Indonesian Journal of Global Health Research
Volume 7 Number 4, August 2025
e-ISSN 2715-1972; p-ISSN 2714-9749
http://jurnal.globalhealthsciencegroup.com/index.php/IJGHR

THE BENEFITS OF DIABETES SELF MANAGEMENT EDUCATION (DSME) ON GLYCEMIC CONTROL (HBA1C) AMONG ADULT TYPE 2 DIABETES MELLITUS PATIENTS IN SOUTHEAST ASIA: A SYSTEMATIC REVIEW

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ABSTRACT
The number of people with Type 2 Diabetes Mellitus (T2DM) in Southeast Asia ranks second highest compared to other regions in the world. Lifestyle modification is known to be significant in controlling glycemic control in T2DM patients. Diabetes Self-Management Education (DSME), which includes lifestyle changes such as diet modification and physical activity, has been implemented in healthcare facilities in Southeast Asian countries. Nevertheless, evidence on the advantage of DSME for patients with T2DM in Southeast Asia remains limited. This systematic review aims to determine the benefits of DSME on glycemic control (HbA1c) among T2DM patients in Southeast Asia. This systematic review searched for relevant articles from three electronic databases, i.e., MEDLINE (PubMed), ProQuest, and Cochrane from January 1st, 2013 until December 30th, 2024. The inclusion criteria for this review are studies with a randomized controlled trial (RCT) design that evaluate the effect of DSME interventions on glycemic control (HbA1c) in patients with T2DM in Southeast Asian countries. Quality of the included studies were assessed using the Risk of Bias (RoB 2.0) Cochrane Methods Bias. A total of 474 studies were identified from the databases, of which six RCT met the inclusion criteria. The review results showed that patients who received at least 3 months of intervention with lifestyle change education, including both diet modification and physical activity, showed a significant reduction in HbA1c. Educational interventions focusing on self-efficacy, particularly in diet modification, effectively reduced HbA1c by 1.1% after 3 months. The benefit of DSME on reduction of HbA1c varied across the different type of interventions. DSME leads to positive effect on glycemic control among patients with T2DM. The diversity of DSME highlights the need for further evaluation of the impact of different types of DSME on the effectivseness of education in achieving long-term HbA1c reduction. PROSPERO registration number: CRD42025634450.

Keywords: diabetes self management education; glycemic control; HbA1c; type 2 diabetes mellitus

How to cite (in APA style)
Febriani, B., Anggondowati, T., Silalahi, J. V., Fatimah, F., Nurhalimah, N., & Audila, H. (2025). The Benefits of Diabetes Self Management Education (DSME) on Glycemic Control (HBA1C) Among Adult Type 2 Diabetes Mellitus Patients in Southeast Asia: A Systematic Review. Indonesian Journal of Global Health Research, 7(4), 295-306. https://doi.org/10.37287/ijghr.v7i4.6360.

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a significant global health problem. The International Diabetes Federation (IDF) reports that by 2024, approximately 588,7 million adults worldwide will be living with diabetes, the majority of which will be T2DM. This number is projected to increase by 45% to 852,5 million people by 2050 (IDF, 2025). In Southeast Asia, the prevalence of T2DM is of great concern, with estimates showing that approximately 106,9 million adults are affected in 2024, and this number is expected to increase significantly by 73% to 184,5 million in 2025 (IDF, 2025) due to lifestyle changes and urbanization (Chan et al., 2022). The prevalence of T2DM in Southeast Asia is higher than other regions, such as the Americas and Europe. The prevalence of T2DM in Southeast Asia (SEA) reached 12.2% in 2024, whereas in the South & Central America (SACA) and Europe, the average prevalence of T2DM is around 9,2% and 5.3% perspectively (IDF,

2025). In addition, the prevalence of T2DM in various countries in Southeast Asia has increased significantly, especially in the adult population, compared to a more stable trend in Western countries (IDF, 2025). The increasing trend of T2DM cases across Southeast Asia is driven by factors such as rising obesity rates and sedentary lifestyles (Chan et al., 2022), (Purwonugroho et al., 2021). A systematic review showed that lifestyle modifications are essential for glycemic control, yet many individuals in the region struggle with effective self-management practices (Purwonugroho et al., 2021). Further research has also shown that improved health interventions and diabetes education can help reduce diabetes prevalence, yet implementation in resource-limited regions remains a challenge (Cassidy & Chinna, 2017). This emphasizes the need for targeted public health interventions to address the growing diabetes epidemic in Southeast Asia.

