Multidisciplinary Reviews

REVIEW ARTICLE
Published Online: March 4, 2024
https://doi.org/10.31893/multirev.2024086

The Self-Management-Based care interventions on quality of life in type 2 Diabetes Mellitus patients: An integrative review

Fadli Fadli[ab] | Nursalam[a] | Elly Lilianty Sjattar[c] | Sumbara[d] | Dimas Ning Pangesti[e] | Arabta M Peraten Pelawi[f]

[a]Faculty of Nursing, Universitas Airlangga, Indonesia.
[b]Mega Buana University, Palopo, Indonesia.
[c]Faculty of Nursing, Universitas Hasanuddin, Indonesia.
[d]Faculty of Nursing, Universitas Bhakti Kencana, Indonesia.
[e]Akper Baitul Hikmah Bandar Lampung, Indonesia.
[f]STIKES Medistra, Indonesia.

Abstract Type 2 Diabetes Mellitus (T2DM) is caused by the disruption of insulin secretion and resistance. One aspect that plays an important role in this disease is self-management education. Good self-care behavior facilitates controlled diabetes management and prevents complications as well as ensures a better life quality. It is necessary to review the up-to-date, evidence-based literature to understand the diabetes self-management based care interventions to improve the quality of life. A literature search was performed on Scopus, PubMed, ProQuest, and Science Direct to find articles published during 2017-2022. The search for the article used different combinations of keywords with Boolean operators, including "type 2 diabetes mellitus", "diabetes self-management" and "quality of life". Studies were selected based on inclusion criteria, with a focus on full test articles discussing self-management of diabetes, T2DM, and quality of life with research designs such as randomized controlled trials (RCT). Eight articles met the criteria and were used in the review. Based on the review, eight articles showed that self-management interventions provide significant effectiveness for quality of life and self-care for type 2 diabetes mellitus patients. Almost all the articles stated an increase in self-care behaviors and quality of life after receiving self-management interventions. Successful diabetes self-management depends on individual self-care activities to control symptoms presented. Furthermore, regular self-management activities prevent complications from arising. Therefore, patients' compliance with diabetes self-management is needed to improve their life quality.

Keywords: interventions, self-care, self-management, Type 2 Diabetes Mellitus, quality of life

1. Introduction

Diabetes mellitus (DM) is a chronic noncommunicable (Mosleh et al., 2017) metabolic disease caused by a disturbance in the hormone insulin that functions to maintain the body's homeostasis by decreasing blood sugar levels (American Diabetes Association, 2017). Type 2 diabetes mellitus is one of the most common types of diabetes experienced by the population (Joyce & Jane, 2014). This chronic disease a global health problem that affects approximately 422 million people worldwide (Moura et al., 2019).

Based on 2021 data from the International Diabetes Federation (IDF), it is estimated that 537 million people, i.e., approximately 1 in 10 people, suffer from diabetes worldwide. The data are estimated to reach 643 million people in 2030, and the total number of cases is predicted to increase by 783 million people in the age range of 20-79 years in 2045 provided no intervention is carried out (IDF, 2021). Globally, Indonesia is currently the fifth country with the most diabetes mellitus cases, namely, 19.5 million, and is estimated to increase by 28.6 million people in 2045 (Perkeni, 2021).

In addition to its increasing incidence, DM also causes many acute and chronic complications. The acute complications include diabetic ketoacidosis, nonketotic hyperosmolar syndrome, and hypoglycemia, while macroangiopathy, microangiopathy, and neuropathy are chronic (Papachristoforou et al., 2020). Once any of these occur, the costs of survival increase, and quality of life is affected. A study in Palestine showed that almost 34% of DM patients experienced poor quality of life (Tietjen et al., 2021). Moreover, several studies have reported that, on average, DM patients in Indonesia experience a decrease in quality of life. According to Umam et al., (2020), patients' quality of life was mostly 63.7% in the moderate category. Among the physical, psychological, social relation, and environmental domains, 61.5%, 60.4%, 58.2%, and 53.8%, respectively, were in the moderate category.

Once self-management is not controlled, patients experience DM throughout their lifetime, which can strongly affect quality of life. Self-management is influenced by several factors, namely, age, sex, education level, length of suffering,

 Received: December 7, 2023 | Accepted: January 22, 2023

knowledge, self-efficacy, diabetes stress, and family support (Lin et al., 2017; Ningrum et al., 2019). Effective self-management is important for improving goal achievement during patient management. Nonadherence to treatment hinders the regulation of blood sugar levels, leading to poor glucose control (Hsu et al., 2018).

