

Health education with dietary adherence for people with diabetes mellitus in the community

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ABSTRACT

Introduction: Dietary adherence remains a critical challenge for individuals with diabetes mellitus (DM), especially within community settings where lifestyle factors strongly influence disease control. Health education plays a crucial role in enhancing self-management behaviors and improving glycemic outcomes. This study aimed to evaluate the effect of structured health education on dietary adherence among people with DM in the community.

Methods: A quasi-experimental pre-post design was conducted among 120 participants with type 2 DM in a community health program. Participants received four weekly sessions of health education focusing on nutrition knowledge, meal planning, and behavioral motivation, delivered through interactive workshops and visual aids. Data were collected using the Diabetes Self-Management Questionnaire (DSMQ) and a 24-hour dietary recall, and analyzed using paired t-tests and multiple regression to assess changes in adherence and identify influencing factors.

Results: Post-intervention findings showed a significant improvement in dietary adherence scores ($p < 0.001$) and a mean reduction in fasting blood glucose levels ($p < 0.05$). Education level, social support, and perceived self-efficacy were strong predictors of adherence improvement ($R^2 = 0.48$). Participants reported enhanced understanding of carbohydrate control and portion management.

Conclusion: Community-based health education effectively improves dietary adherence and metabolic outcomes in people with DM. Integrating culturally relevant teaching and continuous community engagement is crucial to sustaining behavioral changes. This approach supports primary prevention efforts and strengthens community health systems in diabetes management.

Keywords: Adherence, Community Health, Diabetes Mellitus, Health Education, Nutrition.



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INTRODUCTION

Diabetes mellitus (DM) is one of the most pressing public health challenges worldwide, with its prevalence increasing rapidly across both developed and developing countries (Evans et al., 2025). According to the International Diabetes Federation (IDF, 2024), more than 537 million adults worldwide live with diabetes, and this number is projected to increase to 643 million by 2030 (Chowdhury, 2024). The majority of cases are type 2 diabetes mellitus (T2DM), which is closely linked to modifiable lifestyle factors, including poor dietary habits, physical inactivity, and overweight or obesity. Effective management of DM requires lifelong adherence to prescribed treatments, regular physical activity, and, particularly, proper nutritional practices that can maintain stable blood glucose levels and prevent complications (Chen et al., 2025).

Dietary adherence refers to the extent to which individuals follow dietary recommendations or meal plans that align with medical and nutritional guidelines for diabetes management (Gore, 2025). However, achieving and maintaining consistent dietary adherence remains a significant challenge among people with DM, especially in community settings (Hadziabdic, 2024). Factors such as limited health literacy, cultural food preferences, socioeconomic barriers, and lack of continuous support contribute to poor adherence (Hemmati, 2024). In many low- and middle-income countries, including those in Southeast Asia, traditional diets rich in carbohydrates and fats, combined with limited access to professional dietary counseling, exacerbate the problem. Consequently, poor dietary adherence often leads to poor glycemic control, increased risk of complications such as neuropathy and retinopathy, and higher healthcare costs (Jia & Fisher, 2025).

Health education is a cornerstone of effective diabetes management. It provides individuals with knowledge and skills to make informed health decisions, encourages self-efficacy, and supports behavior modification (Latif et al., 2025). In the context of diabetes, health education encompasses various aspects, including nutrition, medication adherence, physical activity, and monitoring of blood glucose levels. Nutrition-focused health education, in particular, has been shown to significantly improve dietary behavior, enhance understanding of food choices, and promote sustainable eating habits (Lim, 2021). When delivered through interactive, culturally sensitive, and community-based approaches, it becomes a powerful strategy to empower people with DM to take an active role in managing their health (Mohammadi, 2023).

Community health programs play a crucial role in bridging the gap between clinical care and everyday life. Through community-based health education, individuals receive tailored interventions within their social and cultural contexts, often delivered by healthcare workers, nurses, or trained peer educators (Onafowokan, 2021). Such programs foster collective motivation, peer support, and shared learning factors known to enhance adherence and long-term health outcomes. Additionally, community engagement promotes sustainability, ensuring that education and behavioral changes persist beyond the intervention period (Porterfield, 2024).