A major challenge in managing T2DM in Southeast Asia is controlling and reducing disease prevalence through behavior change. Research shows that healthy behavioral changes, such as increased physical activity and improved diet, can significantly reduce the risk of T2DM (Purwonugroho et al., 2021). However, cultural factors, such as dietary habits and leisure activities, strongly influence the prevalence of T2DM in the region (Chanpiwat & Kim, 2019). For example, a diet rich in simple carbohydrates, such as sticky rice consumption, has been shown to be associated with suboptimal glycemic control (Karki et al., 2023). In addition, economic factors in low- and middle-income countries also contribute to people's behavior and their access to health services. This poses additional challenges in the implementation of effective health interventions. Therefore, integrated and sustainable solutions, which take into account the local cultural and economic context, are essential to address T2DM in Southeast Asia (Purwonugroho et al., 2021), (Chanpiwat & Kim, 2019).

Diabetes self management education (DSME) has been shown to be effective in managing T2DM in Southeast Asia, particularly through lifestyle modification, diet, and blood glucose monitoring. Studies have shown that DSME-based interventions can significantly reduce HbA1c levels, which is an important indicator in glycemic control (Yeemard et al., 2022), (Nielsen et al., 2020). The implementation of DSME by diabetes educators in health facilities has helped patients understand the importance of self-management and behavior change. Studies in Malaysia and Thailand indicated that participation in DSME programs not only significantly reduced blood glucose levels, but also increased patient engagement in self-management practices (Cassidy & Chinna, 2017), (Xue et al., 2024).

Increased knowledge about blood sugar control and emotion management through DSME can reduce the risk of depression, which negatively impacts glycemic control (Cassidy & Chinna, 2017). Moreover, interventions involving social support and health education were shown to increase patient engagement in self-management practices, which in turn improved health outcomes (Chew et al., 2015), (Adu et al., 2024). Therefore, the implementation of DSME integrated with local cultural approaches is essential to address the challenges of T2DM management in Southeast Asia (Premadasa et al., 2024). The effectiveness of DSME in reducing HbA1c levels has been confirmed by various studies, which showed significant reductions in glycemic levels after participation in this educational program (Yeemard et al., 2022), (Hashiguchi et al., 2023). Thus, DSME is a promising approach to improve T2DM control in Southeast Asian countries, with the potential to reduce the burden of disease and complications from T2DM. This study aims to synthesize evidence on the association between DSME and changes in HbA1c levels among adults with type 2 diabetes mellitus (T2DM) in Southeast Asian countries. It is hypothesized that DSME interventions incorporating lifestyle changes—specifically physical activity and dietary modifications—are associated with improved glycemic control, as reflected in reduced HbA1c levels. The

findings are expected to provide a foundation for enhancing the design and implementation of DSME programs across the region, supporting efforts to reduce the burden of T2DM in Southeast Asia, where cultural and contextual similarities allow for the adaptation of effective, evidence-based strategies.

METHOD

Search Strategy

In this systematic review, literature was searched from three electronic databases, namely MEDLINE PubMed, Health and Medical Collection, ProQuest, and CENTRAL the Cochrane Library. The studies included in this review were randomized controlled trials (RCTs) with a minimum intervention duration of 8 weeks and the main outcome analyzed was glycemic control or reduction in blood glucose levels (HbA1C) between groups that performed DSME through diet modification and physical activity compared to the control group. Articles included in this review were published in the period from January 01, 2013 to December 30, 2024, and in English. This systematic review was registered with the National Institute for Health and Care Research PROSPERO with registration number CRD42025634450 (PROSPERO, 2025). The writing of the results of this review referred to PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) (Shamseer et al., 2015).

Inclusion and Exclusion Criteria

The inclusion and exclusion criteria of the systematic review are as follows:

1) Study Design

Included studies were those with Randomized Controlled Trials (RCT) design that evaluated DSME interventions including diet modification and physical activity, and then compared glycemic control (fasting blood sugar level or HbA1C) between T2DM patients in the intervention and control groups. This review only included studies with RCT design because RCT is a superior study design to prove causality compared to observational studies. With randomization, the results of the study will avoid the possibility of bias and confounding.

2) Participants

The intervention studies used were conducted on T2DM patients, both male and female adults aged ≥18 years and from countries in Southeast Asia, namely Brunei, Burma, Cambodia, Timor-Leste, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam, and Singapore. These countries were taken according to the list of Southeast Asian countries based on a search of the MESH term definition on PubMed database including Mekong Valley and Borneo. Studies on patients with diabetes insipidus, gestational diabetes, type 1 diabetes, or a combination of type 1 and type 2 diabetes were excluded from the analysis.

