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Behavioural Changes in Blood Sugar Control and Dietary Patterns of Type 2 Diabetes Mellitus Patients Based on Animated Video Media

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ABSTRACT
Type 2 Diabetes Mellitus is a global health problem that continues to increase, requiring proper management, including behavioural changes related to blood sugar control and dietary patterns. This study aims to evaluate the effect of animation-based media education on changes in blood sugar control behaviour and dietary patterns in patients with Type 2 Diabetes Mellitus. The research design used was a quasi-experimental study with a One Group Pretest-Posttest Design approach. The study sample consisted of 100 respondents selected using purposive sampling. Data were collected through questionnaire completion during the pretest and posttest. Data analysis was performed using the Wilcoxon Signed Rank Test. The results of the study showed a significant improvement in blood sugar control behaviour, from an average of 24.19 in the pretest to 33.55 in the posttest (Z = -7.692, p = 0.0001). Similarly, dietary patterns improved, with the average score increasing from 3.40 in the pretest to 6.59 in the posttest (Z = -7.123, p = 0.0001). These findings support the use of animated video media as an effective alternative educational tool in diabetes management, as well as the importance of technology-based education to enhance patient awareness and adherence to blood sugar control and healthy eating patterns.

Keywords: *Type 2 Diabetes Mellitus, Animated Video Education, Blood Sugar Control, Dietary Patter, Healthy Behaviour*

INTRODUCTION
Diabetes mellitus (DM) is a growing global health problem that can lead to serious complications, ultimately increasing mortality rates (Gupta et al., 2024). DM terbagi menjadi dua tipe utama, yaitu DM tipe 1 dan DM tipe 2, yang keduanya ditandai dengan hiperglikemia akibat gangguan dalam sekresi insulin, fungsi insulin, atau keduanya (Yadav et al., 2023). DM is divided into two main types, type 1 DM and type 2 DM, both of which are characterised by hyperglycaemia due to impaired insulin secretion, insulin function, or both (Marathe et al., 2017).

Based on data from the International Diabetes Federation (IDF), it is estimated that by 2024 around 589 million adults aged 20-79 years will be living with diabetes, and this number is expected to increase to 853 million by 2050 (IDF, 2024). In addition, data from the World Health Organization (WHO) shows that in 2022, approximately 830 million adults worldwide suffered from diabetes, a figure that is significantly higher than the 200 million recorded in 1990. The prevalence of diabetes among adults has more than doubled, from 6.8% in 1990 to 14.1% in 2022, with more than half of them undiagnosed or not receiving adequate treatment

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(WHO, 2024). In Indonesia, the diabetes situation is increasingly alarming, with data from the 2018 Riskesdas survey showing a prevalence of Type 2 Diabetes Mellitus (DMT2) diagnosed by doctors in people aged ≥15 years of 2%. This figure has increased compared to the 2013 Riskesdas survey, which recorded a prevalence of 1.5% (Indonesian Ministry of Health, 2019).

The Chinese study revealed that a proper diet can improve blood sugar control in T2DM patients, which supports the importance of dietary education as part of the management of this disease. A combination of a grain-vegetable diet and eggs, dairy, nuts play an important role in the management of blood sugar levels in patients with T2DM (Lei et al., 2024). However, although group-based dietary counselling has been conducted, as studied by Setyoadi et al. (2024), the approach did not show a significant impact on the dietary adherence of T2DM patients. This study emphasises the importance of family environmental support to improve adherence to the recommended diet (Setyoadi et al., 2024). Another study by Andriani et al. (2024) on mindful eating showed that more mindful eating behaviour can improve dietary habits and reduce fasting glucose levels in T2DM patients. (Andriani et al., 2024). Dal & Bilici (2024) in their study found that high-quality dietary patterns, such as the Mediterranean and DASH diets, play an important role in the management of blood sugar levels and cardiovascular health of T2DM patients (Dal & Bilici, 2024). These findings support the integration of dietary approaches that have been shown to be effective in video-based educational interventions for patients with diabetes. Finally, the study by Zhu et al. (2021) highlights the importance of lifestyle education in the management of T2DM. They showed that effective lifestyle education, including monitoring of diet and daily habits, can improve the management of blood sugar levels, reduce microalbuminuria, and improve patients' quality of life (Zhu et al., 2021).

Although the role of diet and lifestyle in the management of type 2 diabetes mellitus (DMT2) has been widely discussed in many studies, few have explored the effectiveness of animated video-based educational media in improving blood sugar control and dietary patterns in diabetic patients. This study therefore aims to address this gap by evaluating the impact of animated video-based education on changes in blood sugar control, behaviour, and dietary patterns among patients with type 2 diabetes mellitus. Specifically, the study will examine the impact of animated video-based education on blood sugar control behaviour and dietary patterns among patients with type 2 diabetes mellitus in Pekanbaru City, Riau Province.

METHODS

Research Design

This study utilised a quasi-experimental design with a one-group pretest-posttest approach. This design involved initial measurements (pretest) before treatment and final measurements (posttest) after treatment in one experimental group. The experimental group received treatment in the form of education using animated videos, and the behavioural changes measured were blood sugar control and dietary patterns of patients with type 2 diabetes mellitus.

