

Review

Effectiveness of diabetes self-management education (DSME) in type 2 diabetes mellitus (T2DM) patients: Systematic literature review

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Abstract

Diabetes mellitus is a chronic disease characterized by high glucose levels (hyperglycemia) due to metabolic disorders that prevent patients from producing sufficient amounts of insulin. This research aims to test the effectiveness of implementing diabetes self-management education in patients with Type 2 diabetes mellitus. The search for relevant articles was carried out through Google Scholar, PubMed, ProQuest, and Science Direct using the keywords diabetes mellitus, management education, self-care, diabetes self-management education, DSME, T2DM. The articles were then selected based on inclusion and exclusion criteria. Furthermore, the data were extracted, grouped, and concluded. Based on 15 articles, diabetes self-management education intervention provides significant effectiveness to lifestyle changes and the self-care of T2DM patients. In conclusion, diabetes self-management education intervention has been shown to be effective in dealing with type 2 diabetes mellitus. Furthermore, DSME has a positive effect on lifestyle changes and the self-care of T2DM patients.

Introduction

Diabetes mellitus (DM) is a chronic disease characterized by high glucose levels (hyperglycemia) due to metabolic disorders that prevent the patient from producing sufficient amounts of insulin. The disease can be prevented and controlled by engaging in certain behaviors and lifestyles such as regular exercise, healthy eating patterns, avoiding smoking, and controlling fat and glucose in the blood.¹ The World Health Organization stated that the number of people living with diabetes mellitus (DM) worldwide reached 422 million, and every year 1.6 million deaths are recorded.² The prevalence of the disease in the world is estimated to reach 642 million people by 2040. In 2019, the countries with the highest number of DM sufferers were China, India, the United States, Pakistan, Brazil, Mexico, and Indonesia, with an estimated number of 10 million patients.³ The number of people living with diabetes could be much greater than the prevalence described,

because most sufferers only seek medical help after complications occur. The rising prevalence of diabetes mellitus is due to several factors, such as unhealthy behavior.¹ This behavior is still rampant in Indonesian society, and is evidenced by the results of the Basic Health Research 2018,¹ where 13.6% of the residents were overweight, 21.8% had obesity, and 31% central obesity. Other unhealthy habits include the use of tobacco by men (62.9%) and smoking by adolescents (10-18 years) (23.91%).⁴ There are seven major behaviors related to diabetes self-care management, they include diet, physical activity, monitoring blood glucose levels, adherence to proper medication consumption, good problem solving, coping skills, and risk reduction behavior.⁵ Continuous self-care will reduce the incidence of DM complications. However, most DM sufferers do not practice adequate self-care techniques such as controlling fasting blood glucose levels.⁶

DM management focuses on several aspects, namely education, meal planning, changes in lifestyle, physical activity, habits.⁷ One study explained that educational interventions influence knowledge, physical activity, food intake, self-efficacy, and health literacy.⁸ Diabetes self-management education (DSME) plays a key role in empowering people with diabetes to engage and sustain lifestyle changes, which have been shown to improve health outcomes. DSME is the process of facilitating the knowledge, attitudes, and abilities necessary for self-management.⁹ In addition to this, DSME play an important role in influencing the self-care practices of patients with diabetes mellitus. Based on this phenomenon, a literature review was prepared to highlight effectiveness of DSME on T2DM.

Design and Methods

The collection and review of articles was carried during the month of October 2020. Furthermore, published articles were obtained through several electronic databases, such as Google Scholar, PubMed, ProQuest, and ScienceDirect using the keywords diabetes mellitus, self-care, diabetes self-management education, and DSME. The articles obtained from these databases were then selected based on the inclusion and exclusion criteria in

Significance for public health

Globally, there are various pillars of diabetes mellitus management. One of the important pillars for the prevention and management is education. When properly carried out, it provides benefits to people with diabetes mellitus. Furthermore, the Association of Diabetes Care and Education (AADE) has guidelines for diabetes self-management education (DSME). In reality, there are many health workers that provide education without paying attention to these guidelines. Therefore, this study on the effectiveness of diabetes self-management education (DSME) would provide information regarding the importance of using these guidelines.

order to obtain relevant articles. In addition to this, articles designs were selected using cross-sectional, randomized controlled trials (RCT), systematic reviews, and quasi-experimental studies. Subsequently, the data was then extracted, grouped, and concluded; 137 articles were obtained through the selection process (inclusion and exclusion criteria) (Table 1). These articles were then assessed for criticism and 15 were found to be relevant to the criteria.

Table 1. Inclusion and exclusion criteria.