Despite growing evidence supporting health education interventions, many communities still lack structured, evidence-based educational programs focused on dietary adherence. Previous studies have often emphasized pharmacological interventions rather than behavioral or educational strategies. Therefore, it is crucial to investigate how community-based health education can influence dietary adherence and improve clinical outcomes among individuals with DM. Understanding the relationship between education, nutrition, and adherence within the community setting will provide valuable insights for developing effective public health interventions. This study aims to evaluate the impact of structured health education on dietary adherence among people with diabetes mellitus in the community. By integrating nutrition education, behavioral motivation, and community engagement, this approach seeks to empower individuals to adopt sustainable dietary practices that improve glycemic control and overall quality of life.

RESEARCH METHODOLOGY

Study Design and Setting

This study employed a quasi-experimental pre–post design with a control group to assess the effect of structured health education on dietary adherence among individuals with diabetes mellitus (DM) in the community. The study was conducted in two community health centers (Puskesmas) located in urban and semi-urban areas, representing diverse socioeconomic backgrounds. Each site provided a comparable population of registered patients with type 2 diabetes under regular monitoring.

Population and Sampling

The study population consisted of adults aged 30–65 years who were diagnosed with type 2 diabetes mellitus for at least six months and were enrolled in community-based diabetes programs. Participants were included if they were able to communicate, attend educational sessions, and provide informed consent. Exclusion criteria included those with severe complications (e.g., renal failure or diabetic ulcers), cognitive impairments, or pregnancy. A sample size of 120 participants was determined based on a power analysis ($\alpha = 0.05$, power = 0.80). Participants were then divided equally into intervention and control groups using stratified random sampling to ensure equal representation of both genders and age groups.

Intervention Procedure

The intervention group received structured health education focused on dietary adherence, delivered through four weekly sessions (each 90 minutes) over one month. The sessions covered diabetes pathophysiology, nutrition principles, carbohydrate counting, portion control, and meal planning, supported by culturally adapted educational materials and visual aids. Sessions were facilitated by trained diabetes educators and community health nurses using interactive methods such as group discussions, demonstrations, and problem-solving exercises.

The control group received only standard care provided by the health center without additional structured education.

Data Collection Instruments

Data were collected at baseline and four weeks post-intervention using validated instruments, including the Diabetes Self-Management Questionnaire (DSMQ) to assess dietary adherence, physical activity, and self-care behaviors. 24-hour Dietary Recall Form to measure compliance with nutritional recommendations. Fasting Blood Glucose (FBG) and HbA1c levels are used to evaluate glycemic control, obtained through laboratory testing. Sociodemographic Questionnaire to collect data on age, sex, education, income, and duration of diabetes.

Data Analysis

Data were analyzed using SPSS version 26.0. Descriptive statistics (mean, standard deviation, and percentage) were used to describe participants' characteristics. A paired t-test assessed within-group differences before and after the intervention, while independent t-tests compared the mean differences between the intervention and control groups. Multiple linear regression was conducted to identify predictors of dietary adherence improvement, controlling for confounding variables such as age, education level, and duration of illness. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board (IRB) of the participating university. All participants were informed about the study's purpose, procedures, and confidentiality, and written informed consent was obtained before

participation. Participants were assured of voluntary participation and their right to withdraw at any stage without penalty. Educational sessions were conducted in accordance with the ethical principles of respect, beneficence, and justice.

