
SELF CARE EDUCATION TO IMPROVE CONTROL BLOOD SUGAR LEVEL OF DIABETES MELLITUS PATIENT

Witriyani^{1*}, Irba Tartila amtiyaz², Andriani Mei Astuti³ Megumi Sekar Kaori⁴, Della Adelia Cahyaningsih⁵

Universitas Duta Bangsa Surakarta¹⁻⁵

*Correspondence Email: witriyani@udb.ac.id

ABSTRACT

Diabetes mellitus is a chronic and complex medical disease that leads to significant morbidity and mortality. Self care education helps people to perform diabetes self-management in managing and treating such as controlling blood sugar levels. The purpose of this research is to understand the effect of self care education for reducing blood sugar levels in diabetes mellitus patients. The design of this research is a Pre-Experimental with Pretest-Posttest Group Design with a Pretest-Posttest Group Design and to determine the pre and post-test results for each group, a paired t-test was used. To determine the difference between the control and treatment groups, an independent t-test is used. This research was conducted from Juni to agustus 2026. The research location was at the Baki Region Sukoharjo Regency. Respondents in this study were 60 patients that consists of 30 patient as intervention group and 30 patients as a control group. The results of the study show a significant change in blood sugar levels before and after carried out self care education in intervention group. Before being carried out self care education in intervention group, blood sugar levels were with a Mean±SD of 197.8 ± 24.1; meanwhile, after the intervention blood sugar levels became 151.6 ± 18.3 with p value=0,000 (p value< 0.05). Whereas control group Mean±SD of 195.3 ± 22.6; meanwhile, after the intervention blood levels sugar became 187.9 ± 21.0. Self care education decreases in blood sugar levels in patients with diabetes mellitus.

KEYWORDS

Blood Sugar Level, Diabetes Mellitus, Self Care Education



This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both, and it continues to represent one of the fastest-growing global health emergencies of the twenty-first century. According to the tenth edition of the IDF Diabetes Atlas, an estimated 537 million adults aged 20–79 years were living with diabetes in 2021, a figure projected to rise to 783 million by 2045 (Sun et al., 2022). This growing burden is accompanied by substantial morbidity, mortality, and economic cost, particularly when blood glucose levels remain poorly controlled over time. Effective long-term glycemic control depends not only on pharmacological treatment but also on the patient's own self-care behavior, including glucose self-monitoring, dietary regulation, physical activity, medication adherence, and foot care (Ahmad & Joshi, 2023; Camargo-Plazas et al., 2023). Despite the well-documented importance of these behaviors, adherence to self-care practices among patients with DM remains suboptimal in many settings, often due to limited knowledge, low health literacy, and insufficient structured education from health providers (Ong-Artborirak et al., 2023; Butayeva & Ratan, 2023).

Self care education has consistently been shown to improve glycemic outcomes across diverse populations and healthcare settings. Nurse-led and patient-centered education programs have been associated with meaningful reductions in glycated hemoglobin (HbA1c) and blood glucose, alongside improvements in self-efficacy and quality of life (AlHaqwi et al., 2023; Terkes et al., 2024; Değer et al., 2024; Sun et al., 2025). Systematic reviews and meta-analyses further confirm that structured education and support interventions produce statistically significant improvements in glycemic control compared with usual care alone, although effect sizes vary depending on program intensity, duration, and delivery mode (Butayeva & Ratan, 2023; Yimer et al., 2025). In middle-aged and older adults, who carry a disproportionate share of the global diabetes burden, self-care education appears particularly valuable because it addresses common barriers such as low health literacy, comorbidities, and reduced self-efficacy (Ong-Artborirak et al., 2023; Jafari et al., 2024). Several quasi-experimental and randomized trials conducted in community, hospital, and primary-care settings have reported significant post-intervention reductions in blood glucose following structured self-care education, reinforcing the case for wider implementation of such programs in routine diabetes care (Romero-Castillo et al., 2022; Muhali et al., 2024; Changsieng et al., 2023; Prakoso et al., 2024; Zainudin et al., 2024).

Nevertheless, gaps remain in understanding how a comprehensive, multi-topic self-care education program—delivered over a defined period and evaluated against a concurrent control group—affects blood glucose levels in adults with an established DM diagnosis. Based on this background, the present study was designed to evaluate the effect of a structured self-care education program on blood sugar control among patients with diabetes mellitus, using a pretest-posttest control group design.

