Riset Informasi Kesehatan, Vol. 14, No. 1 (January 2025)
ISSN 2548-6462 (online), ISSN 2088-8740 (print)

DOI: 10.30644/rik.v14i1.913

Self-care management intervention for glycemic control in type 2 Diabetes Mellitus patients

Sri Wahyuni*, Christina Dewi Prasetyowati, Yanuar Eka Pujiastutik
[1]Study Program of Nursing, Faculty of Health Institut Ilmu Kesehatan Bhakti Wiyata Kediri, Indonesia
*Corresponding author's email: sri.wahyuni@iik.ac.id

Accepted: 15 November 2025; revision: 25 January 2025; published: 31 January 2025

Abstract

Background: Diabetes mellitus (DM) is a chronic condition with severe effects. The prevalence of diabetes mellitus is increasing rapidly overall and is estimated to reach 150 million people worldwide. Long-term complications of diabetes with hyperglycemia will affect the socio-economic conditions and quality of life of patients. Diabetes patients are advised to adopt various self-management decisions and participate in care activities to improve glycemic control. Self-care management strategies assist people with diabetes in making decisions and behaviors that improve health outcomes. Self-care management strategies can be the basis for limiting and preventing serious diabetes-related consequences and financial expenses that emerge from this disease problem. This study aims to evaluate the effect of self-care management interventions on glycemic control in people with diabetes.
Method: The study was quasi-experimental, with a pre-posttest design. This study used the purposive sampling strategy with 80 participants (40 controls and 40 interventions). Data was acquired by a questionnaire from the Godin Leisure-Time Exercise Questionnaire (GLTEQ) and the UK Diabetes and Diet Questionnaire. For normal variables, paired and independent t-tests were utilized, whereas Wilcoxon and Mann-Whitney tests were applied for abnormal variables.
Results: The intervention group showed significant changes in the physical activity variable, dietary habits, and random blood glucose (RBG) levels from the post-test, with a statistically significant result, p-value < 0.05. The control group had changed but was not significant, with a statistical test result p-value > 0.05. There was a comparison of the effectiveness of self-care management intervention between the two groups in physical activity, dietary habits, and RBG (p-value < 0.05).
Conclusion: This study suggests that administering self-care management treatments can enhance glycemic control in diabetic patients. Self-care management intervention can be one of the routine programs given to patients, especially for diabetes mellitus patients at Kediri Hospital.

Keywords: Diabetes mellitus; Glycemic control; Self-care management.

INTRODUCTION

Diabetes mellitus is the most common disease that is found all over the world. It is a chronic disease defined by hyperglycemia (1). Hyperglycemia influences the risk of microvascular illnesses including diabetic retinopathy, neuropathy, and diabetic kidney disease as well as macrovascular complications like heart disease, which are the leading causes of mortality and disability among diabetes people globally (2). Long-term consequences of hyperglycemia also affect socioeconomic conditions and the patient's quality of life (3). Globally, the prevalence of diabetes mellitus is increasing quickly, with type 2 diabetes accounting for 90–95% of cases (4). The number of diabetes mellitus cases is estimated at 150 million people worldwide, which is expected to increase manifold by 2025. The US, China, India, and developing countries, including Indonesia, which ranks fifth globally, account for most diabetes mellitus cases (5).

Type 2 diabetes has problems related to uncontrolled blood glucose, and most patients are unable to regulate optimal self-care management such as regulating appropriate physical activity, managing diet, and controlling glucose levels, which can cause negative impacts. Another impact of uncontrolled blood glucose levels is that they

can increase the economic burden on patients and the healthcare system (6). Blood glucose control is the main factor in successful treatment and patient care because it can prevent diabetic foot, retinopathy, nephropathy, neuropathy, and heart disease. Complications from diabetes mellitus will impair the patient's capacity to control self-care practices, impacting their long-term quality of life (7). Patients with type 2 diabetes must be prepared to manage their condition independently and appropriately to optimize blood glucose control through adequate self-care. Type 2 diabetes patients are expected to be aware of risk factors, illness symptoms, dietary habits, increasing physical activity, monitoring glucose levels, and adhering to medication or insulin use (8). According to a global survey, only 16.2% of type 2 diabetes mellitus patients are willing to embrace the self-care management recommendation (9).