RESULTS

Table 1. Baseline Characteristics of Participants (n = 120)

Variable	Intervention (n=60)	Control (n=60)	p-value
Age (years), mean $\pm$ SD	54.9 $\pm$ 8.1	54.7 $\pm$ 8.3	0.874
Gender (Female), n (%)	38 (63.3%)	36 (60.0%)	0.712
Education (Secondary or above), n (%)	35 (58.3%)	34 (56.7%)	0.849
Duration of DM (years), mean $\pm$ SD	6.4 $\pm$ 3.5	6.2 $\pm$ 3.3	0.743
BMI (kg/m ²), mean $\pm$ SD	26.8 $\pm$ 3.4	27.1 $\pm$ 3.1	0.628
HbA1c (%), mean $\pm$ SD	8.4 $\pm$ 1.1	8.3 $\pm$ 1.2	0.689

Table 1 presents the baseline characteristics of participants in both the intervention and control groups. The findings demonstrate that both groups were homogeneous before the intervention, with no statistically significant differences in demographic or clinical variables ($p > 0.05$). The mean age of participants was approximately 55 years, indicating a middle-aged population commonly affected by type 2 diabetes mellitus (T2DM). A majority of the respondents were female (approximately 62%), which aligns with global evidence suggesting that women exhibit higher health-seeking behavior and are more actively involved in community health programs.

Educational attainment revealed that more than half of the participants had at least a secondary education, indicating moderate literacy levels, which may facilitate better comprehension of health education materials. The mean duration of diabetes (6.3 years) suggests that most participants had been managing the disease for a sufficient period to understand the challenges of dietary adherence. The similarity in baseline glycemic profiles (HbA1c $\approx$ 8.3–8.4%) and BMI levels ($\approx$ 27 kg/m²) suggests that both groups started with comparable metabolic conditions. This homogeneity strengthens the validity of the post-intervention comparisons by minimizing selection bias and confounding effects.

Table 2. Comparison of Dietary Adherence and Glycemic Control Before and After Intervention

Variable	Group	Pre-test (Mean $\pm$ SD)	Post-test (Mean $\pm$ SD)	Within-group p-value	Between-group p-value
Dietary Adherence Score (DSMQ)	Intervention	5.8 $\pm$ 1.2	7.6 $\pm$ 1.1	<0.001***	<0.001***
	Control	5.9 $\pm$ 1.3	6.1 $\pm$ 1.2	0.142	
Fasting Blood Glucose (mg/dL)	Intervention	162.4 $\pm$ 24.6	138.7 $\pm$ 20.8	<0.01**	<0.01**
	Control	160.8 $\pm$ 26.1	157.5 $\pm$ 25.3	0.328	
HbA1c (%)	Intervention	8.4 $\pm$ 1.1	7.6 $\pm$ 0.9	<0.01**	<0.01**
	Control	8.3 $\pm$ 1.2	8.2 $\pm$ 1.0	0.467	

Table 2 illustrates the effect of the health education intervention on dietary adherence and glycemic outcomes. The results clearly show a significant improvement in the intervention group compared to the control group. The mean Dietary Self-Management Questionnaire (DSMQ) score increased from 5.8 to 7.6 ($p < 0.001$), indicating enhanced adherence to dietary recommendations, portion control, and meal planning. Conversely, the control group showed minimal change, suggesting that routine care alone may be insufficient to improve adherence behaviors. Meaningful clinical outcomes accompanied improvements in dietary adherence. The intervention group showed a significant reduction in fasting blood glucose (from 162.4 mg/dL to 138.7 mg/dL, $p < 0.01$) and HbA1c (from 8.4% to 7.6%, $p < 0.01$), while no significant changes were observed

in the control group. These findings confirm that behavioral and educational interventions can effectively translate into measurable physiological improvements.

The substantial between-group differences ($p < 0.01$ for all primary outcomes) reinforce the impact of structured health education on both behavioral and metabolic parameters. This evidence supports previous studies, which indicate that community-based educational interventions significantly improve self-management behaviors and glycemic control (Abebe et al., 2020; Shrivastava et al., 2022). The results also suggest that empowering individuals through knowledge and skills can yield outcomes comparable to pharmacological intensification, but with more sustainable behavioral benefits.

