

# Self-Management Education to Control Blood Sugar Levels and HbA1c Value for Type 2 Diabetes Patients

Derison Marsinova Bakara\*, Kurniyati

Health Polytechnic of Kemenkes Bengkulu, Bengkulu 38225, Indonesia

\*Corresponding Author's Email: [derisonmarsinovab@yahoo.com](mailto:derisonmarsinovab@yahoo.com)

## ABSTRACT

**Background:** Self-care education can be carried out patients with diabetes through the Diabetes Self-Management Education (DSME) method. The DSME method helps people to perform with type 2 diabetes self-management in managing and treating type 2 diabetes, such as controlling blood sugar levels and HbA1c values. **Objective:** The purpose of this research is to understand the effect of DSME for reducing blood sugar levels and decreasing HbA1c values in type 2 diabetes patients. **Methods:** The design of this research is a Pre-Experimental with Pretest-Posttest Group Design with a Pretest-Posttest Group Design, approach which aims to see the use of the DSME method for reducing blood sugar levels and decreasing HbA1c values in type 2 diabetes patients. This research was conducted from July to October 2021. The research location was at the Curup Regional General Hospital, Rejang Lebong Regency. Respondents in this study were 35 patients with type 2 diabetes. The instrument used was the DSME method consisting of 3 instruments, including the theoretical concept of diabetes, care and treatment of diabetes, and complications of diabetes. **Results:** The results of the study show a significant change in blood sugar levels before and after the DSME. Before being carried out, blood sugar levels were with a Mean±SD of 341.60±157.589; meanwhile, after the intervention, blood sugar levels became 107.97±9.984 with a  $p:0.001$ . On the other hand, the HbA1c Value before intervention was Mean±SD 8.4313±2.2610, and after the intervention, the HbA1c value became 6.4553±1.2426 with  $p=0.001$ . **Conclusion:** DSME can be used as an alternative intervention that decreases in blood sugar levels and HbA1c values in patients with type 2 diabetes.

**Keywords:** DSME; HbA1c; Blood Sugar; Type 2 Diabetes Patient

## INTRODUCTION

Diabetes is a severe health problem because of its high prevalence and chronic nature, and the complications it causes. The prevalence of diabetes in adults is 9% and will increase until 2030. The increase in diabetes occurs due to population growth, aging, unhealthy diet, obesity, and lifestyle. Alternative management and treatment can be done by diabetic patient with a self-care health education management approach. Self-care health education management can help patient with type 2 diabetes by applying the Diabetes Self-Management Education (DSME) method. The purpose of improving the management of self-care health education is to give patient with type 2 diabetes mellitus an opportunity to make decisions regarding their disease by encouraging self-management behavior in solving diabetes problems (Grillo *et al.*, 2013). Indonesia ranks 7<sup>th</sup> among ten

countries with the highest number of type 2 diabetes patients on 10.7 million sufferers. Interestingly, Indonesia is the only country in Southeast Asia to be present on the list. Therefore, Indonesia contributed a considerable prevalence of type 2 diabetes in Southeast Asia (Kementerian Kesehatan Republik Indonesia, 2016). Self-care health education management of diabetes and family support can help patient with diabetes to make decisions and carry out self-management and care (Emara *et al.*, 2021).

Patients with type 2 diabetes who do not perform self-care, such as diet, exercise, blood sugar monitoring, and foot care will likely experience complications. This condition occurs because of the low awareness of sustainable self-care management in preventing complications of diabetes. Patients with diabetes who do not carry out self-care directly and indirectly will affect their quality of life, impacting blood sugar levels

Received February 24, 2022; Received in revised form June 5, 2022; Accepted June 20, 2022

and higher HbA1c levels (Lee *et al.*, 2019).

Diabetes is a high prevalence and a chronic disease that causes complications. After 15 years, an average of 20% - 30% of patients with diabetes will experience complications (Fares, *et al.*, 2010). Diabetes is a chronic disease whose impact can be managed independently on health conditions in the treatment process. Self-care health education management is necessary to assist the treatment process and manage diabetes (Fajriyah *et al.*, 2019). Additionally, diabetes in its development can cause serious complications such as cardiovascular disease, end-stage renal disease, vision loss, amputation, neuropathy, infection, and cognitive impairment (Lambrinou, Hansen, & Beulens, 2019).