The problems above show that efforts are still needed to improve blood glucose control through self-care management. One effort to improve self-care management can be made through education about self-care management. Previous studies on diabetes self-management education and support (DSMES) have positively influenced the self-care capacities of people with type 2 diabetes (10). Other studies conducted in Iran also showed that type 2 diabetes patients' self-care improved when they received education interventions based on cognitive and social theory (11). According to research in Iraq, giving self-care management interventions for type 2 diabetes outcomes in positive changes in activity, consumption of drugs, and dietary patterns (3).

Self-care management intervention is an instructional strategy that empowers patients to improve their self-care, which is necessary for type 2 diabetes. Many research have explored self-management education in type 2 diabetes mellitus, innovation is still needed in providing education to improve blood glucose control for diabetic patients so that the quality of life for future diabetic patients will be better and more optimal (12). An initial study carried out at a hospital in Kediri showed that the management of glucose levels in people with type 2 diabetes was not optimal (13). Self-care management interventions with a diabetes self-efficacy-enhancing intervention package to improve the optimization of blood glucose control have not been widely carried out and developed by previous researchers. Therefore, this research was conducted to analyze the diabetes self-efficacy-enhancing intervention package on blood glucose regulation in individuals with type 2 diabetes.

Type 2 diabetes includes problems with uncontrolled blood glucose, and most patients are unable to carry out effective self-care management such as regulating appropriate physical activity, managing diet, and controlling glucose levels, which can cause negative impacts. Another impact of uncontrolled blood glucose levels is that they can increase the economic burden on patients and the healthcare system (6). Blood glucose control is the main factor in successful treatment and patient care because it can prevent complications including diabetic foot, nephropathy, neuropathy, retinopathy, and heart disease. Complications from diabetes can impair a patient's capacity to manage self-care activities, impacting their long-term quality of life (7). Appropriate self-care management for type 2 diabetes individuals to improve blood glucose control depends on the patient's readiness to manage the disease independently and appropriately. Patients with type 2 diabetes mellitus are expected to know the risk factors, sickness symptoms, eating arrangements, increasing physical activity, monitoring blood sugar, and compliance with medication or insulin use (8). According to a global survey, only 16.2% of type 2 diabetes mellitus patients are willing to follow the suggested self-care management guidelines. In previous studies, self-care management interventions were carried out by providing education without providing counselling in a closed room, so this is what shows that a diabetes self-efficacy-enhancing intervention package is a unique self-care management intervention.

METHOD

This research approach used a quasi-experimental study using a non-equivalent pre-test and post-test with a control group conducted from June 2023 to September 2023, where the design was chosen because it is not possible to do full randomization of the research subjects. All patients with type 2 diabetes at Kediri Hospital participated in this study. The study included 80 participants, divided into two groups: 40 in the treatment group and 40 in the control group. In this study, the calculation uses G-Power to ensure that the number of samples is sufficient. The G*Power 3.1.9 tool was used to calculate the type error of 0.05 and the power of 0.80. Subjects were chosen using the purposive sampling method. The inclusion criteria include the ability of subjects to communicate well, not experience cognitive impairment, and not have complications from serious illnesses such as diabetic foot ulcers, CVA, and heart disease.

Instruments used to assess glycemic control include physical activity, dietary habits, and blood glucose levels. The Godin Leisure-Time Exercise Questionnaire (GLTEQ) examined physical activity, which has been modified. By using those questionnaires, we were able to measure the patients' metabolic equivalent of task (MET)-hour/week. A total MET-hour/week score of ≥7.5 suggests active physical activity, while a score of <7.5 implies insufficient physical activity (14). Dietary habitation was examined using the UK Diabetes and Diet Questionnaire (UKDDQ), which contains 24 items to analyze the diet and the dietary habits. The measurement data was divided into two categories: an unregulated diet if you eat more than once a week and eat badly. and a restricted diet if you dine more than twice a week and eat well (15). Blood glucose levels were monitored using a glucometer and classified as regulated (<200 mg/dl) or uncontrolled (≥200 mg/dl). Random blood glucose (RBG) levels in peripheral blood were assessed.