3) Outcome

This review included studies that analyzed glycemic control as an outcome, including glycated hemoglobin or HbA1C blood glucose levels. Articles that examined other than measurement of HbA1c blood glucose levels were excluded. The exclusion criteria encompassed studies focusing on gestational diabetes, type 1 diabetes, and populations outside Southeast Asian countries. Additionally, studies were excluded if the interventions did not include educational components related to physical activity and dietary modification, or if the primary outcomes did not involve measurement of HbA1c levels.

Tabel 1.
PICO Criterion

#	PICO	Criteria
P	Population	• Type 2 diabetes mellitus patients • Adults, i.e. ≥18 years old • From Southeast Asian countries (Brunei, Burma, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Cambodia, Timor-Leste, Vietnam, Mekong Valley and Borneo).
I	Intervention	Health education/Diabetes self management education (DSME) with lifestyle changes (physical activity and diet modification interventions)
C	Comparison	Control group with standard care without DSME
O	Outcome	Glycemic control (HbA1C, glycemic hemoglobin, Glycated hemoglobin, and blood glucose levels)

Data Extraction
Screening of articles based on abstract titles and full text articles was carried out using the PICO approach with the following criteria in Table 1.

Outcome Measures
The search results of articles from the three databases can be seen in the PRISMA flowchart (Figure 1.) The characteristics of the articles with the selected randomized controlled trial design can be seen in Table 2. The outcome or outcome is adult T2DM patients in Southeast Asian countries who receive education with lifestyle changes including diet modification and physical activity statistically significantly reduce HbA1c levels compared to the comparison group.

Study Quality Assessment
Study quality assessment was conducted on the selected articles. Four reviewers (BF, JVS, F and HA) conducted the assessment using a checklist from the Cochrane Methods Bias Risk of Bias (RoB 2.0) guidelines (Cochrane Method of Bias, 2020). The results of the quality assessment of the articles would indicate that the identified studies were suitable for inclusion in the review. Four authors also independently assessed study bias based on the Cochrane Methods Bias Risk of Bias (RoB 2.0) guidelines with 5 key points for visual data to be presented (Cochrane Method of Bias, 2020). Data were inputted using Review Manager software version 5.4.1 to present the data graphically (Review Manager, 2023). Risk of bias assessment included randomization, random allocation, blinding of participants and researchers, blinding of outcome data analysis, and data related to loss-to-follow-up of participants.

Study Selection and Data Extraction
BF, JVS, F and HA independently screened abstract titles for PICO-compliant articles. A full text review was then conducted to determine compliance with the PICOs. If there was a difference of opinion between the four reviewers, two reviewers (TA and N) were rechecked as validators to jointly reach a consensus/final decision. The article data were then extracted into a table containing author information, country, sample size, age of participants, comorbidities, interventions, study duration, and study outcomes.

RESULT
Literature Search
Based on the search results from the three databases, a total of 474 articles were obtained in the nbib and RIS metadata file types. Rayyan application was used to identify duplicate articles and 98 duplicate articles were obtained. The 377 articles were then screened by title and abstract using the Rayyan application resulting in 360 articles excluded because they did

not match the inclusion criteria with the PICO (Population, Intervention, Comparison, Outcome) approach based on the title and abstract.

Based on the title and abstract assessment, 17 studies were identified that fit the inclusion criteria, and at the next stage in the full text screening. The articles were reviewed by two reviewers with a Kappa reliability value of 0.679 (Mary L, 2012). There were four articles that were not available in full text. Thus, a total of 13 articles were included in the assessment of articles based on the inclusion criteria. Of the thirteen articles, 7 of them met the exclusion criteria on the grounds that the population was not suitable, the intervention did not include diet modification and physical activity, the design was not a pure RCT and the HbA1c outcome was not equipped with a mean difference figure. A total of 6 articles were included in the systematic review.