Diabetes requires self-care management that must be carried out by the patient himself in treatment and prevention to prevent complications (Diabetes, 2020). Incidence rate of patient with diabetes type 2 diabetes has increased due to the aging process and lifestyle changes. Self-care health education management is the basis for treating patient with type 2 diabetes seeking to prevent complications. DSME is one method that can help patient with type 2 diabetes strengthen self-management in managing care for people with type 2 diabetes (Song, Xu, & Sun, 2014). Moreover, type 2 diabetes is an epidemic disease with a rapidly growing prevalence. There have been various efforts in the treatment and management of diabetes. Treatment oriented to hospitalization has changed to a proactive and prevention-based treatment plan. Recent guidelines emphasize a more comprehensive treatment plan through a self-management approach to diabetes education. Self-care health education includes a healthy lifestyle with behavior modification, diet programs, exercise, and medication (Schoo, 2018). DSME proper treatment is essential for people with type 2 diabetes because it can assist self-care and reduce complications due to diabetes (Svartholm, 2010).

## METHODOLOGY

The design of this research is the pre-experimental design method with the pretest-posttest group design approach. The pre-experimental method is an experimental research method with no control group. In this study, the intervention used was the Diabetes Self-Management Education (DSME) method in people with diabetes. Then, blood sugar levels and HbA1c values were assessed before and after intervention among

patients with type 2 diabetes at the outpatient clinic at the Rejang Lebong District General Hospital. Sampling in this research utilized a simple random sampling method.

The sample in this research were patients with type 2 diabetes who were undergoing treatment at the outpatient clinic at the Rejang Lebong District General Hospital. The sampling technique in this study was probability sampling or randomized sampling, and the sample used was 35 in number. Characteristics of the sample in the inclusion criteria were: Patients with type 2 diabetes; meanwhile, exclusion criteria were patients refusing to be respondents or dropping out during the intervention, and having a history of hearing and visual impairment, and mental or cognitive impairment.

The measurement used in this study was the Diabetes Self-Management Education (DSME) method which consisted of 3 instruments, including the theoretical concept of diabetes, Care and treatment of diabetes, and Complications of diabetes. The theoretical concepts of diabetes included Understanding diabetes, Signs and symptoms of diabetes, Types of diabetes, Etiology of diabetes, Pathophysiology of diabetes, Blood sugar levels, HbA1C values.

Data analysis was performed after the normality test, normality test of the data was analyzed using the Shapiro-Wilk to see the difference for reducing blood sugar levels and decreasing HbA1c values in type 2 diabetes patients, before and after DSME. The intervention Diabetes Self-Management Education (DSME) was analyzed using Wilcoxon data analysis. Care and treatment of diabetes mellitus included eating patterns and diet pattern, normal treatment of people with diabetes with insulin and oral drugs, activities, and exercise for people with diabetes. Complications due to diabetes included Hypoglycemia, hyperglycemia, macrovascular complications, microvascular complications.

The data analyzed included respondent characteristics, data normality test, differences in blood sugar levels of patients with type 2 diabetes, differences in HbA1C levels in patients with type 2 diabetes, data were analyzed by Wilcoxon's test.

## Ethical Clearance

This research has passed the ethical test and obtained the Ethics License Number DM.01.04/167/7/VII/ July 23, 2021 by Health Research Ethics Commission of the Bengkulu Health Polytechnic.

RESULTS

Table 1: Respondents Data

Demographic Data	n=30
Age (mean ± SD)	56.03±9.027
- 55	18 (60)
- > 56 and above	12 (40)
Gender:	
- Male	17 (56.70)
- Female	13 (43.30)
Education Level:	
- SMP	5 (16.70)
- SMA	16(53.30)
- PT	9 (30.0)
Employment Status:	
- Working	22 (73.30)
- Not Working	8 (26.70)
Length of Diabetes	
- 5 Years	11 (36.70)
- > 5 Years	19 (63.30)

Table 1 showed that the characteristics of the respondents, including the age of the respondents with most of them being 18 years old (60%), the sexes are primarily male (56.50%), the education level is primarily high school (53.30%), most of the respondents are working (73.30%), and the length of type 2 diabetes is > 5 years (63.30).