RESEARCH METHOD

This study used a quasi-experimental design with a pretest-posttest control group approach to evaluate the effect of self-care education on blood glucose control in patients with diabetes mellitus. This design was chosen because random allocation of individual patients was not feasible within the outpatient clinic setting, while still allowing for a concurrent comparison group to control for the effect of time and usual care. The population in this study consisted of patients with diabetes mellitus attending outpatient care at the study site. A total of 60 respondents were enrolled and allocated into two groups:

an intervention group (n = 30), which received the structured self-care education program, and a control group (n = 30), which received usual outpatient care without the structured education program.

The sample was determined using a purposive sampling technique, in which respondents were selected because they met the predetermined inclusion criteria rather than through random selection. The inclusion criteria were: (1) had been diagnosed with DM for at least one year; (2) aged 45–70 years; and (3) willing to participate in and complete every stage of the study, from baseline assessment through the post-intervention evaluation. Patients who did not meet all three criteria, who had severe diabetes-related complications limiting participation, or who were unable to communicate verbally were excluded. Data were analyzed using descriptive statistics to describe respondent characteristics. The normality of blood glucose data was assessed prior to hypothesis testing. A paired t-test was used to compare pretest and posttest blood glucose within each group, and an independent samples t-test was used to compare the posttest blood glucose and the mean change between the intervention and control groups. A p-value < 0.05 was considered statistically significant.

RESULT AND DISCUSSION

Table 1. Characteristics of Respondents by Group (N = 60)

Characteristics	Intervention (n=30) f (%)	Control (n=30) f (%)
Age group		
45–54 years	9 (30.0)	8 (26.7)
55–64 years	14 (46.7)	15 (50.0)
65–70 years	7 (23.3)	7 (23.3)
Sex		
Male	2 (6.7)	8 (26.7)
Female	28 (93.3)	22 (73.3)
Education level		
Elementary/Junior High	13 (43.3)	12 (40.0)
Middle School	11 (36.7)	13 (43.3)
High School	6 (20.0)	5 (16.7)
Duration of DM diagnosis		
1–5 years	12 (40.0)	13 (43.3)
6–10 years	11 (36.7)	10 (33.3)
> 10 years	7 (23.3)	7 (23.3)

Table 2. Blood Glucose Level Before and After the Intervention

Group	Pretest Mean ± SD (mg/dL)	Posttest Mean ± SD (mg/dL)	Mean Difference	t	p-value
Intervention (n=30)	197.8 ± 24.1	151.6 ± 18.3	–46.2	9.87	< 0.001*
Control (n=30)	195.3 ± 22.6	187.9 ± 21.0	–7.4	1.42	0.166

As shown in Table 2, the intervention group demonstrated a statistically significant decrease in mean blood glucose level from pretest to posttest (mean difference –46.2 mg/dL, p < 0.001), whereas the control group showed only a small, non-significant reduction (mean difference –7.4 mg/dL, p = 0.166).

Table 3. Comparison of Blood Glucose Reduction Between intervention and control Group

Comparison	Mean Difference	95% CI	t	p-value
Post test Intervention and Control	–36.3 mg/dL	–45.9 to –26.7	7.65	< 0.001*

An independent t-test comparing posttest blood glucose between groups Table 3 show that a statistically significant between-group difference, with the intervention group showing substantially lower posttest values than the control group (mean difference -36.3 mg/dL and $p < 0.001$).

This study found that a structured self-care education program produced a significant reduction blood glucose among patients with diabetes mellitus, while the control group receiving usual care showed no meaningful change. This finding is consistent with a substantial body of evidence supporting self care education as an effective strategy for improving glycemic outcomes (AlHaqwi et al., 2023; Terkes et al., 2024; Butayeva & Ratan, 2023). The magnitude of improvement observed in the intervention group is comparable to results reported in similar quasi-experimental and randomized studies. while a cluster randomized trial of a nurse-led supportive education program demonstrated significant improvements in control glucose level, diet, physical activity, and medication adherence in the experimental group compared with controls (Changsieng et al., 2023). Similarly, teach-back based insulin pen training among older adults with type 2 diabetes produced significant improvements in self care (Değer et al., 2024), and a pilot randomized trial of a diabetes self care education program in type 1 diabetes reported significant improvement in glucose control rates following the intervention (Romero-Castillo et al., 2022).

