October – December, 2024
Original Article
DOI: http://dx.doi.org/10.30867/action.v9i4.1830

AcTion: Aceh Nutrition Journal
Pages: 673 – 682 | p-issn 2527-3310; e-issn 2548-5741

Development of nutrition edutainment program for expectant mothers in disaster situation in Padang

Pengembangan edutainment gizi untuk ibu hamil pada situasi bencana di Padang

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Article History:
Received: April 07, 2024; Revised: April 16, 2024; Accepted: July 22, 2024; Published: December 04, 2024.

Publisher:
Politeknik Kesehatan Aceh
Kementerian Kesehatan RI

Abstract

Expectant mothers are vulnerable to health risks during disasters such as disruption of clean water, exposure to inadequate environmental sanitation, and limited access to safe food. Padang is located on a volcanic plateau which is prone to disasters. This study aimed to develop expectant pregnant mothers on education-based nutritional education for expectant mothers in disaster situations in Padang. This study used a quasi-experimental design conducted in April-November 2019, with a sample of 100 expectant mothers, who were selected by random sampling and divided into four groups of treatments (PowerPoint, Android, website, and Android-website combination). Data were collected through interviews and questionnaires and analyzed using Wilcoxon and Kruskal-Wallis tests. Edutainment-based nutritional education has been developed based on the needs of expectant mothers in disaster situations. The results showed changes in knowledge in all groups (p<0,05), while changes in attitudes occurred in Groups B and C (p<0,05) and changes in practices occurred in Groups A and C (p<0,05) after the intervention. In conclusion, treatment C had a significant impact on knowledge, attitudes, and practices.

Keywords: Edutainment, media, disaster preparedness

Abstrak

Ibu hamil merupakan kelompok rentan yang memiliki risiko kesehatan saat bencana, seperti gangguan terhadap air bersih, paparan terhadap sanitasi lingkungan yang tidak memadai, dan terbatasnya akses terhadap makanan yang aman. Padang terletak di dataran tinggi vulkanik yang rentan terhadap bencana. Penelitian ini bertujuan untuk mengembangkan pendidikan gizi berbasis *edutainment* pada ibu hamil pada situasi bencana di Padang. Penelitian ini menggunakan desain quasi eksperimen yang dilakukan pada bulan April-November 2019, dengan sampel sebanyak 100 ibu hamil yang dipilih secara *random sampling* dan dibagi menjadi 4 kelompok perlakuan (*power point*, *Android*, *website* dan kombinasi *Android-website*). Data dikumpulkan melalui wawancara dan kuesioner, kemudian dianalisis menggunakan uji Wilcoxon dan Kruskal-Wallis. Telah dikembangkan pendidikan gizi berbasis edutainment berdasarkan kebutuhan ibu hamil dalam situasi bencana. Hasil penelitian menunjukkan terdapat perubahan pengetahuan pada seluruh kelompok (p<0,05), sedangkan perubahan sikap terjadi pada kelompok B dan C (p<0,05) dan perubahan praktik terjadi pada kelompok A dan C (p<0,05) pasca intervensi. Kesimpulan, bahwa perlakuan C memiliki dampak signifikan pada pengetahuan, sikap, dan praktik.

Kata Kunci: *Edutainment*, kesiapsiagaan bencana, media)

Introduction

Indonesia is prone to natural and anthropogenic disasters. The factors that may cause disasters in Indonesia are climatic, geological, geographical, political, and sociocultural. Padang is the center of the government of West Sumatera, which is located in the western-central part of Sumatera.

It has a low-lying land on the west coast and a volcanic plateau on the east coast formed by Bukit Barisan, which is known as the area that is prone to earthquakes and tsunamis. Because they are tectonically adjacent to the subduction zone, the confluence zone between the two Eurasian plate earthquakes is a natural phenomenon that is common and difficult to predict, and these natural phenomena are considered sudden and irregular (Sumari et al., 2016; Yulistiya & Yuniawatika, 2022). The data show that approximately 1,844 disasters occurred in Padang in 2017-2022, which consisted of floods, waterspouts, landslides, fires, and other natural disasters. These data did not include earthquakes that constantly occurred in West Sumatera, which were registered in 2009-2019 with the number of earthquakes as 1,914, with an average incidence of 14,5 incidence per month. Recently, 161 cases of Merapi eruptions were reported from December 2023 to February 2024 (Center for Volcanology and Geological Disaster Mitigation, 2024; Padang Central Bureau of Statistics, 2024; Sabtaji, 2020). These data show West Sumatra's vulnerability to various disasters.