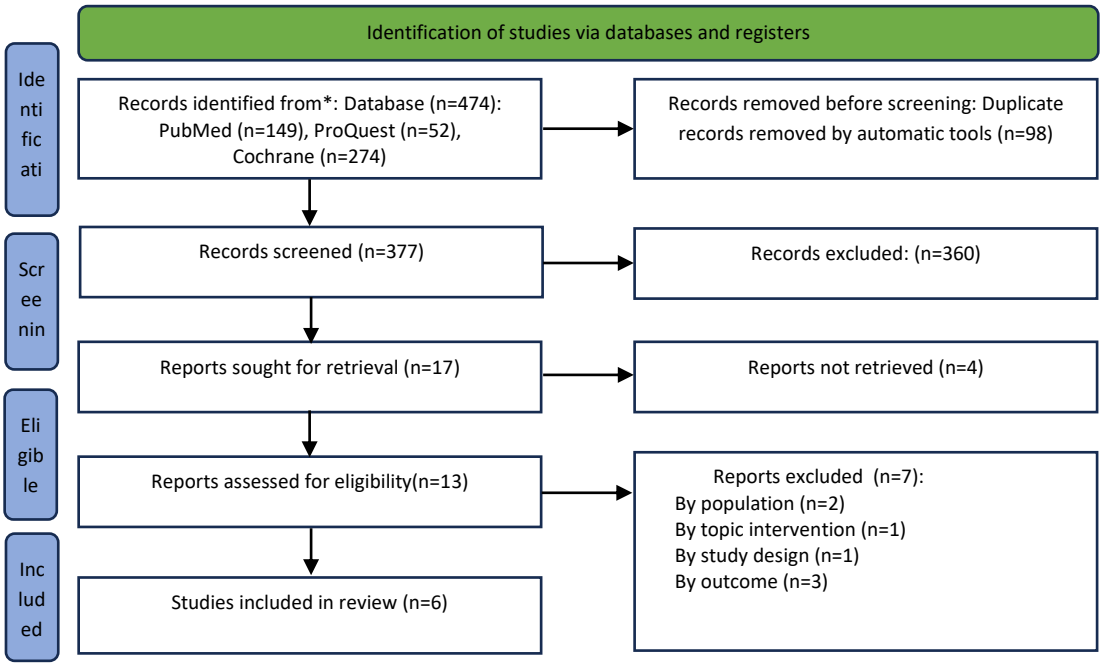

Figure 1. PRISMA Flow Diagram (JBI, 2015)

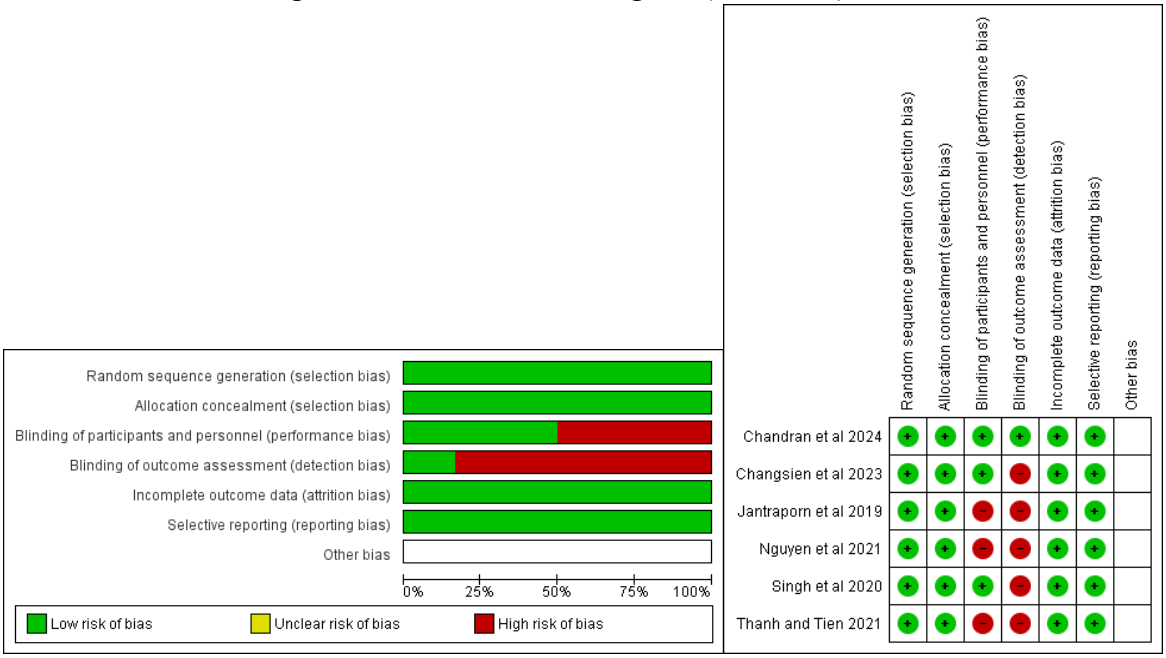

Figure 2 Risk of Bias Rev-Man 5.4. 1 (Review Manager, 2023).

Six full text articles included in the systematic review were subjected to critical appraisal for

randomized controlled trial design using the Cochrane Methods Bias checklist (Cochrane Method of Bias, 2020). In addition, for visual presentation of data, a risk of bias assessment was conducted. Quality assessment of the risk of bias used the Risk of Bias (RoB 2.0) 5 Domain Cochrane Methods Bias tool for randomized trial studies (Cochrane Method of Bias, 2020). Based on the results of the quality assessment, in general, studies included in the systematic review have a low risk of bias, but there are 2 assessment points that still have a high risk of bias. The risk is found in blinding participants and researchers as well as blinding to the analysis of research outcome results.