Location and Time of Research

This study was conducted in Pekanbaru City, Riau Province, on patients with type 2 diabetes mellitus. The selection of this location was based on demographic data from the Riau Provincial Health Office which recorded a significant number of patients with type 2 diabetes mellitus in Pekanbaru City. This study was conducted within a period of time that was adjusted to the availability of participants and the agreed schedule.

Research Sample and Population

The target population in this study was all type 2 diabetes mellitus patients registered in the Pekanbaru City Health Office data. The study sample involved 100 respondents selected using purposive sampling. The sample size was calculated using the sample size formula for large populations. In this calculation, a Z value of 1.96 was used for a 95% confidence level, an estimated population proportion of 50% (p = 0.5) since the exact proportion is unknown,

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and a margin of error of 5% (E = 0.05). Based on these calculations, the required sample size is 100 respondents, which is considered sufficient to provide a representative overview of the effectiveness of educational use of animated video media among type 2 diabetes mellitus patients in Pekanbaru City. The sample was selected using purposive sampling techniques.
Respondents involved in this study must meet the following inclusion criteria: (1) willing to be a respondent and provide informed consent, (2) diagnosed with type 2 diabetes mellitus, and (3) conscious and able to answer research questions. Exclusion criteria include: (1) significant hearing or vision impairment, and (2) unwillingness to participate in all stages of the study.

Research Variables

The independent variable in this study was animated video media, while the dependent variables were blood sugar control behaviour and dietary patterns in patients with type 2 diabetes mellitus. Blood sugar control behaviour was measured through several aspects, namely adherence to diabetes medication, frequency of self-monitoring of blood sugar levels, adherence to blood sugar testing schedules at health facilities, and management of diabetes through a healthy diet and avoidance of foods high in sugar.
Dietary patterns are measured by considering several factors, including adherence to the recommended diet for diabetes, such as regulating carbohydrate, fat, and protein intake; increasing consumption of nutritious foods such as vegetables, fruits, and foods with a low glycaemic index; and reducing consumption of high-sugar and saturated fat foods. Questionnaire scores will be categorised as positive if they are at or above the median value, and negative if they are below the median value.

Sampling and Data Collection Procedures

Sampling was conducted in collaboration with community health centres in Pekanbaru to identify and recruit participants who met the inclusion criteria and did not meet the exclusion criteria. Participants who agreed to participate in the study provided informed consent and were involved in completing questionnaires at the pretest and posttest stages.
In the pretest stage, participants will complete a questionnaire measuring their level of self-awareness in controlling blood sugar levels. After that, participants from the experimental group will receive education in the form of an educational animated video about diabetes management for 60 minutes. After the intervention is complete, the posttest stage will be carried out by completing the same questionnaire to measure changes in self-awareness and blood sugar control behaviour as well as dietary patterns. The entire data collection process will be conducted independently by the respondents under the supervision of the researcher to ensure the validity of the questionnaire completion. The collected data will be kept confidential and used solely for the purposes of this study.

Data Analysis

Data analysis was performed using the Wilcoxon Signed Rank Test to test for significant differences between pretest and posttest scores in the experimental group related to changes in blood sugar control and dietary patterns in patients with type 2 diabetes mellitus. This test was used because the data obtained were paired and not normally distributed.

RESULTS

Table 1. Characteristics of respondents based on age, education, and occupation

NO	Characteristics	n	%
1	**Age**		
	< 20 years old	21	21.0
	20- 30 years old	34	34.0
	31-40 years old	27	27.0
	41-50 years old	10	10.0
	> 50 years old	8	8.0

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2	**Gender**		
	Male	37	37.0
	Female	63	63.0
3	**Education**		
	Elementary School	3	3.0
	Junior High School	11	11.0
	Senior High School	65	65.0
	Higher Education	21	21.0
4	**Occupation**		
	Housewife	26	26.0
	Government Employee	13	13.0
	Farmer/Fisherman	13	13.0
	Entrepreneur	16	16.0
	Unemployed	32	32.0
	Total	**100**	**100,0**

Table 1 shows the majority of respondents in this study were aged 20-30 years (34%), with a predominance of females (63%). Most respondents had a high school education (65%), and the most common occupation was unemployed or not working (32%). These characteristics describe the socio-demographic profile of type 2 diabetes mellitus patients in Pekanbaru City as a basis for analysing blood sugar control behaviour and lifestyle.

Table 2. Overview of Blood Sugar Control Behaviour and Dietary Patterns of Type 2 Diabetes Mellitus Patients Before and After Education Using Animated Video Media

NO	Behaviour	Pre test		Post test	
		n	%	n	%
1	**Blood Sugar Control**				
	Negative	82	82.0	21	21.0
	Positive	18	18.0	79	79.0
2	**Dietary Patterns**				
	Negative	75	75.0	20	20.0
	Positive	25	25.0	80	80.0

Table 2 shows that before education, most patients showed negative blood sugar control behaviour at 82%, but after education, positive behaviour increased significantly to 79%, while negative behaviour dropped to 21%. Similarly, before education, 75% of patients had negative dietary patterns, and after education, positive dietary patterns increased to 80%, while negative dietary patterns decreased to 20%.