Natural disasters are catastrophic events of atmospheric, hydrological, and geological origin that often affect the public health and well-being of populations affected by injuries, disabilities, fatalities, and other negative physical and mental health effects. This condition can occur in human groups, especially vulnerable groups, which are populations with special needs or those at risk for physical, psychological, or social health problems after a disaster (Hamidzada & Cruz, 2017; Hoffman, 2009; Onyango & Uwase, 2017; Xu et al., 2016).

According to the Ministry of Health of the Republic of Indonesia, one of the vulnerable groups in disaster conditions is expectant mothers, who are at risk for both physical and mental problems, including pregnancy-related problems. Expectant mothers are prone to specific health problems that mostly occur in pre-, during-, and post-disaster situations, mostly because of limited access to clean water, proper sanitation, shelter, and the threat of communicable diseases. Limited access to proper food and nutrition also often creates concern for expectant mothers' well-being, as this condition may slow the post-disaster recovery process. Accordingly, professional, integrated, and focused knowledge, and practices are required to prepare for possible future disasters, as well as nutritional problems that might follow (Directorate General of Public Health, 2020; PAHO, 2019; Prasad & Francescutti, 2017; Sato et al., 2016; Steinbeck, 2006; Wright & Vesala-Husemann, 2006).

Knowledge is an important domain required to develop an individual's health behavior. Research has shown that behavior change caused by knowledge improvement lasts longer than behavior that is not knowledge based. Furthermore, improving expectant mothers' knowledge of their individual health efforts and behaviors can build capacity and reduce vulnerability to disasters (Rincón Uribe et al., 2021).

Research shows that education on disaster mitigation in various aspects is needed, including the nutritional problems of expectant mothers and their families, which need to be done because of the difficulty of expectant mothers to evacuate, as well as their families' health problems, including children. Thus, accurate information, particularly nutrition education in disaster situations, can help women prepare themselves independently before a disaster to protect their pregnancy, thereby increasing the possibility that expectant mothers and their families can survive during and after a disaster (Ozkazanc & Duman, 2015; Sato et al., 2016). Furthermore, there has been no specific research on nutritional education for expectant mothers during disasters.

Nutrition education is a method with a broader vision that encompasses educational strategies and environmental support to encourage the adoption of healthier and sustainable food choices as well as eating schemes for various population groups or individuals. It not only aims to encourage critical thinking, attitudinal change, and practice skills through information sharing but also integrates actions to enable and facilitate health-conducive nutritional behaviors and environments (Piscopo, 2019).

There are many barriers to delivering information during a disaster. The ignorance of populations arises because the knowledge provided is not applied properly and the media used to deliver information is not suitable, whereas nutrition education requires educational, creative, and innovative media (Bergmann et al., 2010).

Edutainment is a modern form of technology and entertainment that offers new opportunities to acquire knowledge in an entertaining manner as a substitute for traditional lectures, classes, or workshops,

where individuals can gain information in a laid-back atmosphere (Anikina & Yakimenko, 2015). Androids and websites are edutainment-based nutritional education that have been extensively applied abroad, with a higher potential to be applied in Indonesia as Internet usage grows rapidly, with approximately 85% of the total Internet users in Indonesia accessing the Internet through mobile phones, while the rest use PCs and laptops (Rahayu & Lestari, 2018). Based on these premises, an edutainment-based nutritional education program was developed to determine the impact of several interventions on expectant mothers' knowledge, attitudes, and practices regarding nutrition during disasters.

Methods

This research was conducted from April to November 2019 at the Integrated Healthcare Center (Posyandu) visited by expectant mothers of four districts located in the tsunami red zone of Padang in the work areas of Padang Pasir, Ulak Karang, Air Tawar, and Lubuk Buaya Public Health Centers. The population consisted of expectant mothers domiciled in the districts, and the minimum sample size in each district was 25 expectant mothers (a 15% chance of dropping out). The small minimum sample size was determined by considering the sample's characteristic limitation, namely expectant mothers.