Several mechanisms may explain why structured self-care education improves glycemic control. First, education increases patients' knowledge and self-efficacy regarding glucose monitoring, diet, and medication use, which in turn supports more consistent self-care behavior (Ong-Artborirak et al., 2023; Chen et al., 2021). Second, structured education addresses psychosocial barriers such as diabetes distress and low self-efficacy, which have been shown to independently predict poorer self-care behavior (Jafari et al., 2024). Third, repeated contact with health providers during multi-session programs, as used in the present study, appears to reinforce behavior change more effectively than single-session or purely informational approaches, consistent with meta-analytic evidence that empowerment-based and nurse-led interventions produce larger effects on HbA1c and self-efficacy than usual care alone (Chen et al., 2021; Sun et al., 2025).

The absence of significant change in the control group mirrors findings from other controlled studies in which usual care alone, without structured educational reinforcement, was insufficient to produce measurable improvement in glycemic control over a comparable follow-up period (Farmer et al., 2021; Zainudin et al., 2024). This underscores that glycemic improvement is unlikely to occur passively and instead depends on active, structured educational input. Findings from the WHO African Region systematic review and meta-analysis similarly indicate that diabetes self care education and support interventions are moderately to substantially effective in improving glycemic control compared with standard care across diverse low- and middle-income settings (Yimer et al., 2025; Ernawati et al., 2021), supporting the generalizability of the present results beyond high-income healthcare contexts.

The present findings are also consistent with narrative and systematic reviews emphasizing that comprehensive self-care—encompassing glucose monitoring, diet, physical activity, medication adherence, and foot care—collectively contributes to better glycemic outcomes and reduced disease burden (Ahmad & Joshi, 2023; Camargo-Plazas et al., 2023). Programs that address multiple self-care domains simultaneously, as in the present intervention, may therefore be more effective than single-topic education, a pattern also observed in patient-centered self-management interventions among South Asian adults with type 2 diabetes (Asmat et al., 2024) and in web-based programs targeting self-care behaviors and glycated hemoglobin (Eghtedari et al., 2023).

From a nursing practice perspective, these results support the integration of structured, multi-session self-care education into routine outpatient diabetes management, delivered by nurses or trained health educators as part of a broader diabetes self-management education and support (DSMES) framework (Muhali et al., 2024; Prakoso et al., 2024; Silva et al., 2021). Given the rising global prevalence of diabetes (Sun et al., 2022), scalable, low-cost education interventions such as the one evaluated here represent a pragmatic strategy for improving population-level glycemic control, particularly in resource-limited outpatient settings.

CONCLUSION

Structured self-care education significantly improved blood glucose control among patients with diabetes mellitus compared with usual care. These findings support the incorporation of comprehensive, multi-session self-care education covering glucose monitoring, diet, physical activity, medication adherence, and foot care into routine nursing and outpatient diabetes management. Healthcare providers, particularly nurses, are encouraged to deliver structured self-care education as a standard component of diabetes care, and future research should evaluate its long-term effectiveness using larger, randomized, multi-site samples.

Acknowledgments

Thank you to the Ministry of Higher Education, Science, and Technology, the research and community service institution, and Duta Bangsa University Surakarta for the support and funding provided for research and publication.

REFERENCES

- Abo Emara, R., Hamed, M., Awad, M., & Zeid, W. (2021). Effect of diabetes self-management education program on glycemic control in diabetic patients attending the family medicine outpatient clinic, Suez Canal University Hospital, Ismailia, Egypt. *The Egyptian Journal of Internal Medicine*, 33(1), 1–8. <https://doi.org/10.1186/s43162-021-00058-9>
- Ahmad, F., & Joshi, S. H. (2023). Self-care practices and their role in the control of diabetes: A narrative review. *Cureus*, 15(7), e41409. <https://doi.org/10.7759/cureus.41409>
- AlHaqwi, A. I., Amin, M. M., AlTulaihi, B. A., & Abolfotouh, M. A. (2023). Impact of patient-centered and self-care education on diabetes control in a family practice setting in Saudi Arabia. *International Journal of Environmental Research and Public Health*, 20(2), 1109. <https://doi.org/10.3390/ijerph20021109>
- Asmat, K., Sivarajan Froelicher, E., Dhamani, K. A., Gul, R., & Khan, N. (2024). Effect of patient-centered self-management intervention on glycemic control, self-efficacy, and self-care behaviors in South Asian adults with type 2 diabetes mellitus: A multicenter randomized controlled trial. *Journal of Diabetes*, 16(3), e13611.
- Butayeva, J., & Ratan, Z. A. (2023). The impact of health literacy interventions on glycemic control and self-management outcomes among type 2 diabetes mellitus: A systematic review. *Journal of Diabetes*, 15(9), 724–735. <https://doi.org/10.1111/1753-0407.13436>

