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Flashcard-Based Menu Education to Improve Dietary Management in Patients with Type 2 Diabetes Mellitus

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Abstract

Background: Dietary self-management is essential for maintaining glycemic control and preventing complications in patients with type 2 diabetes mellitus (T2DM). However, difficulties understanding dietary recommendations and planning appropriate meals may affect adherence. Flashcard-based menu education offers a simple visual approach to improve dietary understanding, although evidence regarding its effectiveness in Indonesian primary healthcare settings remains limited.
Objective: To compare short-term dietary self-management scores in patients who received flashcard-based menu education and those who continued usual care.
Methods: This non-randomized, two-group pretest–posttest study involved 40 patients with T2DM, equally allocated to intervention and control groups, at a community health center in Banda Aceh, Indonesia. The intervention group received flashcard-based menu education over seven days, while controls continued usual care. Dietary self-management was assessed using a shortened 16-item adaptation of the Self-Management Dietary Behavior Questionnaire (SMDBQ). Between-group posttest differences were analyzed using the Mann–Whitney U test.
Results: Mean dietary self-management scores increased from 35.80 to 49.05 in the intervention group, whereas control scores changed slightly from 36.50 to 36.05. Posttest scores differed significantly between groups ($U = 3.00$, $Z = -5.35$, $p < 0.001$). However, the unadjusted comparison could not exclude potential confounding factors.
Conclusion: Flashcard-based menu education was associated with improved dietary self-management scores after seven days among patients with T2DM. Nevertheless, the non-randomized design, small sample size, and unverified validity of the adapted questionnaire limit causal interpretation. Further randomized studies with validated instruments and longer follow-up are recommended.

Keywords: Dietary management, Flashcards, Menu Planning, Type 2 Diabetes Mellitus, Patient education

INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) remains one of the diseases with the highest prevalence nationally. According to the Aceh Health Office Profile published by the Aceh Health Office (2023), there were 16,796 new cases of diabetes mellitus recorded throughout 2023. Overall, there were 154,889 people with diabetes mellitus across Aceh Province. One of the areas with the highest number of T2DM patients in

Aceh Province is Banda Aceh City, with a reported total of 15,404 patients (1,2)

The main factors contributing to the increasing number of patients with Type 2 Diabetes Mellitus (T2DM) are unhealthy lifestyles, such as an unbalanced diet (3). Proper dietary management, including adherence to an appropriate dietary pattern, can help control blood glucose levels (4). One of the most prominent problems among patients with T2DM is their low level of understanding and adherence to proper dietary management and meal planning. Many patients with T2DM have difficulty understanding and following the recommended diet, and some of them do not yet fully understand how to manage their food menu appropriately and according to their dietary needs (5);(6)

Dietary management is recommended as one of the primary measures to prevent further complications. Successful disease control in patients with type 2 diabetes mellitus (T2DM) is determined by patients' adherence to managing their daily dietary patterns or diet (7). One dietary management model used for patients with T2DM is the 3J model (meal schedule, meal quantity, and food type), which refers to the timing, amount, and type of food consumed (8). The 3J dietary model is implemented through the Plate Method (PM), which involves dividing the food on a plate into three portions: 25% protein, 25% carbohydrates, and 50% vegetables, accompanied by fruit and snacks/inter-meal beverages (9).

Understanding of dietary management is provided through flashcards as a new innovation in dietary menu management for patients with type 2 diabetes mellitus (T2DM) (10). A study conducted by Darmawan in 2019, entitled "The Role of the 3J Diet in Patients with Diabetes Mellitus at Sudiang Raya Community Health Center, Makassar," showed that the implementation of the 3J diet for three days resulted in a reduction in blood glucose levels (11).

A study conducted by Aprillia (2024), entitled "The Effect of Health Education Using Flashcard Media on the Knowledge and Attitudes of Patients with Type 2 Diabetes Mellitus Regarding Foot Care at Cakranegara Community Health Center," demonstrated a difference in patients' knowledge and attitudes regarding foot care before and after receiving health education through flashcard media (12).

The most notable difference between this study and previous studies lies in the approach and focus of the intervention. Information regarding dietary menu management, including the types of menus that can be consumed by patients with type 2 diabetes mellitus (T2DM) undergoing dietary therapy, is presented in the form of flashcards as an appropriate educational medium (13);(14)

Based on interviews conducted by the researchers at the Banda Aceh City Community Health Center, it was found that 3 out of 4 patients reported that they did not yet fully understand the types of food menus that could be consumed by patients with type 2 diabetes mellitus (T2DM). Some patients undergoing dietary therapy also reported feeling bored with the prescribed diet.