Study Characteristics

The review was conducted on six articles with RCT designs that had been identified. The independent variable in this systematic review is Diabetes self management education with lifestyle modification in the form of diet modification and physical activity while glycemic control HbA1c or fasting blood sugar levels as the dependent variable. Most of the outcome indicators used as glycemic control are HbA1c. The total number of respondents was 1,019 T2DM patients from various countries.

Table 2.
Summary of Identified Study Characteristics

No	Author	Country	n	Age	Comorbid	Intervention	Duration	Gycemic control
1	Changsieng et al. 2023	Thailand	103	Adult	Type 2 diabetes mellitus patients with HbA1c 7-10% and taking oral glycemic medication	Diabetes self management dengan a Nurse-Led Supportive Education Program for Behavior Change (Changsieng et al., 2023)	12 weeks	HbA1c
2	Chandaran et al. 2024	Singapore	176	21-75 years old	Type 2 diabetes mellitus patients	Diabetes self managament education (Chandran et al., 2024)	24 weeks	HbA1c
3	Jantraporn et al. 2020	Thailand	53	35-59 years old	Type 2 diabetes mellitus patients	Education : dietary self-efficacy (Jantraporn et al., 2020)	12 weeks	HbA1c
4	Nguyen et al. 2021	Vietnam	93	50-65 years old	Pre diabetes mellitus patients with fasting plasma glucose ≥6.1 mmol/L	Lifestyle intervention (a healthy diet and be physical active) (Nguyen et al., 2021)	6 months	Fasting plsama glucose
5	Singh et al. 2020	Malaysia	230	30-65 years old	Type 2 diabetes mellitus patients	Eating self-efficacy (a structure lifestyle intervention) (Singh et al., 2020)	6 months dan 12 months	HbA1c
6	Thanh and Tien 2021	Vietnam	364	40–80 years old	Type 2 diabetes mellitus patients	Group patient education (Thanh & Tien, 2021)	3 months	HbA1c

Effect of DSME with Diet Modification and Physical Activity in Lowering HbA1c Levels

The decrease in HbA1c levels after the diabetes self management education intervention with lifestyle changes both dietary modifications and physical activity resulted in a decrease in HbA1c which can be seen in Table 3.

Table 3.
Decrease in HbA1c levels

Studi	Author	Intervention	Glikemic	Duration	Mean	P value

			control		difference	
1	Changsieng et al. 2023	a Nurse-Led Supportive Education Program for Behavior Change (Changsieng et al., 2023)	HbA1c	12 weeks	-0,7%	<0,001
2	Chandaran et al. 2024	Self-management education (Chandran et al., 2024)	HbA1c	24 weeks	-0,6%	<0,01
3	Jantraporn et al. 2020	Education : dietary self-efficacy (Jantraporn et al., 2020)	HbA1c	12 weeks	-1,1%	<0,002
4	Nguyen et al. 2021	Lifestyle intervention: a healthy diet and be physical active (Nguyen et al., 2021)	Fasting plasma glucose	6 months	-0,2mM	0,518
5	Singh et al. 2020	Transcultural diabetes nutrition alogarithm-motivational interviewing (Singh et al., 2020)	HbA1c	6 months dan 12 months	-1 ± 0,1% -0,5 ± 0,2%	<0,001 <0,007
6	Thanh and Tien 2021	Group patient education (Thanh & Tien, 2021)	HbA1c	3 months	-0,54 ± 1,41%	<0,001

DISCUSSION

This systematic review examined the relationship between diabetes self-management education (DSME) and glycemic control in a population of patients with type 2 diabetes mellitus (T2DM) in Southeast Asia. Most studies featured nurse educator-led interventions that focused on patient-centered goal setting, education on diabetes knowledge, and behavior change strategies. These included dietary planning, physical activity promotion, medication adherence, and psychosocial support. Patients engaged in active discussions with educators to tailor nutrition and exercise plans based on cultural norms, food availability, and individual health conditions. The interventions reviewed frequently incorporated initial assessments of patients' baseline knowledge, lifestyle behaviors, and readiness for change.

Educators used these assessments to guide the development of individualized care plans. Follow-up discussions were held to evaluate progress, provide encouragement, and reinforce behavioral goals. This structured, interactive model promoted trust and motivation, enabling patients to take ownership of their self-care. Across studies, DSME interventions were generally conducted over a minimum duration of three months, which appeared to be sufficient to observe meaningful clinical changes. The most notable outcome was a consistent reduction in HbA1c levels, with several studies showing improvements ranging from 0.5% to over 1.0%. These reductions are both statistically and clinically significant, reducing the risk of diabetes-related complications.