- Camargo-Plazas, P., Robertson, M., Alvarado, B., Paré, G. C., Costa, I. G., & Duhn, L. (2023). Diabetes self-care and the older adult. *PLOS ONE*, 18(8), e0288797. <https://doi.org/10.1371/journal.pone.0288797>
- Changsieng, P., Pichayapinyo, P., Lagampan, S., & Lapvongwatana, P. (2023). Implementation of self-care deficits assessment and a nurse-led supportive education program in community hospitals for behavior change and HbA1c reduction: A cluster randomized controlled trial. *SAGE Open Nursing*, 9, 1–12. <https://doi.org/10.1177/21501319231181106>
- Chen, Y., Tian, Y., Sun, X., Wang, B., & Huang, X. (2021). Effectiveness of empowerment-based intervention on HbA1c and self-efficacy among cases with type 2 diabetes mellitus: A meta-analysis of randomized controlled trials. *Medicine*, 100(38), e27353. <https://doi.org/10.1097/MD.00000000000027353>
- Değer, T. B., Gönderen Çakmak, H. S., Cihan Erdoğan, B., & Değer, M. Ö. (2024). Effect of insulin pen training using the teach-back method on diabetes self-management, quality of life, and HbA1c levels in older patients with type 2 diabetes: A quasi-experimental study. *Healthcare*, 12(18), 1854. <https://doi.org/10.3390/healthcare12181854>
- Eghtedari, M., Goodarzi-Khoigani, M., Shahshahani, M. S., Javadzade, H., & Abazari, P. (2023). Is web-based program effective on self-care behaviors and glycated hemoglobin in patients with type 2 diabetes: A randomized controlled trial. *Iranian Journal of Nursing and Midwifery Research*, 28(6), 723–729. https://doi.org/10.4103/ijnmr.ijnmr_59_22
- Ernawati, U., Wihastuti, T. A., & Utami, Y. W. (2021). Effectiveness of diabetes self-management education (DSME) in type 2 diabetes mellitus (T2DM) patients: Systematic literature review. *Journal of Public Health Research*, 10(2), 2240. <https://doi.org/10.4081/jphr.2021.2240>
- Farmer, A., Bobrow, K., Leon, N., Williams, N., Phiri, E., Namadingo, H., et al. (2021). Digital messaging to support control for type 2 diabetes (StAR2D): A multicenter randomized controlled trial. *BMC Public Health*, 21, 1–14. <https://doi.org/10.1186/s12889-021-11874-7>
- Holloway, D., James, S., Ekinci, E., & Craft, J. (2023). Systematic review of the effectiveness of nurse-led care in reducing glycated haemoglobin in adults with Type 1 or 2 diabetes. *International Journal of Nursing Practice*, e13135.
- Jafari, A., Moshki, M., Naddafi, F., Taghinezhad, F., Charoghchian Khorasani, E., Karimian, N., Farhadian, Z., & Alizadeh, H. (2024). Application of the path analysis model to evaluate the role of distress, mental health literacy and burnout in predicting self-care behaviors among patients with type 2 diabetes. *Diabetology & Metabolic Syndrome*, 16, 130. <https://doi.org/10.1186/s13098-024-01375-z>
- Muhali, S. S., Muhali, F. S., Mfinanga, S. G., Sadiq, A. M., Marandu, A. A., Kyala, N. J., Said, F. H., Nziku, E. B., Mirai, T. E., Ngocho, J. S., Mlay, H. L., Waria, G. G., Chambega, A., Kessy, S. N., Kilonzo, K. G., Lyamuya, F. S., Mkwizu, E. W., Shao, E. R., & Chamba, N. G. (2024). Impact of self-monitoring blood glucose on glycaemic control among insulin-treated patients with diabetes mellitus in northeastern Tanzania: A randomised controlled trial. *Journal of Diabetes Research*, 2024, 6789672. <https://doi.org/10.1155/2024/6789672>
- Ong-Artborirak, P., Seangpraw, K., Boonyathee, S., Auttama, N., & Winaiprasert, P. (2023). Health literacy, self-efficacy, self-care behaviors, and glycemic control among older adults with type 2 diabetes mellitus: A cross-sectional study in Thai communities. *BMC Geriatrics*, 23, 297. <https://doi.org/10.1186/s12877-023-04010-0>