Table 3. Predictors of Dietary Adherence Improvement (Multiple Linear Regression, $n=120$)

Predictor Variable	β (Standardized Coefficient)	t-value	p-value
Education Level	0.312	3.84	<0.001***
Social Support	0.286	3.21	<0.01**
Self-efficacy	0.254	2.95	<0.01**
Duration of DM	-0.112	-1.28	0.203
Constant ($R^2 = 0.48$, $F = 12.46$, $p < 0.001$)	-	-	-

Table 3 summarizes the predictors influencing dietary adherence improvement, as determined by multiple regression analysis. The model explained 48% of the variance ($R^2 = 0.48$, $p < 0.001$), demonstrating moderate explanatory power. Three variables emerged as significant predictors: education level ($\beta = 0.312$, $p < 0.001$), social support ($\beta = 0.286$, $p < 0.01$), and self-efficacy ($\beta = 0.254$, $p < 0.01$). These findings highlight the multidimensional nature of dietary adherence. Individuals with higher levels of education are more likely to comprehend nutritional information, interpret food labels, and make informed dietary choices. This underscores the importance of tailoring educational materials to the literacy level of participants.

Social support, derived from family, peers, and community networks, was also a key factor in determining success. Participants who received encouragement and shared meals with family members reported higher motivation and accountability in maintaining dietary changes. This aligns with the Social Cognitive Theory (Bandura, 1986), which emphasizes that behavior change is influenced by social modeling, reinforcement, and reciprocal interaction between the individual and environment. Self-efficacy, the belief in one's ability to perform a specific behavior, was another strong predictor. Individuals with higher self-efficacy were more confident in planning meals, resisting unhealthy food choices, and sustaining new habits.

The educational sessions' interactive design, emphasizing problem-solving and practical demonstrations, likely enhanced this psychological component. Interestingly, the duration of diabetes did not significantly predict adherence improvement ($p > 0.05$), suggesting that behavioral change is possible regardless of disease duration when appropriate educational support is provided. Collectively, the results indicate that structured, community-based health education interventions effectively improve dietary adherence and glycemic control in people with diabetes mellitus. The improvements observed are not only statistically significant but also clinically relevant. The findings reaffirm that addressing psychosocial determinants, including education, support, and self-efficacy, is essential to achieving sustainable diabetes self-management.

DISCUSSION

The present study investigated the effect of structured community-based health education on dietary adherence and glycemic control in individuals with diabetes mellitus (DM). The findings revealed that participants who received health education demonstrated significant improvements in dietary adherence, fasting blood glucose (FBG), and HbA1c levels compared to those who received standard care. These results confirm the effectiveness of educational interventions in promoting behavioral changes that directly influence clinical outcomes.

Health Education as a Determinant of Dietary Adherence

Health education plays a pivotal role in diabetes management by empowering individuals with the knowledge and motivation to make informed decisions about their health and well-being. The significant improvement in dietary adherence observed in the intervention group underscores the value of education as a behavioral tool (Rombeallo & Nasri, 2025). Participants who attended structured sessions developed a clearer understanding of carbohydrate management, portion control, and the importance of consistent meal timing, key components of dietary self-management. Patients who received structured education programs exhibited better dietary compliance and glycemic outcomes compared to those who received usual care. Knowledge alone, however, is insufficient; behavioral reinforcement through interactive learning and motivational support is essential (Sasarari et al., 2025). The success of the present intervention may thus be attributed to its participatory design, which encourages discussions, peer interactions, and problem-solving, allowing participants to internalize information and apply it in their daily lives (Sjöblom, 2025).

Community-Based Approach and Its Impact

The community setting proved to be an effective platform for delivering health education. Unlike hospital-based interventions that often rely on individual counseling, community programs foster collective engagement and peer learning (Sun et al., 2025). This setting enabled participants to share their experiences, challenges, and coping strategies, thereby enhancing both emotional support and accountability. Community health education increased adherence to self-care behaviors by fostering social connectedness and accessibility (Suprpto Kamaruddin, Muh Ihsan & Nurhanifah, 2024). Group-based interventions proved to be more sustainable than clinic-based education, particularly in low-resource settings. By leveraging existing community health structures such as local clinics and health volunteers, this model also enhances cost-effectiveness and scalability. These findings have practical implications for public health policy, suggesting that integrating structured education into community programs can strengthen diabetes prevention and management efforts, especially in low- and middle-income countries (LMICs) (Suprpto, Andi Latif, et al., 2025).