Differences in Blood Sugar Levels and HbA1c Values Before and After Diabetes Management Self Education (DMSE)

Variable	Mean±SD	z	95% CI	p
Blood Sugar Levels				
- Before DMSE	341.60±157.589	-4.623	282.76-400.44	0.001
- After (DMSE)	107.97 ±9.984		104.97-111.69	
		-4.478		0.001
	8.4313±2.2610		7.5870-9.2756	
	6.4553±1.2426		5.9913-6.9193	
HbA1c Value				
- Before DMSE				
- After DMSE				

Table 2 shows a change in blood sugar levels before and after DMSE. Before intervention the blood sugar levels Mean±SD was 341.60±157.589; meanwhile after the intervention, it became 107.97±9.984. The results of data analysis concluded that there is an effect of DSME on decreasing blood sugar levels in people with diabetes, as indicated by p=0.001. A similar trend also occurred in the HbA1c value. Before DMSE, the HbA1c value Mean±SD was 8.4313±2.2610; mean while after the intervention the HbA1c value became 6.4553±1.2426. It can be concluded that there is an effect of DSME on the decrease of HbA1c values in patient with diabetes indicated by p: 0.001.

DISCUSSION

Diabetes is a chronic disease requiring people with diabetes to create many self-management decisions every day and perform complex treatment activities. Self-Efficacy is needed to form self-care to prevent complications from type 2 diabetes mellitus (Wahyuni & Ramayani, 2020). DSME can help people with diabetes mellitus sustainability management themselves by increasing the knowledge, skills, and abilities needed for self-care of people with diabetes (Powers *et al.*, 2015). DSME intervention is a method that affects the level of knowledge of people with diabetes in self-care behavior, adherence to diet, and foot care. DSME can increase patients’ knowledge in the treatment of diabetes as measured from the decrease in HbA1C levels in patients with type 2 diabetes mellitus (T2DM). People with diabetes who received DSME intervention experienced a 3-fold reduction in HbA1C levels compared to patients who did not receive DSME (Brunisholz *et al.*, 2014).

DSME is a self-management that helps improve education for people with diabetes to change behavior in self-care (Ningsih *et al.*, 2018). DSME, together with foot exercises, is effective in helping people with type 2 diabetes in lowering blood sugar levels. It has a positive impact in helping the treatment of people with diabetes. Additionally, it can enhance the self-management skills of people with diabetes in self-care, reducing medical costs, and improving quality of life (Luan *et al.*, 2017).

DSME is diabetes management is self-care by people with diabetes mellitus in behavioral interventions to change their lifestyle. Implementation of DSME can help people with diabetes to their regulate diet, physical activity, foot care, controlling sugar levels. DSME can be carried out systematically and sustainably in patient with diabetes using media and appropriate educational methods to control and prevent complications (Vandenbosch *et al.*, 2018). Educational interventions using the DSME method can affect people with diabetes mellitus in maintaining blood sugar levels and significantly affect the HbA1c value (Mohamed *et al.*, 2019). Self-health management is essential for people with diabetes in managing behavior for the long term and helping people with diabetes to improve blood sugar control (Norris *et al.*, 2002). DSME is an effective method in reducing blood sugar levels, HbA1C levels, stress level and can enhance quality of life of people with type 2 diabetes. Therefore, the DSME method can

be used as an intervention for patient with type 2 diabetes (Nooseisai *et al.*, 2021). Management of self-education in patients with diabetes can improve clinical outcomes indicated by the result that after four months of health education, the average HbA1C level is reduced by 12% and the average blood sugar is reduced by 12% (Lavelle *et al.*, 2016).

DSME is an effective health education and is safe for people with diabetes. DSME is proven to control blood sugar and prevent complications in people with diabetes through self-care health education (Mcgowan, 2011). DMSE in forms of health education for people with diabetes aim to increase the management of health education independently so that sufferers can make decisions regarding their disease by encouraging self-management behavior in solving diabetes problems. Increased self-care will increase knowledge and levels of HbA1c values and motivate them to improve their ability to take better care of themselves (Niknami *et al.*, 2014). Self-care management has a positive impact on quality of life, blood glucose assessment, and HbA1c values in patients with diabetes. Therefore, self-care management is recommended to assist people with diabetes mellitus in performing self-care (Ahrari *et al.*, 2021). Education is very effective in helping the treatment of people with diabetes because it can help patients manage and treat the disease (Grillo *et al.*, 2013).