The self-care management intervention is carried out by giving a diabetes self-efficacy-enhancing intervention package, which comprises a booklet on self-care management, activities to build self-efficacy through counselling, and follow-up via phone or WhatsApp for the treatment group to encourage the achievement of self-care management continuous with verbal persuasion. Respondents were divided into two groups during the research's implementation: the treatment group and the control group, where at the pre-intervention stage, an assessment of the optimization of blood sugar control would be carried out in the two groups using questionnaires on physical activity, dietary habits, and peripheral blood sugar levels in patients.

The treatment group received standard intervention from the hospital and a diabetes self-efficacy-enhancing intervention package. Subjects were given education through booklets, followed by counselling in a closed room to increase confidence and ability in self-care management. Then, the patient followed up by telephone or WhatsApp every week. The control group received standard intervention from the hospital. The post-test was carried out in both groups a month after the intervention. The post-test was measured by conducting an assessment and filling out a questionnaire on characteristics, physical activity, dietary habits, and blood glucose levels.

Data was analyzed at numerous stages, including editing to confirm data, coding, inserting data, and tabulating. Categorical variables were analyzed using univariate statistics. The chi-square test will be used to assess homogeneity and computer software will be used to do bivariate analyses. To compare before and post-test surveys with normal variables, the Paired and Independent t-tests were employed, while Wilcoxon and Mann-Whitney tests were used with abnormal variables. A significance level of 0.005 was utilized for all tests.

The Health Research Ethics Committee, Institut Ilmu Kesehatan Strada Indonesia, accepted this study under the reference number 000286/EC/KEPK/I/07/2023.

RESULTS

According to Table 1, most

respondents in both the treatment group and the control group are over 50 years old. Most of the respondents in either the treatment group or the control group were female (60% and 57.5%), respectively. Most responders in the intervention group had a low level of education (82.5%). In contrast, practically all the control group's respondents had a low degree of education (77.5%). Most respondents in the intervention and control groups were unemployed, at 45% and 37.5%, respectively. Almost all responders in the intervention and control groups were married, with 92.5% and 87.5% respectively. The intervention group (60%) and control group (52.5%) had diabetes for less than 5 years on average. The comparison of several tests between the intervention and control groups revealed that the respondents' age, sex, education, occupation, marital status, and duration of diabetes were $p > 0.05$. This result implies that there was no difference between the treatment and the control groups.

Table 1. The frequency distribution of respondent's characteristics

Variable	Treatment group (n=40)		Control group (n=40)		*P-value*
	N	%	N	%	
Age (in years					
≤50	13	33.5	14	35	0.813
>50	27	67.5	26	65	
Sex					
Male	16	40	17	42.5	0.820
Female	24	60	23	57.5	
Education					
Low education (≤senior high school)	33	82.5	31	77.5	0.576
Higher education (>senior high school)	7	17.5	9	22.5	
Occupation					
Unemployed	18	45	15	37.5	0.785
Office workers	11	27.5	12	30	
Work outside the office	11	27.5	13	32.5	
Marital status					
Married	37	92.5	36	87.5	0.692
Unmarried/ widow/widower	3	7.5	4	12.5	
Duration of diabetes					
<5 years	24	60	21	52.5	0.499
≥5 years	16	40	19	45.5	

*Chi-squared test

Table 2 demonstrates that dietary habits in the treatment group before the intervention were mostly uncontrolled (72.5%), while after the intervention, they were generally in the regulated diet category (67.5%. Before the intervention, the treatment group's physical activity was typically less than 7.5 MET-minutes per week, but after the intervention, it increased to ≥7.5 MET-minutes/week. Before the intervention, the treatment group's blood glucose levels were ≥200 mg/dl (70%), whereas after the intervention, they were <200 (50%). The treatment group showed significant differences in food habits, physical activity, and blood glucose levels before and after the intervention (p-value < 0.05). Table 2 also reveals that food habits in the control group before and after the routine intervention were mainly controllable (77.67% and 65%, respectively). Before and after the routine intervention, the control group averaged <7.5 MET-minutes/week (72.5% and 55%). The control group's blood glucose levels before and after routine intervention were usually ≥200 mg/dl (72.5% and 57.5%, respectively). In the control group, there were no significant differences in food habits, physical activity, and blood glucose levels before and after the intervention (p-value > 0.05).