This study used a quasi-experimental research design with a sample of 100 expectant mothers, who were divided into four groups based on the edutainment used: Treatment A Group was chosen as the control group, which used PowerPoint Presentation media; Treatment B Group, which used Android media; Treatment C Group, which used website media; and Treatment D Group, which used Android and Website media. In addition, all respondents in each district received nutritional education in the form of PowerPoint presentations. The research flow is illustrated in Figure 1.

Primary and secondary data were collected. Primary data included the individual characteristics of expectant mothers and their families and media acceptance, which consisted of the ease of understanding, fonts, images, colors, material quantities, interest level, nutritional knowledge, nutritional attitudes, and nutritional practices of expectant mothers during disasters. The data collection process consisted of a) pre-test to measure the knowledge, attitudes, and practices before intervention; b) the intervention was carried out five times in each group; and c) post-test after intervention to determine the impact of intervention on each group. Furthermore, secondary data consisted of general information regarding the research location.

The data were collected through in-depth interviews and quantitative questionnaires. Qualitative data were analyzed through verification, coding, entry, cleaning, and analysis, whereas quantitative data were analyzed through descriptive and inferential statistics using Microsoft Office and SPSS.

The knowledge, attitude, and practice variables were processed by adding the scores for each question based on the appropriate answers divided by the total score multiplied by 100. The behavior level categories used were good (score > 80%), moderate (score 60-80%), and low (score < 60%) of the total score. Statistical tests were used to determine differences in knowledge, attitudes, and practices between the treatment groups and their changes before and after nutrition education. The small sample size (25 respondents for each group) affects the normality of the data, and it is estimated that the research data are not normally distributed. Based on this consideration, the significance of the statistical tests was determined using Wilcoxon and Kruskal-Wallis tests.

This study was approved by the Research Ethics Committee of the Faculty of Medicine, Andalas University in the form of a Letter of Statement No. 486/UN/16.2/KEP-FK/2021.

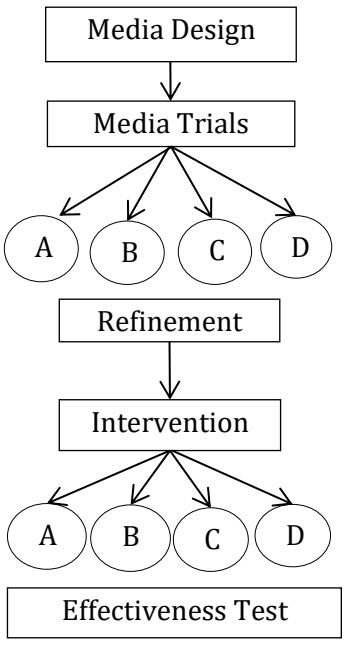

Figure 1. Research flow

Result and Discussion

Table 1. Frequency distribution of respondents

Characteristics	Group A		Group B		Group C		Group D	
	n	%	n	%	n	%	n	%
Age								
20-30 years old	15	60,0	13	52,0	10	40,0	21	84,0
31-40 years old	9	36,0	11	44,0	14	56,0	4	16,0
> 41 years old	1	4,0	1	4,0	1	4,0	0	0,0
Educational Background								
Primary school	4	16,0	0	0,0	0	0,0	3	12,0
Junior high school	2	8,0	2	8,0	5	20,0	1	4,0
Senior high school	12	48,0	13	52,0	19	76,0	11	44,0
College	7	28,0	10	40,0	1	4,0	10	40,0
Occupation								
Housewife	20	80,0	17	68,0	24	96,0	19	76,0
Government employees/ Indonesian National Army	4	16,0	3	12,0	0	0,0	3	12,0
Private	1	4,0	5	20,0	1	4,0	3	12,0

There were 25 respondents in each intervention group, and the control and treatment groups were chosen randomly. The characteristics of the respondents in each of the four groups were categorized by age, educational background, and occupation, as described in more detail in Table 1. Table 1 shows that all groups mainly consisted of expectant mothers aged 20-30 years old (40,0-84%) and 31-40 years old (16,0-56,0%). This illustrates that the ability to obtain information through nutritional education should be high. Similar to the educational background, most of the entire group of expectant mothers had an educational background of senior high school (44,0-76,0%) and college (4,0-40,0%). In addition, other results showed that all groups mainly consisted of housewives (68,0%-96,0%).