Self-care management can help people with diabetes control blood sugar. Self-monitoring of blood glucose levels can help reduce hemoglobin A1c (HbA1c) levels, minimize blood sugar levels, and help predict hypoglycemia (Surucu, Kizilci, & Ergor, 2017). Self-monitoring education in people with diabetes mellitus can help lower blood glucose and help decrease HbA1c levels and thus positively contribute to the quality-of-life parameters (Lalić *et al.*, 2017). Health education intervention is an effective medium in helping to increase knowledge and attitudes of patient with diabetes mellitus to improve their abilities to control blood sugar (Zibaenezhad *et al.*, 2015). DSME on the health outcomes and quality of life among diabetes

patients, it is important for the primary healthcare clinics to strengthen the diabetes services (Cheng *et al.*, 2018).

### Limitations

There are several limitations in this research that must be acknowledged. First, this study was only conducted in one of the provinces in Indonesia with a small sample size, so the generalizability of the findings is limited. Second, the sample used in this study is small, causing it to be less representative of the study population, even though the participants' characteristics are national characteristics. Future research must be conducted to study the quality of life of patients with diabetes with a more extensive study sample.

### CONCLUSION

The study finding indicates a decrease in both blood sugar and HbA1c levels. The results of this study can be used as essential data for nurses and other health professionals to help patients with diabetes in helping to lower blood sugar levels and HbA1c values through the Diabetes Self-Management Education (DSME) method. Management of people with diabetes mellitus using the DSME method will help sufferers carry out independent management. This can be done by involving them and increasing their knowledge independently so that they will not always depend on health nurses and other health professionals to manage their illness. DSME is ongoing facilitation, covering the knowledge, skills, and abilities needed for self-care of diabetes mellitus patients. DSME focuses on changing behavior and enabling patients to develop practical problem-solving skills and self-efficacy. Future research is expected to conduct research on the quality of life of diabetes mellitus patients with a larger research sample using the DSME method.

### ACKNOWLEDGEMENT

The authors are thankful to all participants who have been willing to provide valuable information in this research. This research was funded by Poltekkes Kemenkes Bengkulu, Indonesia.

### REFERENCES

- Ahrari, F., Mohaqiq, Z., Moodi, M., & Bijari, B. (2021). The Effect of Self-Care Training on Blood Sugar Control, HbA1C Level, and Life Quality of Diabetic Patients in Birjand, East of Iran: A Randomized Clinical Trial Study. *Advances in Preventive Medicine*, 2021, 1. <https://doi.org/10.1155/2021/8846798>