ISSN 2548-6462 (online), ISSN 2088-8740 (print)

Table 2. Comparison of blood glucose control in the treatment and control groups

Category	Treatment group (n=30) N (%)		P-value	Control group (n=30) N (%)		P-value
	Before	After		Before	After	
Dietary habits [a]						
Controlled diet	11 (27.5)	27 (67.5)	0.001	9 (22.5)	14 (35)	0.059
Uncontrolled diet	29 (72.5)	13 (32.5)		31 (77.7)	26 (65)	
Physical Activity [a]						
<7.5 MET-minutes/week	28 (70)	12 (30)	0.002	29 (72.5)	22 (55)	0.052
≥7.5 MET-minutes/week	12 (30)	28 (70)		11 (27.5)	18 (45)	
Blood glucose [b]						
<200 mg/dl	10 (25)	22 (55)	0.001	11 (27.5)	17 (42.5)	0.447
≥200 mg/dl	30 (75)	18 (45)		29 (72.5)	23 (57.5)	

Note: [a] Wilcoxon signed ranks test; [b] Paired sample t-test

Table 3. The effect of management intervention on dietary habits, physical activity, and blood glucose levels in diabetic patient

Variable	Treatment group Mean±SD	Control group Mean±SD	P-value
Dietary habits before [a]	1.30 ± 0,464	1.23 ± 0,423	0.449
Dietary habits after [a]	1.68 ± 0,474	1.35 ± 0,483	0.004
Physical activity before [a]	1.30 ± 0,464	1.28 ± 0,452	0.806
Physical activity after [a]	1.60 ± 0,496	1.45 ± 0,504	0.025
Blood glucose before [b]	218.40± 28.25	213.75±39.40	0.064
Blood glucose after [b]	191.47±12.56	211.27±33.86	0.001

[a] Mann-Whitney test, [b] independent sample t-test

Table 3 shows that the dietary habits of patient diabetes increased before and after the intervention; The treatment group experienced a greater rise than the control group, from 1.30 ± 0.464 to 1.68 ± 0.474 and from 1.23 ± 0,423 to 1.35 ± 0,483. The dietary habits of the treatment and control groups changed significantly after the intervention (p=0.004). The physical activity increased before and after the intervention; however, the treatment group increased more than the control group, from 1.30 ± 0.464 to 1.60 ± 0.496 and 1.28 ± 0.452 to 1.45 ± 0.504. The treatment and control groups had significantly different levels of physical activity following the intervention (p=0.025). Blood glucose levels decreased before and after the intervention, with a greater decrease in the treatment group compared to the control group (218.40± 28.25 to 191.47±12.56 and 213.75±39.40 to 211.27±33.86, respectively). The treatment and control groups had significantly different blood glucose levels after the intervention (p=0.01). After the intervention, the p-value for various tests in both groups was <0.005. It confirms that there were differences between the two groups; the use of the diabetic self-efficacy-enhancing intervention package for diabetes mellitus patients was successful.

DISCUSSION

The average age of respondents in this survey was more than 50 years and female. Most respondents work, are married, and have suffered from DM for < 5 years. Several tests comparing the two

groups revealed a p-value > 0.005. It shows that there was no difference between the treatment and control groups. The results of this study indicated that glycemic control comprising of physical activity, dietary habits, and blood glucose levels in patients with diabetes mellitus significantly improved immediately following a month of the intervention. The findings show that the instructional program's diabetes self-efficacy-enhancing intervention package has improved glycemic control in patients. A healthy diet is closely related to eating habits by limiting foods with high sugar and fat content, increasing portions of vegetables and fruit, and limiting certain carbohydrates (16). Furthermore, earlier research indicated a considerably bigger change in frequency and physical activity among patients in the treatment and control groups; there was no significant difference in moderate-intensity physical activity following the intervention between the two groups (17). So, this reveals a contrast from the research results, which showed significant results.