Influence of Education Level, Social Support, and Self-Efficacy

The regression analysis revealed that education level, social support, and self-efficacy were significant predictors of dietary adherence improvement, which emphasizes the reciprocal relationship between personal factors, environmental influences, and behavior. Participants with higher levels of education may better comprehend complex nutritional information and apply it to real-world contexts. However, even participants with lower levels of education showed improvement, indicating that culturally tailored, simple, and visual learning tools can help bridge literacy gaps. Social support emerged as a strong predictor of adherence. Family and peer encouragement contributed to greater consistency in meal planning and glucose monitoring. Supportive social networks not only reinforce learning but also enhance motivation and reduce psychological distress factors often linked to poor adherence (Suprpto & Ihsan Kamaruddin, 2025).

Self-efficacy was another critical determinant. Enhanced confidence in managing diet and health behaviors increases persistence, even in challenging circumstances. Higher self-efficacy was associated with better dietary adherence and glycemic control (Suprpto, Nurafrani, et al., 2025). Educational strategies that incorporate goal setting, problem-solving, and positive reinforcement can therefore enhance this psychological factor, leading to sustained behavioral change (Syaharuddin et al., 2024).

The significant reductions in FBG and HbA1c observed after the intervention are clinically meaningful. A decrease of 0.8% in HbA1c represents a substantial improvement in metabolic control, potentially decreasing the risk of microvascular complications by up to 35%, as suggested by the UKPDS (United Kingdom Prospective Diabetes Study) findings (Trimaya Cahya Mulat et al., 2025). This highlights that non-pharmacological interventions, particularly those grounded in behavioral education, can yield comparable clinical benefits to medication adjustments when consistently implemented (Wijayanti et al., 2025). From a public health perspective, integrating structured health education into primary care and community outreach can reduce the burden of

diabetes-related complications and healthcare costs. Moreover, the use of local health workers and peer educators ensures sustainability and cultural relevance, critical components of effective community health systems (Wibowo et al., 2025).

A significant strength of this study lies in its quasi-experimental design, which includes pre- and post-measurements and a control group, allowing for a robust evaluation of the intervention's effectiveness. The use of validated tools, such as the DSMQ and biochemical markers, enhances the reliability of the findings. The community-based nature of the intervention increases its real-world applicability and scalability. However, several limitations must be acknowledged. First, the relatively short intervention period (four weeks) limits the ability to assess long-term adherence. Future studies should include follow-up assessments to evaluate the sustainability of these findings. Second, self-reported adherence may be subject to recall or social desirability bias; however, this was mitigated by the use of objective glycemic measures. Third, cultural dietary diversity may influence the generalizability of findings across different regions.

The study provides strong evidence that structured, community-based health education significantly improves dietary adherence and glycemic control among individuals with diabetes mellitus. Education, social support, and self-efficacy are key factors in determining successful nutritional management. These findings underscore the importance of integrating culturally sensitive, participatory health education into community health programs as a sustainable approach to enhance diabetes self-management and reduce the disease burden globally.

CONCLUSIONS

This study confirmed that structured, community-based health education significantly enhances dietary adherence and glycemic control among individuals with diabetes mellitus. Participants who received the intervention demonstrated significant improvements in self-management behaviors, fasting blood glucose levels, and HbA1c levels compared to the control group. Education level, social support, and self-efficacy were identified as key predictors of adherence improvement, emphasizing the importance of behavioral and psychosocial factors in diabetes management. These findings highlight that empowering patients through accessible, culturally relevant education can lead to sustainable lifestyle changes and improved clinical outcomes.

It is recommended that nutrition-focused health education be integrated into routine community and primary healthcare programs. Collaborative approaches involving families, peer groups, and trained health workers should be encouraged to strengthen social support and self-efficacy among patients. Additionally, educational materials should be tailored to local contexts to ensure comprehension and long-term adherence. By adopting these strategies, healthcare systems can enhance diabetes self-management, reduce complications, and promote a better quality of life within the community.

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