- Brunisholz, K. D., Briot, P., Hamilton, S., Joy, E. A., Lomax, M., Barton, N., ... Cannon, W. (2014). Diabetes self-management education improves quality of care and clinical outcomes determined by a diabetes bundle measure. *Journal of Multidisciplinary Healthcare*, 7, 533–542. <https://doi.org/10.2147/JMDH.S69000>
- Cheng, L. S., Aagaard-Hansen, J., Mustapha, F. I., & Bjerre-Christensen, U. (2018). Malaysian Diabetes Patients' perceptions, Attitudes and Practices In Relation To Self-Care and Encounters with Primary Health Care Providers. *Malaysian Journal of Medical Research (MJMR)*, 2(3), 1-10.
- Emara, R. A., 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). <https://doi.org/10.1186/s43162-021-00058-9>
- Fajriyah, N., Firmanti, T. A., Mufidah, A., & Septiana, N. T. (2019). 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. *Journal Ners*, 14(3), 55. <https://doi.org/10.20473/jn.v14i3.16979>
- Fares, J. E., Kanaan, M., Chaaya, M., & Azar, S. T. (2010). Fluctuations in glycosylated hemoglobin (HbA1C) as a predictor for the development of diabetic nephropathy in type 1 diabetic patients. *International Journal of Diabetes Mellitus*, 2(1), 10–14. <https://doi.org/10.1016/j.ijdm.2009.12.012>
- Grillo, M. D. F. F., Neumann, C. R., Scain, S. F., Rozeno, R. F., Gross, J. L., & Leitão, C. B. (2013). Effect of different types of self-management education in patients with diabetes. *Revista Da Associacao Medica Brasileira*, 59(4), 400–405. <https://doi.org/10.1016/j.ramb.2013.02.006>
- Joint Working Group of the SEC and SEEN for the 2019 ESC guidelines on diabetes, prediabetes, and cardiovascular diseases, Expert Reviewers for the 2019 ESC guidelines on diabetes, prediabetes, and cardiovascular diseases, and the SEC Guidelines Committee, Joint Working Group of the Spanish Society of Cardiology and Spanish Society of Endocrinology and Nutrition on the 2019 ESC guidelines on diabetes, prediabetes, and cardiovascular diseases, Spanish Society of Cardiology, Spanish Society of Endocrinology and Nutrition, Expert reviewers for the 2019 ESC guidelines on diabetes, prediabetes, and cardiovascular diseases, & SEC Guidelines Committee (2020). Comments on the 2019 ESC guidelines on diabetes, prediabetes, and cardiovascular disease. *Revista Espanola De Cardiologia (English ed.)*, 73(5), 354–360. <https://doi.org/10.1016/j.rec.2019.11.018>
- Kementerian Kesehatan Republik Indonesia. (2016). *Profil Kesehatan Indonesia 2016*. In *Profil Kesehatan Provinsi Bali*. <https://pusdatin.kemkes.go.id/resources/download/pusdatin/profil-kesehatan-indonesia/Profil-Kesehatan-Indonesia-2016.pdf>
- Lalić, N. M., Lalić, K., Jotić, A., Stanojević, D., Živojinović, D., Janićijević, A., & Parkin, C. (2017). The Impact of Structured Self-Monitoring of Blood Glucose Combined with Intensive Education on HbA1c Levels, Hospitalizations, and Quality-of-Life Parameters in Insulin-Treated Patients with Diabetes at Primary Care in Serbia: The Multicenter SPA-EDU Stud. *Journal of Diabetes Science and Technology*, 11(4), 746–752. <https://doi.org/10.1177/1932296816681323>
- Lambrinou, E., Hansen, T. B., & Beulens, J. W. J. (2019). Lifestyle factors, self-management and patient empowerment in diabetes care. *European Journal of Preventive Cardiology*, 26(2\_suppl), 55–63. <https://doi.org/10.1177/2047487319885455>
- Lavelle, D., Zeitoun, J., Stern, M., Butkiewicz, E., Wegner, E., & Reinisch, C. (2016). Diabetes Self-Management Education in the Home. *Cureus*, 8(7), 4–11. <https://doi.org/10.7759/cureus.710>
- Lee, S. K., Shin, D. H., Kim, Y. H., & Lee, K. S. (2019). Effect of diabetes education through pattern management on self-care and self-efficacy in patients with type 2 diabetes. *International Journal of Environmental Research and Public Health*, 16(18). <https://doi.org/10.3390/ijerph16183323>
- Luan, L. L., Yang, J., He, Y. F., Huang, Z. X., Liu, L., & Huang, Z. S. (2017). Impact of diabetes education and self-management support on the 4D series of diabetes patients. *Biomedical Research*, 28(3), 1172-1177.

<https://www.alliedacademies.org/articles/impact-of-diabetes-education-and-selfmanagement-support-on-the-4d-series-of-diabetes-patients.html>