Inclusion	Exclusion
1. Research related to diabetes self-management education (DSME) or diabetes self-management education (DSME), DM management and self-care	1. Publications in the form of news, quotes, abstracts, and editorial only.
2. Research provides information regarding the effects of DSME	2. Research does not contain all components of the journal
3. The full text is available in English or Indonesian	3. The text is not in English or Indonesian
4. Q1-Q3 qualified journal	4. Unqualified journals Q1-Q3

Table 2. Article review result.

No.	Title	Researcher (Year)	Research purposes	Design	Sample
1	Participation in structured diabetes mellitus self-management education program and association with lifestyle behavior: results from a population-based study	Carmienke S, Baumert J, Gabrys L, <i>et al.</i> (2020)	Whether participation in structured diabetes self-management education (DSME) programs for participants with diabetes mellitus is associated with healthy lifestyles in routine care apart from randomized controlled studies remains unclear and is a question of this study.	Cross-sectional population-based analysis	15 participants
2	Diabetes self-management education (DSME) - Effect on knowledge, self-care behavior, and self-efficacy among type 2 diabetes patients in Ethiopia: A controlled clinical trial	Hailu FB, Moen A, Hjortdahl P (2019)	Diabetic patients must be equipped with the necessary knowledge to perform self-care activities according to confidence. Researchers prepared a diabetes self-management education (DSME) intervention and assessed how this influenced diabetes knowledge levels, self-care behavior, and self-reported patient self-efficacy.	Quasi-Experiment	220 participants
3	Effect of diabetes self-management education on glycemic control among type 2 diabetic patients at a family medicine clinic in Kenya: A randomized controlled trial	Gathu CW, Shabani J, Kuniya N, Ratansi R (2018)	This study seeks to assess the effectiveness of DSME and also compare the effects of DSME by certified diabetes educators and family physicians.	RCT	96 participants
4	The effect of diabetes self-management education on body weight, glycemic control, and other metabolic markers in patients with type 2 diabetes mellitus	Yuan C, Lai CW, Chan LW, <i>et al.</i> (2014)	To comprehensively evaluate the effect (DSME) on metabolic markers and atherosclerotic parameters in patients with type 2 diabetes.	Quasi-Experiment	76 participants
5	Diabetes self-management education improves quality of care and clinical outcomes determined by a diabetes bundle measure	Brunisholz KD, Briot P, Hamilton S, <i>et al.</i> (2014)	This study aims to determine the impact of the DSME intervention by measuring HbA1c and diabetes bundle components so that diabetes care can be improved.	A retrospective case-control study	4.587 participants
6	The effect of diabetes self-management education on HbA1c level and fasting blood sugar in type 2 diabetes mellitus patients in primary health care in Binjai City of North Sumatra, Indonesia	Rusdiana, Savira M, Amelia R (2018)	To evaluate HbA1c levels and fasting blood sugar in T2DM patients after the DSME intervention was carried out in Binjai City, North Sumatra, Indonesia.	Quasi-experiment	80 participants
7	Diabetes self-management education and medical nutrition therapy: a multisite study documenting the efficacy of registered dietitian nutritionist interventions in the management of glycemic control and diabetic dyslipidemia through retrospective chart review	Marincic PZ, Salazar MV, Hardin A, <i>et al.</i> (2018)	Document outcomes for patients with type 2 diabetes (T2D) completing DSME and MNT through American Diabetes Association-recognized programs.	Descriptive, retrospective chart review	100 participants
8	Effect of diabetes self-management education (DSME) on glycated hemoglobin (HbA1c) level among patients with T2DM: Systematic review and meta-analysis of randomized controlled trials	Bekele BB, Negash S, Bogale B, <i>et al.</i> (2020)	The aim of this systematic review and meta-analysis (SRMA) was to evaluate the Diabetes Self-Management Education or Support (DSME/S) on glycosylated hemoglobin (HbA1c) among T2DM patients.	Systematic review and meta-analysis (PRISMA) guidelines	25 studies

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Results and discussions

The effectiveness of DSME in T2DM is the main focus of this literature review. The heterogeneity of DSME implementation were seen based on the number of sessions, the time span, and the methods used. The study presented 6 articles with homogeneous results showing that DSME has a good effect on T2DM patients (Table 2).

Table 2. Continued from previous page.