The research question in this study is: "Is there an effect of flashcard-based menu management on dietary management among patients with type 2 diabetes mellitus at the Banda Aceh City Community Health Center" This study aims to determine the effectiveness of flashcard-based menu management in improving dietary management among patients with type 2 diabetes mellitus at the Banda Aceh City Community Health Center.

METHODS

Study Design

This study employed a quantitative approach with a quasi-experimental design, specifically a two-group pretest–posttest design. The study involved an intervention group and a control group. The participants were assigned to the two groups non-randomly. The data were analyzed using univariate and bivariate analyses to determine the relationships between the measured variables (15)

Participants

The source population consisted of 139 patients with type 2 diabetes mellitus recorded at the community health center from October to December 2024. Purposive sampling was used. Although an initial sample-size calculation yielded 58 participants, the final analyzed sample comprised 40 participants (20 per group). The manuscript must clearly document why 18 otherwise eligible participants were not

included and whether exclusion occurred before or after group assignment, because post hoc selection for 'homogeneity' may introduce selection bias.

Instruments

Dietary self-management was assessed using a 16-item version adapted from the Self-Management Dietary Behavior Questionnaire (SMDBQ), covering calorie-needs recognition, healthy food selection, meal scheduling, and dietary behavior. Because the original instrument contains 33 items, use of a shortened 16-item version requires evidence of content validity and reliability for the study population. The scoring range and category thresholds should be reported only if they were validated for this adapted version.

Data Collection

Data were collected from 40 patients with type 2 diabetes mellitus at the Banda Aceh City Community Health Center. Participants were divided into an intervention group (n=20) and a control group (n=20). Both groups completed the Self-Management Dietary Behavior Questionnaire (SMDBQ) as a pretest. The intervention group received a flashcard-based dietary menu for seven days and was instructed to follow the recommended menus for breakfast, lunch, and dinner. The control group received no intervention and continued their usual dietary practices. After seven days, both groups completed the SMDBQ as a posttest. All data were recorded confidentially for analysis.

Data Analysis

Data analysis included descriptive statistics for participant characteristics and outcome distributions. Within-group pretest-posttest changes and between-group post-intervention or change-score comparisons were assessed using tests selected according to the distribution and scale of the data. The manuscript should report the normality assessment, identify the exact test used for each comparison, and present effect estimates with confidence intervals where possible rather than relying on p-values alone.

Ethical Consideration

This study was conducted in accordance with ethical principles for research involving human participants. Ethical approval was obtained from the relevant ethics committee or authorized institution prior to the commencement of the study. In addition, permission to conduct the study was obtained from the Community Health Center where the research was carried out. Before data collection, all participants were provided with an explanation of the study objectives and procedures and were asked to provide informed consent. The privacy and confidentiality of participants were maintained throughout the study, and all data collected were used solely for research purposes. Participation was voluntary, and participants had the right to withdraw from the study at any time without facing any consequences.

RESULTS

Respondents Demographic Data

Table 1. Frequency Distribution of the Demographic Characteristics of Patients with Type 2 Diabetes Mellitus in the Intervention and Control Groups at Community Health Centers in Banda Aceh City (n = 40)

No	Variable	Category	Intervention f (%)	Control f (%)
1	Age	Late Adulthood (36-45)	3 (15.0)	4 (20.0)
		Early Elderly (46-55)	9 (45.0)	9 (45.0)
		Late Elderly (56-65)	8 (40.0)	7 (35.0)
2	Gender	Male	3 (15.0)	6 (30.0)
		Female	17 (85.0)	14 (70.0)
3	Education	Senior High School	19 (95.0)	17 (85.0)
		Higher Education	1 (5.0)	2 (10.0)
		Junior High School	-	1 (5.0)
4	Occupation	Housewife	15 (75.0)	15 (75.0)
		Self-employed	3 (15.0)	2 (10.0)

		Trader	2 (10.0)	2 (10.0)
		Teacher	-	1 (5.0)
5	Duration of Diabetes Mellitus	1 Year	1 (5.0)	2 (10.0)
		2 Year	3 (15.0)	3 (15.0)
		3 Year	7 (35.0)	5 (25.0)
		4 Year	4 (20.0)	5 (25.0)
		5 Year	4 (20.0)	4 (20.0)
		6 Year	1 (5.0)	1 (5.0)
	Total		20 (100.0)	20 (100.0)