Table 2. Frequency distribution of respondent based on average of knowledges, attitudes and practices of expectant mothers

Group	Knowledges		Attitudes		Practices	
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test
A	46,8	70,8	82,2	84,2	77,3	88,0
B	52,0	66,0	81,3	85,4	84,7	88,0
C	42,4	56,8	82,9	86,1	82,0	95,3
D	52,4	64,4	84,1	85,8	89,3	93,3

Table 2 shows that the average level of knowledge for Group A before intervention was 46,8 and after intervention by given education using power point presentation was increased to 70,8. While the average level of knowledge for Group B before intervention was 52,0 and after intervention by given education through videos, power point presentations, social media images from WhatsApp via Android was increased to 66,0. The average level of knowledge for Group C before intervention was 42,4 and after intervention by given education through videos, power point presentations and images via website was increased to 56,8. As for Group D, the average level of knowledge before intervention was 52,4 and after intervention by given education through videos, PowerPoint presentations, and images via Android and the website increased to 64,4.

Based on Table 2, the average score of attitude for Group A before intervention was 82,2 and after intervention by given education using PowerPoint presentation, it increased to 84,1. The average score of attitude for Group B before intervention was 81,3 and after intervention by given education through videos, PowerPoint presentations, and social media images from WhatsApp via Android increased to 85,4. The average score of attitudes for Group C before intervention was 82,9 and after intervention by given education through videos, power point presentations and images via

website was increased to 86,1. As for Group D, the average score of attitudes before intervention was 84,1 and after intervention by given education through videos, PowerPoint presentations, and images via Android and websites increased to 85,8.

Furthermore, based on Table 2, the average score of practice for Group A before intervention was 77,3 and after intervention by given education using power point presentation was increased to 88,0. The average score of practice for Group B before intervention was 84,7 and after intervention by given education through videos, PowerPoint presentations, and social media images from WhatsApp via Android increased to 88,0. The average score of practice for Group C before intervention was 82,0 and after intervention by given education through videos, power point presentations and images via website was increased to 95,3. As for Group D, the average score of practice before intervention was 89,3 and after intervention by given education through videos, power point presentations and images via Android and website was increased to 93,3.

The Development of Nutrition Media Based on Edutainment Technology

Edutainment is a combination of education and entertainment, a modern form of technology and entertainment that offers new opportunities for individuals to acquire knowledge in an entertaining manner as a substitute for traditional lectures, classes, or workshops, where individuals can gain information in a laid-back atmosphere, improving their learning of new information by making it more engaging (Anikina & Yakimenko, 2015; Makarius, 2016). Research has shown that research targets are more satisfied and motivated in learning activities along with improved critical thinking skills (Ramdani et al. 2020).

Androids and websites are edutainment-based nutritional education that have been extensively applied abroad, with a higher potential to be applied in Indonesia as Internet usage grows rapidly, with approximately 85% of the total Internet users in Indonesia accessing the Internet through mobile phones, while the rest use PCs and laptops (Rahayu & Lestari, 2018).

Edutainment allows individuals to discover new things from reliable sources but is not an alternative to academic education (Anikina & Yakimenko, 2015). Edutainment, as an educational strategy, supports the reversal of the current health situation by including the use of audiovisual technology, communication, and the Internet to improve the quality of life of the population, supporting the active dialogue of individuals through facilitated communication (Daun & Gambardella, 2018).

Nutritional edutainment media for expectant mothers in disaster situations were developed in the form of videos by following the steps of media development, which started with the identification of nutritional knowledge needs and the characteristics of expectant mothers before, during, and after a disaster, by considering the Guidelines for Nutrition Program in Disaster Management. The material was compiled in the form of scripts, followed by the preparation of storyboards. Videos were recorded and tested on several expectant mothers to discover the ease of understanding and interest level and revised on the suggested parts; thus, the media is suitable for production and use.

The results of the nutritional education media development for expectant mothers in disaster situations were in the form of videos, pictures, and PowerPoint presentations that could be accessed through the official website of the Health Promotion Department of Poltekkes Kemenkes Padang (https://promkes.poltekkes-pdg.ac.id) with the name of *"EDGIHANA (Edukasi Gizi Ibu Hamil Masa Bencana*–translate as Nutrition Education for Expectant Mothers during disasters*)*".