No.	Title	Researcher (Year)	Research purposes	Design	Sample
9	Effects of diabetes self-management education on glycaemic control in children with insulin-dependent diabetes mellitus.	Qayyum AA, Lone SW, Ibrahim MN, <i>et al.</i> (2010)	To evaluate the effect of diabetes self-management education (DSME) on glycemic control (HbA1c) in Pakistani children suffering from type-1 diabetes mellitus.	Quasi-experiment	50 participants
10	Effectiveness of diabetes self-management education on quality of life in diabetic elderly females	Kargar Jahromi M, Ramezanli S, Taheri L. (2014)	The aim of the present study was to determine the effectiveness of diabetes self-management education on quality of life in elderly females with diabetic mellitus (type 2) in Shiraz, Iran, 2013.	Quasi-experiment	90 participants
11	The effect of self-management education through weblogs on the quality of life of diabetic patients	Rasoul AM, Jalali R, Abdi A, Salari N, <i>et al.</i> (2019)	The aim of determining the effect of self-management education through weblogs on the quality of life of affect the patients.	Quasi-experiment	98 participants
12	DM-calendar app as a diabetes self-management education on adult type 2 diabetes mellitus: a randomized controlled trial	Kusnanto, Widyanata KAJ, Suprajitno, Arifin H (2019)	The aim was to evaluate the effect of diabetes mellitus calendar app as a Diabetes Self-Management Education (DSME) program on self-efficacy, HbA1c levels, lipid profile, and insulin in adult type 2 diabetes mellitus (T2DM).	Randomized controlled trial	30 participants
13	Effect of a nurse-led diabetes self-management education program on glycosylated hemoglobin among adults with type 2 diabetes	Azami G, Soh KL, Sazlina SG, Salmiah MS, <i>et al.</i> (2018)	The aim of this study was to investigate the effectiveness of a nurse-led diabetes self-management education on glycosylated hemoglobin.	Quasi-Experiment	71 participants
14	Effects of an outpatient diabetes self-management education on patients with type 2 diabetes in China: A randomized controlled trial	Zheng F, Liu S, Liu Y, Deng L (2019)	This study is aimed at assessing the effectiveness of a simple outpatient diabetes self-management education program.	Randomized controlled trial	60 participants
15	Effect of a community-based diabetes self-management empowerment program on mental health-related quality of life: a causal mediation analysis from a randomized controlled trial	Sugiyama T, Steers WN, Wenger NS, <i>et al.</i> (2015)	The aim of this systematic review and meta-analysis is to investigate the association between DSME or support (DSME/S) and glycemic control among T2DM patients.	Randomized controlled trial	516 participants

The DSME intervention given to T2DM patients in Ethiopia had a positive impact, such as an increase in knowledge and adherence to diet therapy, exercise, glucose monitoring, and wound care.¹⁰ In line with that, another study explained that DSME significantly improved medication adherence, self-management behavior, knowledge, self-efficacy, and quality of life.¹¹⁻¹³ Several studies show that DSME interventions improve the quality of life.¹⁴⁻¹⁷ Through these interventions, bad behavior such as smoking and alcohol consumption can also be avoided or reduced.¹⁰

Several interventions are also able to influence lifestyle changes such as increasing the duration of exercises (cycling, walking, aerobics), reducing smoking habits, and increasing the consumption of fruits and vegetables.¹⁸ Lifestyle changes caused by DSME interventions are expected to improve the clinical and health status of T2DM patients. One study proved this showing DSME's effectiveness in controlling fasting blood glucose, random blood glucose, total cholesterol, and triglycerides.¹¹ In line with that, other studies also showed that DSME can influence glycemic control, body weight and BMI control.^{11,19-21} Apart from data homogeneity in the article, another difference was found regarding the effect of DSME on HbA1c. Cunningham¹⁴ states that DSME does not significantly affect HbA1c. This is in contrast with other studies which explain that this intervention can significantly affect HbA1c.²¹⁻²⁶ After reviewing several studies, it is proven that DSME has a positive effect on the lifestyle and clinical or health status of T2DM patients. However, the implementation process could be influenced by several factors, namely: i) limited resources, ii) culture, iii) relationship with diabetes, and iv) rela-

tionship with clinic.

This systematic review focuses on the effectiveness of DSME on T2DM disease progression. It is known that the DSME intervention provides benefits to the development of T2DM disease. The demonstrated benefits point to efforts to increase T2DM development through lifestyle changes and self-care for T2DM patients. Lifestyle changes such as exercising diligently, increasing consumption of fruits and vegetables, and avoiding smoking can improve the patient's clinical condition and the patient's health status.¹⁸ The clinical condition can be seen from the levels of blood glucose and HbA1c.

DSME has a positive effect on T2DM patients to improve their knowledge, behavior, self-efficacy, and clinical conditions of patients such as blood glucose levels, HbA1c, lipid profiles.^{10,11,19-21} However, there were differences in results in studies involving HbA1c levels. The difference that lies in the presence or absence of this effect on HbA1c can be a concern in future studies to consider the determining factors that can influence it. Several studies in this review show that the effectiveness of DSME is influenced by education providers and support systems.^{17,22,25,26}

Conclusions

Based on the 15 articles reviewed, it was found that DSME intervention provides significant effectiveness to lifestyle changes and the self-care of T2DM patients. Therefore, it improves the clinical or health status of T2DM patients.

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