Univariate Data of the Intervention and Control Groups

Table 2. Frequency Distribution Based on Pretest and Posttest Results of Dietary Management (SMDBQ) in the Intervention and Control Groups Among Patients with Type 2 Diabetes Mellitus at Puskesmas in Banda Aceh City (n = 40)

No	Dietary Management	Intervention f (%)	Control f (%)
		Pretest	
1	Low	2 (10.0)	3 (15.0)
2	Moderate	18 (90.0)	17 (85.0)
3	High	0 (0.0)	0 (0.0)
	Total	20 (100.0)	20 (100.0)
		Postest	
1	Low	0 (0.0)	6 (30.0)
2	Moderate	5 (25.0)	14 (70.0)
3	High	15 (75.0)	0 (0.0)
	Total	20 (100.0)	20 (100.0)

Mean Differences in Dietary Management Between the Intervention and Control Groups

Table 3. Distribution of Mean Dietary Management Scores in the Intervention and Control Groups at Puskesmas in Banda Aceh City (n = 40)

Group	N	Mean	Min	Max	Standard Deviation
Pre Test Intervention Group	20	35.80	29.0	43.0	3.578
Post Test Intervention Group	20	49.05	41.0	52.0	2.819
Pre Test Control Group	20	36.50	30.0	45.0	4.033
Post Test Control Group	20	36.05	30.0	45.0	4.419

Comparison of Dietary Management on the Effectiveness of Flashcard-Based Menu Planning Between the Intervention and Control Groups Among Patients with Type 2 Diabetes Mellitus at Community Health Centers in Banda Aceh

Table 4. Comparison (Mann–Whitney Test) of the Intervention and Control Groups Regarding Dietary Management Among Patients with Type 2 Diabetes Mellitus at Community Health Centers in Banda Aceh

	Post-Test Scores
Mann-Whitney U	3.000
Wilcoxon W	213.000
Z	-5.350
Asymp. Sig. (2-tailed)	<,001

Data collection for this study was conducted from June 2 to June 30, 2025, among patients with type 2 diabetes mellitus (T2DM) at the Banda Aceh City Community Health Center. A total of 40 respondents participated in the study, consisting of 20 respondents in the intervention group and 20 respondents in the control group. Based on the results of the study (16).

Based on the results presented in Table 1, the frequency distribution of the demographic characteristics of patients with type 2 diabetes mellitus (DM) in the intervention group showed that the highest proportion by age was in the early elderly group (46–55 years), consisting of 9 respondents (45.0%). In terms of sex, the highest proportion was female, with 17 respondents (85.0%). Regarding educational level, the highest proportion were high school graduates, with 19 respondents (95.0%). In terms of occupation, the highest proportion were housewives, with 15 respondents (75.0%). Based on the duration of diabetes, the highest proportion consisted of patients who had been diagnosed with DM for 3 years, totaling 7 respondents (35.0%). Meanwhile, the frequency distribution of the demographic characteristics of patients with type 2 DM in the control group showed that the highest proportion by age was in the early elderly group (46–55 years), consisting of 9 respondents (45.0%). In terms of sex, the highest proportion was female, with 14 respondents (70.0%). Regarding educational level, the highest proportion were high school graduates, with 17 respondents (85.0%). In terms of occupation, the highest proportion were housewives, with 15 respondents (75.0%). Based on the duration of diabetes, the highest proportions were patients who had been diagnosed with DM for 3 and 4 years, with 5 respondents (25.0%) in each group.

Based on the results presented in Table 2, Regarding the distribution of diet management in the intervention group, the pretest showed that the highest number of respondents—18 (90.0%)—fell into the moderate category. At the posttest stage, the majority of respondents (15 or 75.0%) were in the high diet management category. In contrast, the pretest distribution for the control group showed that 17 respondents (85.0%) were in the moderate category; at the posttest stage, the majority (14 or 70.0%) remained in the moderate category.

Based on Table 3, the intervention group had a mean pretest score for dietary management of 35.80, with a minimum score of 29.0, a maximum score of 43.0, and a standard deviation of 3.578. Meanwhile, the mean posttest score for dietary management was 49.05, with a minimum score of 41.0, a maximum score of 52.0, and a standard deviation of 2.819. In the control group, the mean pretest score for dietary management was 36.50, with a minimum score of 30.0, a maximum score of 45.0, and a standard deviation of 4.033. Meanwhile, the mean posttest score for dietary management was 36.05, with a minimum score of 30.0, a maximum score of 45.0, and a standard deviation of 4.419.