Previous research with randomized controlled trials (RCT) explained that Self-management procedures in type 2 diabetes showed a reduction in HbA1c and increased self-care behavior in numerous countries (18). The current systematic review and meta-analysis revealed evidence of the usefulness of patient-centered self-management care interventions in improving glycemic control and self-care behaviors in individuals with type 2 diabetes (19). Furthermore, previous meta-analysis results investigated numerous variables and found no differences between self-care management treatments in the treatment and control groups on HbA1c levels, BMI, depression, self-care, diabetes awareness, and self-efficacy (20). Self-care management strategies are crucial to excellent diabetes care, and they have been found to enhance outcomes in adult patients with diabetes (21). Another study found that self-care management with a self-instructional approach improves self-care behavior in diabetic patients and that improving proper behavior can reduce long-term effects in patients (22). Self-care management intervention is a critical component of treatment for individuals with chronic diseases, and it is the focus of many therapies. Self-care management intervention has been characterized as the process of keeping healthy through acts that promote health and prevent illness (21).

Improved glycemic control through self-care management interventions is based on a combination of physiological mechanisms such as insulin sensitivity, cortisol control and psychological mechanisms (increased self-awareness and stress management). These self-care management interventions target various aspects of lifestyle that affect blood sugar levels, such as diet, physical activity, medications, and stress management.

There were limitations in the current investigation. The limitations of this study include the relatively short period between the first assessment and follow-up. The short duration of the research (four weeks) meant that when the post-test evaluation was carried out, not all respondents showed optimal changes, even though statistically the results showed significant results. Additionally, this study did not adequately assess the long-term impact of self-care management education on diabetic patients. The study had a limited sample size of 40 patients in both the intervention and control groups. More research on the long-term impact of self-care management interventions with a bigger sample size is suggested.

CONCLUSIONS

The current study shows that self-care management treatments are directly related to glucose control in diabetic patients. Self-care management techniques improve

glucose control in diabetic individuals. It is crucial to encourage self-care management treatments connected to type 2 diabetes to improve self-management and patient outcomes in general.

ACKNOWLEDGEMENTS

Researchers would like to thank the Bhakti Wiyata Institute of Health Science Kediri and Aura Syifa Hospital of Kediri for their support in this study activity so that we can finish it on time.