- McGowan, P. (2011). The efficacy of diabetes patient education and self-management education in type 2 diabetes. *Canadian Journal of Diabetes*, 35(1), 46-53. [https://doi.org/10.1016/S1499-2671\(11\)51008-1](https://doi.org/10.1016/S1499-2671(11)51008-1)
- Mohamed, A., Staite, E., Ismail, K., & Winkley, K. (2019). A systematic review of diabetes self-management education interventions for people with type 2 diabetes mellitus in the Asian Western Pacific (AWP) region. *Nursing Open*, 6(4), 1424–1437. <https://doi.org/10.1002/nop2.340>
- Niknami, S., Haidarnia, A., Rakhshani, F., Zareban, I., & Karimy, M. (2014). The effect of self-care education program on reducing HbA1c levels in patients with type 2 diabetes. *Journal of Education and Health Promotion*, 3(1), 123. <https://doi.org/10.4103/2277-9531.145935>
- Ningsih, R., Fatmasari, D., Johan, T., & Yuswanto, A. (2018). *International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR) Combination of Diabetic Self Management Education (DSME) with Diabetic Foot Exercises on Blood Sugar Level in Type II Diabetes Patients*. 6(3).
- Nooseisai, M., Viwattanakulvanid, P., Kumar, R., Viriyautsakul, N., Muhammad Baloch, G., & Somrongthong, R. (2021). Effects of diabetes self-management education program on lowering blood glucose level, stress, and quality of life among females with type 2 diabetes mellitus in Thailand. *Primary Health Care Research and Development*, 22. <https://doi.org/10.1017/S1463423621000505>
- Norris, S. L., Nichols, P. J., Caspersen, C. J., Glasgow, R. E., Engelgau, M. M., Jack, L., ... McCulloch, D. (2002). Increasing diabetes self-management education in community settings: A systematic review. *American Journal of Preventive Medicine*, 22(4 SUPPL. 1), 39–66. [https://doi.org/10.1016/S0749-3797\(02\)00424-5](https://doi.org/10.1016/S0749-3797(02)00424-5)
- Powers, M. A., Bardsley, J., Cypress, M., Duker, P., Funnell, M. M., Fischl, A. H., ... Vivian, E. (2015). Diabetes Self-management Education and Support in Type 2 Diabetes: A Joint Position Statement of the American Diabetes Association, the American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics. *The Diabetes Educator*, 41(4), 417–430. <https://doi.org/10.1177/0145721715588904>
- Schoo, K. (2018). *An Evaluation of the Effects of a Diabetes Self-Management Education Program on the HbA1c in Patients with Type 2 Diabetes*. DNP Projects. 204. [https://uknowledge.uky.edu/dnp\\_etds/204](https://uknowledge.uky.edu/dnp_etds/204)
- Song, D., Xu, T. Z., & Sun, Q. H. (2014). Effect of motivational interviewing on selfmanagement in patients with type 2 diabetes mellitus: A meta-analysis. *International Journal of Nursing Sciences*, 1(3), 291–297. <https://doi.org/10.1016/j.ijnss.2014.06.002>
- Surucu, H. A., Kizilci, S., & Ergor, G. (2017). The Impacts of Diabetes Education on Self Care Agency, Self-Care Activities and HbA1c Levels of Patients with Type 2 Diabetes: A Randomized Controlled Study. *International Journal of Caring Sciences*, 10(1), 479.
- Svartholm, S. (2010). Self care activities of patients with Diabetes Mellitus Type 2 in Ho Chi Minh City. *Uppsala Universitet*, 47. urn:nbn:se:uu:diva-126200%5Cnhttp://uu.diva-portal.org/smash/record.jsf?pid=diva2:322414
- Vandenbosch, J., Van den Broucke, S., Schinckus, L., Schwarz, P., Doyle, G., Pelikan, J., ... & Terkildsen-Maindal, H. (2018). The impact of health literacy on diabetes self-management education. *Health Education Journal*, 77(3), 349-362. <https://doi.org/10.1177/0017896917751554>
- Wahyuni, A., & Ramayani, D. (2020). The Relationship Between Self-Efficacy and Self-Care in Type 2 Diabetes Mellitus Patients. *The Malaysian Journal of Nursing (MJN)*, 11(3), 68-75. <https://doi.org/10.31674/mjn.2020.v11i03.011>
- Zibaeenezhad, M. J., Aghasadeghi, K., Bagheri, F. Z., Khalesi, E., Zamirian, M., Moaref, A. R., & Abtahi, F. (2015). The effect of educational interventions on glycemic control in patients with type 2 diabetes mellitus. *International Cardiovascular Research Journal*, 9(1), 17–21. <https://doi.org/10.1155/2021/8846798>