The Mann–Whitney U test indicated a statistically significant difference in post-intervention dietary self-management scores between the intervention and control groups ($U=3.000$, $Z=-5.350$, $p<0.001$). Because this was a non-randomized study and baseline-adjusted analysis was not reported, the result should not be interpreted as proof that the intervention alone caused the observed difference.

DISCUSSION

The study found a statistically significant between-group difference in dietary self-management after the seven-day intervention. Participants receiving flashcard-based menu education showed higher post-intervention scores than those receiving usual care. The visual and structured format of flashcards may have supported understanding of food choices, portions, and meal schedules [18]. However, the non-randomized design, small sample, short follow-up, and uncertainty regarding validation of the shortened SMDBQ limit causal interpretation.

Dietary management is a planned and structured effort to regulate the intake of food and beverages consumed by an individual, with the aim of maintaining or improving health status. This management includes food selection, portion control, meal timing, and the adjustment of nutritional needs according to an individual's physical or medical condition (17).

The importance of dietary management has become increasingly recognized with the rising prevalence of non-communicable diseases, such as diabetes mellitus, hypertension, obesity, and

cardiovascular disease (18). An unhealthy and unbalanced diet, characterized by high consumption of saturated fat, sugar, and salt, along with low fiber intake, is one of the major contributing factors to these health problems. Therefore, the implementation of dietary management is an essential preventive as well as therapeutic measure (19).

This study is consistent with the findings of Kusdalinah (2018), which showed a difference in the mean blood glucose levels between the control group, with a mean pre-test value of 278.27 mg/dL and a mean post-test value of 285.67 mg/dL. In the control group, a slight decrease in the mean dietary management score was also observed; however, the decrease was not as substantial as that observed in the treatment (intervention) group. Patients with diabetes mellitus in the control group did not receive dietary management interventions and continued to follow their usual dietary patterns and daily activities. Several patients with diabetes mellitus in the control group who were categorized as having a "moderate" level of dietary management in both the pre-test and post-test may have been influenced by several factors, despite not receiving any specific intervention. These factors may include biological factors, such as hereditary factors, prior knowledge, personal motivation, environmental influences, and health conditions (20).

According to the researchers, the difference in dietary management between the intervention and control groups was also supported by the provision of menu-planning education using flashcards, which presented information in a format that was easier for respondents to understand and remember. The visual presentation of information enabled patients to gain a clearer understanding of recommended foods and foods that should be limited (21). In addition, the use of flashcards facilitated the gradual delivery of information, allowing patients to better apply the knowledge they acquired in their daily lives (22);(23) Therefore, flashcards can serve as an educational medium that can be utilized by healthcare professionals to improve dietary management among patients with type 2 diabetes mellitus.

Limitations

This study has several limitations that should be considered when interpreting the findings. First, the study used a quasi-experimental two-group pretest-posttest design rather than a randomized controlled trial, and participants were selected using purposive sampling. Therefore, the findings may not be fully generalizable to all patients with Type 2 Diabetes Mellitus. Second, the study involved a relatively small sample of 40 participants, consisting of 20 participants in the intervention group and 20 participants in the control group. Third, the study was conducted at one Community Health Center in Banda Aceh, which may limit the applicability of the findings to other healthcare settings or populations. In addition, the flashcard-based dietary menu intervention was provided for seven days. Therefore, the study primarily demonstrates short-term changes in dietary management behavior and does not determine whether the observed improvement can be maintained over a longer period.

CONCLUSION

In this small non-randomized study, flashcard-based menu education was associated with increased self-reported dietary management over seven days. The intervention group mean rose by 13.25 points; the control mean declined by 0.45 points, and posttest scores differed between groups ($U = 3.000$, $p < 0.001$). The findings justify further testing of culturally appropriate visual dietary education, but do not establish an independent or durable intervention effect.

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Author Contributions

RM contributed to the study conception, design, data collection, data analysis, and manuscript drafting. SR contributed to the methodology, data interpretation, critical revision of the manuscript, and final approval of the manuscript. NS contributed to data collection,

interpretation, critical revision of the manuscript, and final approval of the manuscript. All authors have read and approved the final version of the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request. Data are not publicly available due to privacy and ethical restrictions involving participant information.

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