Nurse-led DSME programs based on established behavioral theories, such as Orem's Self-Care Deficit Theory, were particularly effective in improving patient outcomes. For example, Changsieng et al. (2023) reported a -0.7% HbA1c reduction after 12 weeks, alongside improvements in dietary behavior, physical activity, and medication adherence. The intervention used visual tools and practical demonstrations, increasing participant satisfaction and self-efficacy. Motivational interviewing (MI) was another key component in several successful DSME programs. Singh et al. (2020) found that MI significantly improved eating self-efficacy and long-term adherence to healthy behaviors. Participants in the MI group achieved the greatest improvements in diet quality, physical activity levels, and HbA1c (-0.5%) over 12 months. This underscores the value of behavioral counseling approaches in DSME, especially for populations facing emotional or social barriers to healthy living.

Several interventions placed strong emphasis on dietary modification. Participants were guided to reduce refined carbohydrates, increase fruit and vegetable intake, and manage portion sizes. These nutritional strategies aligned with cultural preferences and food

availability, which is crucial in Southeast Asia, where staple diets often include high-carbohydrate foods such as white rice. Tailoring these interventions to local diets enhanced adherence and relevance. The studies consistently demonstrated that dietary behavior change was the most influential factor in improving glycemic control. For example, Jantraporn et al. (2019) observed a significant −1.1% reduction in HbA1c through carbohydrate-focused DSME combined with telemonitoring. Although physical activity did not improve significantly in this case, dietary self-efficacy and healthy food choices markedly increased.

In contrast, Nguyen et al. (2021) implemented a community-based intervention that focused more heavily on physical activity. Participants increased walking time, reduced sedentary behavior, and experienced improvements in weight and HDL-C. While the glucose reduction was modest, the findings suggest that even small increases in physical activity can contribute meaningfully to metabolic health. Physical activity was further promoted in Singh et al.'s (2020) intervention, which prescribed ≥150 minutes/week of exercise. This was associated with sustained weight loss and improved HbA1c. Nonetheless, some studies noted challenges in achieving consistent physical activity changes, particularly among older patients or those with mobility limitations, indicating a need for more tailored or accessible exercise options.

The studies emphasized the importance of cultural adaptation in DSME programs. Using culturally familiar foods, examples, and educational materials improved patient engagement. For instance, the transcultural Diabetes Nutrition Algorithm (tDNA) used in Malaysia helped align nutritional advice with local eating patterns, enhancing relevance and acceptance. Telemonitoring and remote support were explored as viable tools for DSME, especially in resource-limited or rural settings. Jantraporn et al.'s weekly phone calls demonstrated that even brief, remote follow-up could reinforce dietary goals and problem-solving, leading to substantial clinical improvements. These strategies offer scalable options for expanding DSME reach.

Group-based education models also proved effective in Southeast Asia. Thanh and Tien (2021) reported that a 3-month group DSME program significantly improved diabetes knowledge and HbA1c, especially among poorly controlled patients. The social support offered by group sessions helped build confidence and shared accountability, though measurable behavior data were limited. While most interventions yielded positive outcomes, several limitations were noted. Some studies had short durations or lacked long-term follow-up, making it difficult to assess the sustainability of behavior changes. Others did not track specific lifestyle metrics (e.g., exact fruit/vegetable servings, physical activity minutes), which limits the ability to link behaviors directly to clinical outcomes.

Attrition was another common challenge, particularly in studies with longer durations or less frequent follow-up. This highlights the need for flexible, patient-centered delivery models that can accommodate participants' schedules, preferences, and access barriers. Hybrid approaches that blend in-person sessions with digital tools may help address this issue. In line with previous global reviews, this review supports DSME as an effective intervention for reducing HbA1c in T2DM patients (Bekele et al., 2021). Structured education, especially when combined with motivational strategies and culturally relevant content, can lead to meaningful improvements in clinical, behavioral, and psychosocial outcomes. These effects are amplified when the program includes ongoing follow-up, self-monitoring, and personalized support.

The benefits of DSME extend beyond glycemic control. Improved knowledge, confidence in self-care, better decision-making, and reduced emotional distress contribute to a more holistic diabetes management approach. Powers et al. (2020) emphasized that DSME should aim not

only to reduce biomarkers but also to enhance the overall quality of life and self-efficacy of patients. Importantly, DSME can be effectively delivered in a variety of formats-whether individual or group-based, in-person or remote, clinic-based or community-integrated. The flexibility of DSME makes it adaptable for use in Southeast Asia's diverse health systems. It also underscores the critical role of nurses and allied health workers in extending diabetes care beyond physicians and specialists. In conclusion, this review affirms the benefits of DSME interventions, particularly those targeting dietary behavior and physical activity with nurse educator support, for glycemic control among type 2 diabetes patients in Southeast Asia. The success of these programs depends on cultural tailoring, structured follow-up, and empowering patients through knowledge and self-efficacy. Moving forward, DSME should be a central component of national diabetes strategies, especially in low- and middle-income countries, where cost-effective, scalable, and sustainable interventions are urgently needed.