The Effect of Edutainment-based Nutritional Education on the Knowledge of Maternal Nutrition in Disaster Situations

Knowledge is the most important domain in the formation of overt behavior and plays an important role in shaping actions. This is a result of curiosity through sensory processes, which is influenced by the intensity of attention and perception of stimuli or health information. Knowledge is influenced by several factors such as education. Education is a learning process from not knowing, a regulated process, and socially organized continuous transference of notable experiences from previous generations to the following, which is one of the methods that can be used to improve one's knowledge, or a planned effort to influence others, whether individuals, groups, or communities, in order to make them do what is expected by educators (Angga, 2018; Donsu, 2017; Naziev, 2017;

Rincón Uribe et al., 2021; Saadah et al., 2020; Wawan & Dewi, 2017).

Nutritional knowledge is a consequential factor that influences the behavior of individuals, families, and communities. To construct long-lasting knowledge-based practices, nutritional knowledge from various sources such as schools, printed media, and electronic media is essential (Khomsan et al., 2009; Scalvedi et al., 2021). Lack of nutritional knowledge increases the potential for nutritional problems. Research has shown that lack of nutritional knowledge or daily nutritional knowledge may cause nutritional problems. Thus, nutritional knowledge improvements are needed to aim for changes in attitudes and behaviors towards awareness to fulfill nutritional needs and achieve optimal health status (Proverawati & Wati, 2017; Tamrin et al., 2019).

The results of the Wilcoxon signed ranks test for knowledge showed a p-value < 0,05, for all treatment groups (Group A 0,0001; Group B = 0,001; Group C = 0,001; and Group D = 0,0001), which means that there was a statistically significant difference in respondents' knowledge following the intervention using edutainment-based nutritional education media.

The Kruskal–Wallis test before intervention showed a p-value = 0,139 (α > 0,05), which means that there was no significant difference in knowledge of respondents before the intervention of each educational media used, while after intervention, it showed a p-value = 0,051 (α > 0,05), which means that there was a significant difference in knowledge after the intervention of each educational media used. This indicates that edutainment-based nutritional education has a significant impact on the knowledge of individuals, groups, and communities.

Other studies have shown that a comprehensive program can significantly affect nutritional knowledge (Lanham-New et al., 2019). The utilization of PowerPoint presentations, photos, and videos through social media is a comprehensive edutainment-based medium that can effectively optimize the delivery of information in nutrition education.

This statement is also supported by the results of in-depth interviews with expectant mothers which said, "videos provided a lot of knowledges and benefits," "videos could provide input to expectant mothers about food that can be prepared in disaster preparation and instructions on nutrition and recommended food for expectant mothers, as well as the importance of family roles to expectant mothers." Other studies have shown that the use of video allows for better knowledge improvement, and this method is recommended as an educational strategy (Wolfensberger et al., 2019).

Furthermore, the utilization of Android to learn new knowledge makes it easier for the research target to understand the information (Handoyono & Rabiman, 2020). This discussion concludes that the utilization of technology-based edutainment may contribute to the improvement of knowledge.

The Effect of Edutainment-based Nutritional Education on the Attitudes Towards Maternal Nutrition in Disaster Situations

Attitude refers to an individual's tendency to react to a matter, person, or thing by accepting, rejecting, or being indifferent. Each individual provided a different response or attitude towards the stimulus. This is because the formation of attitudes is influenced by knowledge, habits, and beliefs; hence, even though individuals receive the same stimulus, the attitudes formed will not necessarily be the same, which implies that it is important to intervene in individual knowledge and beliefs to form the expected attitudes in target groups (Purwanto, 2014; Rahmah, 2016). Research states that, to pursue successful behavior change, comprehensive education and motivation enhancement are needed (Putri & Pritasari, 2017; Al Rahmad et al., 2023). Thus, it is essential to intervene in individual attitudes in an effort to develop expected behavior change.

A nutritional attitude is an individual's tendency to agree with a proposed statement related to nutrition and food, in which nutritional education is needed to foster a better nutritional attitude (Khomsan et al., 2009). The results of the Wilcoxon signed-rank test for attitudes showed a p-value < 0,05, for Group B (p-value = 0,009) and Group C (p-value = 0,004), while the others showed a p-value > 0,05, for Group A (p-value = 0,272) and Group D (p-value = 0,201). These results indicate a statistically significant difference in the attitudes of the respondents in Groups B and C before and after the intervention using edutainment-based nutritional education media.