- Prakoso, A. B., Khasanah, U., Anggraini, D., & Nurhayati, N. (2024). The evidence-based nursing practice: Application of diabetes self-management education to lowering blood glucose. *International Journal of Global Health Research*.
- Romero-Castillo, R., Pabón-Carrasco, M., Jiménez-Picón, N., & Ponce-Blandón, J. A. (2022). Effects of a diabetes self-management education program on glucose levels and self-care in type 1 diabetes: A pilot randomized controlled trial. *International Journal of Environmental Research and Public Health*, 19(23), 16364. <https://doi.org/10.3390/ijerph192316364>
- Silva, A. L. D. A., Santos, C. M. S., Oliveira, M. V. G., et al. (2021). Factors related to negative self-care adherence in individuals with diabetes mellitus. *Revista Rene*, 22, e70902.
- Sun, H., Saeedi, P., Karuranga, S., Pinkepank, M., Ogurtsova, K., Duncan, B. B., Stein, C., Basit, A., Chan, J. C. N., Mbanya, J. C., Pavkov, M. E., Ramachandaran, A., Wild, S. H., James, S., Herman, W. H., Zhang, P., Bommer, C., Kuo, S., Boyko, E. J., & Magliano, D. J. (2022). IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. *Diabetes Research and Clinical Practice*, 183, 109119. <https://doi.org/10.1016/j.diabres.2021.109119>
- Sun, J., Fan, Z., Kou, M., Wang, X., Yue, Z., & Zhang, M. (2025). Impact of nurse-led self-management education on type 2 diabetes: A meta-analysis. *Frontiers in Public Health*, 13, 1622988. <https://doi.org/10.3389/fpubh.2025.1622988>
- Terkes, N., Bektas, H., & Balci, M. K. (2024). Effect of web-based education intervention on blood glucose control, self-care and quality of life in patients with type 2 diabetes: A single-blinded randomized controlled trial. *International Journal of Nursing Practice*, 30(6), e13298. <https://doi.org/10.1111/ijn.13298>
- Yimer, Y. S., Addissie, A., Kidane, E. G., Reja, A., Abdela, A. A., & Ahmed, A. A. (2025). Effectiveness of diabetes self-management education and support interventions on glycemic levels among people living with type 2 diabetes in the WHO African Region: A systematic review and meta-analysis. *Frontiers in Clinical Diabetes and Healthcare*, 6, 1554524. <https://doi.org/10.3389/fcdhc.2025.1554524>
- Zainudin, A. M., Rasool, A. H. G., Yaacob, N. M., Muhamad, R., & Mohamed, W. M. I. W. (2024). The effect of USM-IAM-based counselling vs. standard counselling on insulin adherence, FBS and HbA1c among patients with uncontrolled type 2 diabetes mellitus (T2DM): A randomised controlled trial. *BMC Endocrine Disorders*, 24, 118. <https://doi.org/10.1186/s12902-024-01577-6>

Author's short biography

Authors Name:

Name : Witriyani
Affiliation : Universitas Duta Bangsa Surakarta
Phone Number : 083147092665
Email : witriyani@udb.ac.id

Authors Name:

Name : Irba Tartila Amtiyaz
Affiliation : Universitas Duta Bangsa Surakarta
Phone Number : 082156505445
Email : irba_tartila@udb.ac.id

Authors Name:

Name : Andriani Mei astuti
Affiliation : Universitas Duta Bangsa Surakarta
Phone Number : 081269812003
Email : andriani_meiastuti@udb.ac.id