Strengths and limitations

The strength of this review lies in the type of studies reviewed, which were limited to RCTs that could provide strong evidence of the impact of the intervention. Articles used were sourced from three reputable electronic databases specialized in health and health intervention studies. Furthermore, diabetes education is specific to the intervention of diet modification and physical activity in T2DM patients. However, we cannot avoid the limitations of this systematic review. First, the population was not diverse, coming from only 5 countries in Southeast Asia. Second, the education provided used a variety of approaches, which was overcome by determining an approach that focused on diet modification and physical activity interventions. Third, studies with RCT designs were limited, with only a few RCT studies meeting the inclusion and PICO criteria.

CONCLUSION

Overall, Diabetes Self-management Education with lifestyle changes including diet modification and physical activity is effective in glycemic control in T2DM patients in Southeast Asian countries. HbA1c levels will decrease after at least three months of intervention. The intervention that showed the most significant glycemic control was education with a dietary-self efficacy approach. The results of this systematic review can be used as one of the bases in the establishment of type 2 diabetes mellitus management programs in each health service in Southeast Asia. Evaluation of the effectiveness of educational programs needs to be done in producing long-term HbA1c reduction.

REFERENCES

Adu, F. A., Poku, C. A., Adu, A. P., & Owusu, L. B. (2024). The role of social support and self-management on glycemic control of type 2 diabetes mellitus with complications in Ghana: A cross-sectional study. *Health Science Reports*, *7*(4), e2054. https://doi.org/10.1002/hsr2.2054

Cassidy, D., & Chinna, K. (2017). Depression, distress and self-efficacy: The impact on diabetes self-care practices. *PLOS ONE*, *12*(3), e0175096. https://doi.org/10.1371/journal.pone.0175096

Chan, S. P., Aamir, A. H., Bee, Y. M., Deerochanawong, C., Paz-Pacheco, E., Tiu, F., Foo, S. H., Tan, K. E. K., Le, T. Q., Saraswati, M. R., Bunnag, P., Panusunan Sibarani, R., Raza, S. A., & Tran, N. Q. (2022). Practical Guidance on Basal Insulin Initiation and Titration in Asia: A Delphi-Based Consensus. *Diabetes Therapy*, *13*(8), 1511–1529. https://doi.org/10.1007/s13300-022-01286-0

Chandran, R. S., Rahman, N., Gandhi, M., Tan, N. C., Phoon, I. K. Y., Seah, D. E. J., Cheah, M. H., Sek, K., & Gardner, D. S.-L. (2024). Intermittently scanned continuous glucose monitoring provides no benefit over structured self-monitoring of blood glucose in type 2 diabetes not on prandial insulin, in the context of diabetes self-management education: GLucose monitoring programme SingaporE (GLiMPSE). *Diabetes Research and Clinical Practice*, *211*, 111678. https://doi.org/10.1016/j.diabres.2024.111678

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*.

Chanpiwat, P., & Kim, K.-W. (2019). Arsenic health risk assessment related to rice consumption behaviors in adults living in Northern Thailand. *Environmental Monitoring and Assessment*, *191*(11), 674. https://doi.org/10.1007/s10661-019-7836-y

Chew, B., Khoo, E., & Chia, Y. (2015). Social Support and Glycemic Control in Adult Patients With Type 2 Diabetes Mellitus. *Asia Pacific Journal of Public Health*, *27*(2), NP166–NP173. https://doi.org/10.1177/1010539511431300

Cochrane Method of Bias. (2020). *RoB 2: A revised Cochrane risk-of-bias tool for randomized trials | Cochrane Bias*. https://methods.cochrane.org/bias/resources/rob-2-revised-cochrane-risk-bias-tool-randomized-trials

Hashiguchi, O. L., Cox, S. E., Edwards, T., Castro, M. C., Khan, M., & Liverani, M. (2023). How can tuberculosis services better support patients with a diabetes co-morbidity? A mixed methods study in the Philippines. *BMC Health Services Research*, *23*(1), 1027. https://doi.org/10.1186/s12913-023-10015-7

IDF. (2025). *IDF Diabetes Atlas 2025 Global Diabetes Data & Insights*. https://diabetesatlas.org/resources/idf-diabetes-atlas-2025/

Jantraporn, R., Pichayapinyo, P., Lagampan, S., & Mayurasakorn, K. (2020). *Effects of Carbohydrate Reduction Program and Telemonitoring on Glycosylated Hemoglobin in Patients with Poorly Controlled Type 2 Diabetes: A Randomized Controlled Trial*.