REFERENCES

1. Tülüce D, Dikici İC, Kaplan Serin E. The effect of education of patients with type 2 diabetes at risk of covid-19 on symptoms and some metabolic outcomes: A randomized controlled study. Prim Care Diabetes. 2023;17(1):3–11.
2. Joanne B Cole, Jose C Florez. Genetics of diabetes mellitus and diabetes complications. Nat Rev - Nephrol. 2020;16:377–90.
3. Abdulah DM, Hassan AB, Saadi FS, Mohammed AH. Impacts of self-management education on glycaemic control in patients with type 2 diabetes mellitus. Diabetes Metab Syndr Clin Res Rev [Internet]. 2018;12(6):969–75.
4. Tamiru S, Dugassa M, Amsalu B, Bidira K, Bacha L, Tsegaye D. Effects of Nurse-Led diabetes Self-Management education on Self-Care knowledge and Self-Care behavior among adult patients with type 2 diabetes mellitus attending diabetes follow up clinic: A Quasi-Experimental study design. Int J Africa Nurs Sci [Internet]. 2023;18(August 2022):100548.
5. Ministry of Health Republic of Indonesia. Profil Kesehatan RI 2017 [Internet]. Jakarta; 2018.
6. Fajriyah N, Firmanti TA, Mufidah A, Septiana NT. A Diabetes Self-Management Education/Support (DSME/S) Program in Reference to the Biological, Psychological and Social Aspects of a Patient with Type 2 Diabetes Mellitus: A Systematic Review. J Ners. 2019;14(3):55–64.
7. Li X, Ge J, He L. Influence of Self-Practice Oriented Teaching plus Psychological Intervention on Blood Glucose Level and Psychological State in Patients with Type 2 Diabetes Mellitus on Insulin Therapy. Evidence-based Complement Altern Med. 2022;2022:1–7.
8. Chatterjee S, Davies MJ, Heller S, Speight J, Snoek FJ, Khunti K. Diabetes structured self-management education programmes: a narrative review and current innovations. Lancet Diabetes Endocrinol [Internet]. 2018;6(2):130–42.
9. Albikawi ZF, Petro-Nustas W, Abuadas M. Self-care Management Intervention to Improve Psychological Wellbeing for Jordanian Patients with Type Two Diabetes Mellitus. Issues Ment Health Nurs. 2016;37(3):190–201.
10. Moses M, Olenik NL. Perceived impact of caregiver's participation in diabetes education classes on implementation of self-care behaviors. J Am Pharm Assoc [Internet]. 2019;59(4):S47–51.
11. Ghoreishi MS, Vahedian-shahroodi M, Jafari A, Tehranid H. Self-care behaviors in patients with type 2 diabetes: Education intervention base on social cognitive theory. Diabetes Metab Syndr Clin Res Rev [Internet]. 2019;13(3):2049–56.
12. Andriyanto A, Hidayati RN. Literature Review: Pemanfaatan Media Promosi Kesehatan (Smartphone) dalam Mencegah dan Mengendalikan Kadar Gula Diabetes Tipe 2. J Ners dan Kebidanan. 2018;5(2):172–7.
13. Medical Record of Aura Syifa Hospital. Number of DM Patients at Aura Syifa Hospital, Kediri, October-December 2022. 2023.
14. Rias YA, Tsai HT, Thato R, Apriyanto BS, Chou KR, Ho SC, et al. Synergistic Interactions of Insufficient Physical Activity and a High Systemic Immune-Inflammation Index on Psychological Problems in Indonesians With Type 2 Diabetes Mellitus. Biol Res Nurs. 2023;0(0):1–11.

15. England CY, Thompson JL, Jago R, Cooper AR, Andrews RC. Development of a brief, reliable and valid diet assessment tool for impaired glucose tolerance and diabetes: The UK Diabetes and Diet Questionnaire. Public Health Nutr. 2017;20(2):191–9.
16. Sanaeinasab H, Saffari M, Yazdanparast D, Karimi Zarchi A, Al-Zaben F, Koenig HG, et al. Effects of a health education program to promote healthy lifestyle and glycemic control in patients with type 2 diabetes: A randomized controlled trial. Prim Care Diabetes [Internet]. 2021;15(2):275–82.
17. Avery L, Flynn D, Van Wersch A, Sniehotta FF, Trenell MI. Changing physical activity behavior in type 2 diabetes: A systematic review and meta-analysis of behavioral interventions. Diabetes Care. 2012;35(12):2681–9.
18. Asmat K, Dhamani K, Froelicher ES, Gul R. A Patient-Centered Self-Management Intervention to Improve Glycemic Control, Self-Efficacy and Self-Care Behaviors in Adults with Type 2 Diabetes Mellitus: A SPIRIT Compliant Study Protocol for Randomized Controlled Trial. Diabetes, Metab Syndr Obes. 2023;16:225–36.
19. Asmat K, Dhamani K, Gul R, Froelicher ES. The efectiveness of patient-centered care vs. usual care in type 2 diabetes self-management: A systematic review and meta-analysis. Front Public Heal. 2022;2–17.
20. Wong SKW, Smith HE, Chua JJS, Griva K, Cartwright EJ, Soong AJ, et al. Effectiveness of self-management interventions in young adults with type 1 and 2 diabetes: a systematic review and meta-analysis. Diabet Med. 2020;37(2):229–41.
21. Riegel B, Westland H, Iovino P, Barelds I, Bruins Slot J, Stawnychy MA, et al. Characteristics of self-care interventions for patients with a chronic condition: A scoping review. Int J Nurs Stud. 2021;14(4):1–10.
22. Wahyuni S, Prasetyowati CD, Pratiwi WN, Alfiadi K. Self-instructional training application on diabetic patients' self-care behaviors. Nurse Media J Nurs. 2021;11(2):268–77.