Table 3. The Effect of Providing Education Using Animated Video Media on Blood Sugar Control Behaviour and Dietary Patterns of Type 2 Diabetes Mellitus Patients

NO	Behaviour	Mean	SD	Min-Max	Z	P-value
1	**Blood Sugar Control**					
	Pre test	24.19	5.974	13-40	-7.692	0,0001
	Post test	33.55	5.424	16-40		
2	**Dietary Patterns**					
	Pre test	3.40	1.954	0-9	-7.123	0,0001
	Post test	6.59	2.179	2-9		

Table 3 shows the effect of providing education using animated video media on blood sugar control behaviour and dietary patterns in patients with type 2 diabetes mellitus. The analysis

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showed a significant increase in blood sugar control behaviour scores, from an average of 24.19 in the pre-test to 33.55 in the post-test ($Z = -7.692$, $p = 0.0001$). Likewise, in dietary patterns, the average score increased from 3.40 in the pre-test to 6.59 in the post-test ($Z = -7.123$, $p = 0.0001$). The highly significant p value ($p < 0.05$) indicates that education with animated video media has a positive effect on improving blood sugar control behaviour and dietary patterns in patients with type 2 diabetes mellitus.

DISCUSSION

The results of this study indicate that education using animated video media significantly improves blood sugar control behaviour in patients with type 2 diabetes mellitus. These findings are in line with various recent studies reporting the effectiveness of animated media in increasing patients' behavioural intentions and engagement to reduce sugar intake and improve dietary habits (Favaretti et al., 2022; Vandormael et al., 2021). In addition, animated video media proved to be equivalent to other educational media such as e-booklets in improving patients' health knowledge and attitudes (Putri et al., 2023).

The decrease in blood sugar levels and HbA1c reported in several studies related to multimedia education programmes supports the results of this study, which showed improved metabolic control after video-based education intervention (Penney-Amador et al., 2020; Velázquez–López et al., 2017). The effectiveness of animated video media is also evident from the increase in compliance and self-management practices among patients with type 1 diabetes, which is likely to be applicable to patients with type 2 diabetes (Emiliana et al., 2019; Tınmaz & Altundağ, 2025).

Moreover, a comparison between multimedia and face-to-face education demonstrated comparable outcomes, suggesting that animated video media can serve as a flexible and effective alternative for diabetes education, particularly in contexts characterised by limited resources or access to health facilities (Molavynejad et al., 2022). However, in order to optimise educational outcomes, it is imperative that video content is tailored to specific age groups and presented in a manner that is accessible and comprehensible to the target audience, without recourse to complex medical jargon (Dincer & Bahçecik, 2021; van het Schip et al., 2020).

This study also indicates significant changes in the dietary patterns of type 2 diabetes patients after receiving education through animated videos. These findings are consistent with those of studies demonstrating the efficacy of video education in enhancing dietary compliance and metabolic parameters, including body weight, glucose levels, and lipid profiles, in patient populations (Annisyah et al., 2024; Molavynejad et al., 2022).

Integration of multimedia education with nutritional therapy has been shown to provide long-term benefits in metabolic control, including reductions in HbA1c and triglycerides, and healthier lifestyle changes (Reséndiz Lara et al., 2020). Improvements in dietary patterns were also reflected in increased consumption of unsaturated fats, vegetables, and patient knowledge of calories and glycaemic index through interactive media such as educational games and animated videos (Koohmareh et al., 2021). Moreover, video education has been demonstrated to enhance self-management and adherence to dietary and physical activity routines, thereby improving quality of life and reducing HbA1c levels, as evidenced by studies conducted on children with diabetes. It is anticipated that these benefits will also be applicable to adult patients (Tınmaz & Altundağ, 2025).

This study demonstrates the efficacy of employing engaging and readily accessible animated video media to enhance blood sugar control and dietary patterns in patients with type 2 diabetes. This medium has the potential to function as an efficient and scalable educational solution, particularly in areas characterised by limited access. Nevertheless, the study's limitations must be acknowledged, including the relatively modest sample size and the restricted follow-up period. It is therefore recommended that future research be conducted on a larger sample size over a longer observation period in order to assess the sustainability of

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behavioural changes. Furthermore, the development of more personalised educational videos, in conjunction with their integration with digital applications, has the potential to enhance patient engagement. From a clinical perspective, the integration of animated video media within diabetes education programmes has the potential to enhance patient management, promote adherence to treatment regimens, and mitigate the risk of diabetes-related complications.

CONCLUSION

This study demonstrates that education using animated video media significantly improves blood sugar control behaviour and dietary patterns in patients with type 2 diabetes mellitus. Therefore, further research is recommended to involve a larger sample size and long-term observation to evaluate the sustainability of behavioural changes. Clinically, the integration of animated video-based education into diabetes education programmes can be a flexible and effective solution to improve disease management and reduce diabetes complications in the community

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