JBI, G. (2015). *JBISRIR endorses PRISMA Statement: PRISMA flow diagram*. https://jbi.global/news/article/jbisrir-endorses-prisma-statement

Karki, A., Vandelanotte, C., Khalesi, S., Dahal, P., & Rawal, L. B. (2023). The effect of health behavior interventions to manage Type 2 diabetes on the quality of life in low- and middle-income countries: A systematic review and meta-analysis. *PLOS ONE*, *18*(10), e0293028. https://doi.org/10.1371/journal.pone.0293028

Mary L, M. (2012). *Interrater reliability: The kappa statistic—PMC*. https://pmc.ncbi.nlm.nih.gov/articles/PMC3900052/#abstract1

Nguyen, S. N., Tran, V. D., Le, T. T. M., Nga, H. T., & Tho, N. T. T. (2021). Lifestyle Interventions Reduce the Risk of Type II Diabetes and Cardiovascular Diseases Development among Pre-diabetic Adults. *International Journal Of Pharmaceutical Research And Allied Sciences*, *10*(2), 94–102. https://doi.org/10.51847/8RpiSiVJRG

Nielsen, K. K., Calopietro, M., Yeow, T. P., Tahir Bin Aris, & Bjerre-Christensen, U. (2020). Perceptions and Abilities Related to Patient Engagement In Diabetes Care among Primary Healthcare Providers in Malaysia: A Qualitative Study. *Malaysian Journal of*

Public Health Medicine, *20*(2), 207–214. https://doi.org/10.37268/mjphm/vol.20/no.2/art.280

Premadasa, S. S., Masingboon, K., & Samartkit, N. (2024). Diabetes self-management and its influencing factors among adults with type 2 diabetes mellitus in rural Sri Lanka: A cross-sectional study. *Belitung Nursing Journal*, *10*(4), 448–455. https://doi.org/10.33546/bnj.3441

PROSPERO, N. (2025). *International prospective register of systematic reviews*. https://www.crd.york.ac.uk/prospero/

Purwonugroho, T. A., Budi, R., Laksmi, M., Ika, M., Vitis Vini Fera Ratna, U., Githa Fungi, G., Hanif Nasiatul, B., Hening, P., Pugud, S., Jamaludin Al J., E., & Didik, S. (2021). Community pharmacist home visit-based intervention improved diabetes patients' outcomes: A randomized controlled trial. *Journal of Applied Pharmaceutical Science*. https://doi.org/10.7324/JAPS.2021.110306

Review Manager. (2023). *RevMan. In (Version 5.4.1) Cochrane Training*. https://training.cochrane.org/online-learning/core-software

Shamseer, L., Moher, D., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., & Stewart, L. A. (2015). *Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: Elaboration and explanation*. https://doi.org/10.1136/bmj.g7647

Singh, G. H. K., Chee, W. S. S., Hamdy, O., Mechanick, J. I., Lee, V. K. M., Barua, A., Mohd Ali, S. Z., & Hussein, Z. (2020). Eating self-efficacy changes in individuals with type 2 diabetes following a structured lifestyle intervention based on the transcultural Diabetes Nutrition Algorithm (tDNA): A secondary analysis of a randomized controlled trial. *PLOS ONE*, *15*(11), e0242487. https://doi.org/10.1371/journal.pone.0242487

Thanh, H. T. K., & Tien, T. M. (2021). Effect of Group Patient Education on Glycemic Control Among People Living with Type 2 Diabetes in Vietnam: A Randomized Controlled Single-Center Trial. *Diabetes Therapy*, *12*(5), 1503–1521. https://doi.org/10.1007/s13300-021-01052-8

Xue, H., Li, M., Fan, L., Zou, J., Yang, B., & Du, W. (2024). Metformin-Related Adverse Drug Reactions Among Rural and Urban Adults Aged 45 Years and Older in Jiangsu Province of China, 2010-2020. *Asia Pacific Journal of Public Health*, *36*(1), 146–149. https://doi.org/10.1177/10105395231207675

Yeemard, F., Srichan, P., Apidechkul, T., Luerueang, N., Tamornpark, R., & Utsaha, S. (2022). Prevalence and predictors of suboptimal glycemic control among patients with type 2 diabetes mellitus in northern Thailand: A hospital-based cross-sectional control study. *PLOS ONE*, *17*(1), e0262714. https://doi.org/10.1371/journal.pone.0262714