The Kruskal–Wallis test before intervention showed a p-value = 0,561 (α >

0,05), and after intervention showed a p-value = 0,729 (α > 0,05), which means that there was no difference in respondents' attitudes before and after the intervention for each educational media used. Although there was no significant difference, especially in Group A (control/power point presentations) and Group D (Android and Website), there were substantial changes in the positive attitudes of expectant mothers.

Nutrition education can influence individual attitudes towards certain health behaviors. This study shows different results from other studies that show a significant difference in the attitude of the research subject after edutainment intervention (p-value = 0,01). Furthermore, other studies have shown significant differences in the nutritional attitudes of groups given nutritional education (p = 0,012) (Amira and Setyaningtyas 2021; Putri and Pritasari 2017).

This possibility occurred in Group A, which only displayed PowerPoint presentations that did not show either side of the human senses (audio or visual). At the same time, Group D did not show significant differences in attitudes, possibly due to the relatively young age of expectant mothers (84%) and high educational background (40%); thus, they might have shown positive attitudes towards nutritional education since the beginning, due to the accessibility of information from various media in advance. Other possibility obtained from the result of in-depth interviews with expectant mothers concluded that, "videos should not show too much of the conditions during disasters, due to the possibility of it to recall trauma to the victims who experienced it." However, in terms of presentation, nutritional education has positive influence on the attitudes of individuals, groups and communities.

The Effect of Edutainment-based Nutritional Education on the Practice of Expectant Mothers in Disaster Situations

Practices are behaviors whose performance depends on an individual's knowledge, which is performed in the presence of specific cues under stimulus control. Furthermore, individuals will make an assessment or judgement of what is known, while the next process is to carry out what they know or respond to (Thrailkill et al., 2018).

Research has demonstrated that practice is the result of knowledge, attitudes, or interactions with each other. Through the intervention of knowledge, attitudes, and practices, it is possible to develop appropriate information and preventive actions to improve health (Lvovschi et al., 2022; Montuori et al., 2022).

The results of the Wilcoxon signed-rank test for practice showed a p-value < 0,05, for Group A (p = 0,019) and Group C (p = 0,011), while the others showed a p-value > 0,05, for Group B (p = 0,132) and Group D (p = 0,064). These results indicate a statistically significant difference in the practices of the respondents in Groups A and C before and after the intervention using edutainment-based nutritional education media. The results of the Kruskal-Wallis test showed that a p-value > 0,05 was obtained for changes in practices before intervention (pre-test = 0,331), which means that there was no difference in the practices of respondents before the intervention of each educational media used. The level of practices after intervention with educational media showed a p-value of 0,05 (post-test = 0,004), which means that there was a difference in practices after the intervention of each educational media used.

The four groups had the same level of practice before intervention, whereas there was a significant difference in the practice of expectant mothers after the intervention using edutainment media. This result is supported by other research showing that eating habits are significantly related to the nutritional knowledge and attitudes of individuals. Nutritional education and interventions have been found to be effective in promoting healthy eating and lifestyle behaviors (Choi & Kim, 2008). Other studies also showed significant differences in the practice of research subjects before and after intervention, which concluded that the utilization of media in nutritional education may improve the practice of health behavior (Dahlan et al., 2023).

This study has various limitations, which are mostly related to the sample size. It is important to conduct further research by considering the characteristics of a wider sample, which could be in the form of the number or coverage of the research area.

Conclusion

It has been developed and received an Android-based nutritional video and website as a nutrition edutainment medium for expectant mothers' nutrition during disasters based on their needs of expectant mothers in disaster situations with the name of "EDGIHANA

(Edukasi Gizi Ibu Hamil Masa Bencana)." It was found that there were changes in the knowledge, attitudes, and practices of expectant mothers after the intervention by using edutainment media in the control group (PowerPoint presentation), android group, website group, and android-website combination group.

It is suggested that nutrition education based on Android and websites should be implemented gradually and continuously to achieve positive behavioral changes. Furthermore, Android and web-based nutrition education programs need to be supported by various parties, such as health agencies, to prepare this media in patient waiting rooms at hospitals or public health centers.

Acknowledgements

The authors declare that they have no conflicts of interest. The study was financially supported by the Health Polytechnic of Padang, and the authors declare that there are no conflicts of interest. In this study, JA and RSE contributed to the design and implementation of the research, RS analyzed the results, NAN wrote the manuscript, and WD and SM supervised the project.

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