowledge of DM diet ($p=<0.001$). Audiovisual media is more interesting by displaying images and sounds compared to leaflet media in the control group[27],[28]. Leaflet media is that is often used to convey list of exchange food ingredients during nutrition education. In Iraq, nutrition education intervention using lectures with Power Point images and interactive videos significantly increased knowledge among type 2 diabetes patients [29]. DM diet education aims to help DM patients manage their daily diet while adhering to the 3J principles (quantity, schedule, and type).

The advantage of research was that the data obtained is objective, systematic, and measurable. Data was obtained from collection by a trained enumerator using questionnaires that had been tested for validity and reliability. Media development was carried out following the steps of the R & D method with results that were very suitable for use as a media for DM diet nutrition counseling, both from the assessment of media experts, nutritional material and language, and small group assessments.

The weakness of the research was that there was no ongoing evaluation of the research subjects, whether video media is applied in preparing the diet for diabetics as the subjects of this research. Another weakness of video media is that not all DM patients have mobile and use Android considering that many are over 40 years old.

CONCLUSION

The evaluation result starting from the assessment of nutrition material, language, and media experts, and the assessment of small groups of potential users as well as the result of the analysis after the intervention on a significant increase in knowledge can be concluded that the DBMP videos are highly feasible for use among DM patients.

The DBMP videos were effective audiovisual aids/media for DM diet nutritional counseling. Puskesmas or Prolanis managers provide DBMP video media as a teaching tool when carrying out nutrition education, but keep in mind that many DM patients are in the elderly category, so playing videos with Android handphone that images display are not too large, research could be carried out. Continued with research subjects of DM patients and accompanying families in preparing daily menus at home.

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