According to Kurniawan et al., (2020), out of 123 respondents, 62.6% had low self-management of blood sugar monitoring indicators. Moreover, a Chinese study showed moderate self-management behavior in 50.4% of diabetes patients, and 33.6% had low self-management (Qi et al., 2021). Considering this, some patients still do not know about self-management in depth or correctly. Various interventions to improve patients' self-management have been carried out in the form of diabetes mellitus self-care and self-management education, but no optimal results have been obtained yet, and many people have not shown independence in managing their disease. To manage the disease effectively, a spiritual approach is needed to control patients' emotions and self-concepts. Furthermore, increasing families' knowledge and skills in helping patients overcome their disease problems is necessary to improve quality of life. Therefore, this integrative review aimed to explore diabetes self-management-based care interventions to improve quality of life.

2. Methodology

2.1. Search strategy

An integrated review was used as the study method. This review provides an integrated analysis of the effects of self-management-based care interventions on quality of life in type 2 diabetes mellitus patients. We systematically searched Scopus, PubMed, ProQuest, and Science Direct. Articles published within recent years (2017-2022). The search for articles on self-management-based care interventions on quality of life was the first identified from Scopus. Then, keywords and related words were extracted from various sources through a comprehensive search using different combinations of keywords and Medical Subject Headings (MeSH) terms. The search for articles used different combinations of keywords with Boolean operators, including “type 2 diabetes mellitus” OR "T2DM" AND “diabetes self-management” OR "self-care" AND “quality of life”.

2.2. Eligibility criteria

The selection of articles in this integrative review must meet the inclusion criteria based on population, interventions, combination, and outcome (PICO) criteria. Therefore, the inclusion criteria for studies to be included in this review were as follows: (1) had a history of diabetes self-management and quality of life, (2) were conducted in nursing areas that specifically address self-management and quality of life in patients with T2DM, (3) were published in English, and (4) were original studies with a study design that included a quantitative study with a randomized controlled trial (RCT). The exclusion criteria were as follows: (1) conference papers, commentaries, editorials, theses, or other expert opinions; (2) studies in languages other than English; (3) studies whose full text was not available; and (4) studies that were conducted on self-management and quality of life in patients with T2DM.

2.3. Study Selection and Data Extraction

Article selection was performed by collecting articles obtained from a search of the databases. We transferred all the articles from the search to the bibliography manager program (Mendeley). All duplicate articles were excluded by the automatic duplication removal process in Mendeley's tool. If the bibliography manager software did not recognize an article, it was reviewed again and manually removed. Two reviewers worked separately to complete this manual selection.

The article review process was carried out by applying the eligibility criteria, and we filtered and assessed each article in two stages. In the first stage, the reviewer selected the article based on the title and abstract. Moreover, a thorough screening of the full-text articles specified in the first stage was carried out in the second stage. We examined all the articles during the screening before deciding whether the title or abstract was needed to provide additional information. Then, once we selected the articles, we recorded all the data in a spreadsheet for data extraction and charting. The extracted data included the author, year, study design, and summary of the findings. To ensure accuracy, the same reviewer analyzed the data. We did not assess the studies' quality with the integrative review methodology.

3. Thematic results

3.1. Search Results

The first author performed an initial database search and evaluated the articles. We used the PRISMA Flowchart 2009 (Moher et al., 2010) to record the article review and selection process (Figure 1). The first search of the four databases yielded 1.137 results. We subsequently collected all the articles and removed duplicate reports. The titles and abstracts of the articles were screened after duplicates were removed (n=218). The reports were retrieved (n=31) if they were not peer-reviewed, had been published for less than ten years (2017-2022) or were not related to self-management or quality of life in patients with T2DM. In the next stage, eligibility assessments were carried out on the sources (n=19) and reports that were not explicitly

related to self-management or quality of life in patients with T2DM. were excluded. Eight articles were ultimately selected for inclusion after the remaining articles were screened for the discovery of significant self-management and quality of life related to T2DM. Finally, 8 papers were included in the synthesis (Table 1).

3.2. Study Characteristics

Based on Table 1, eight articles were selected based on an integrative review approach; six of those articles discussed the effect of self-management interventions on self-care behavior, and two measured the quality of life of type 2 diabetes mellitus patients. Almost all the articles reported an increase in self-care behaviors and quality of life after receiving self-management interventions. Successful diabetes self-management depends on individual self-care activities to control the symptoms presented. Furthermore, regular self-management activities prevent complications from arising.

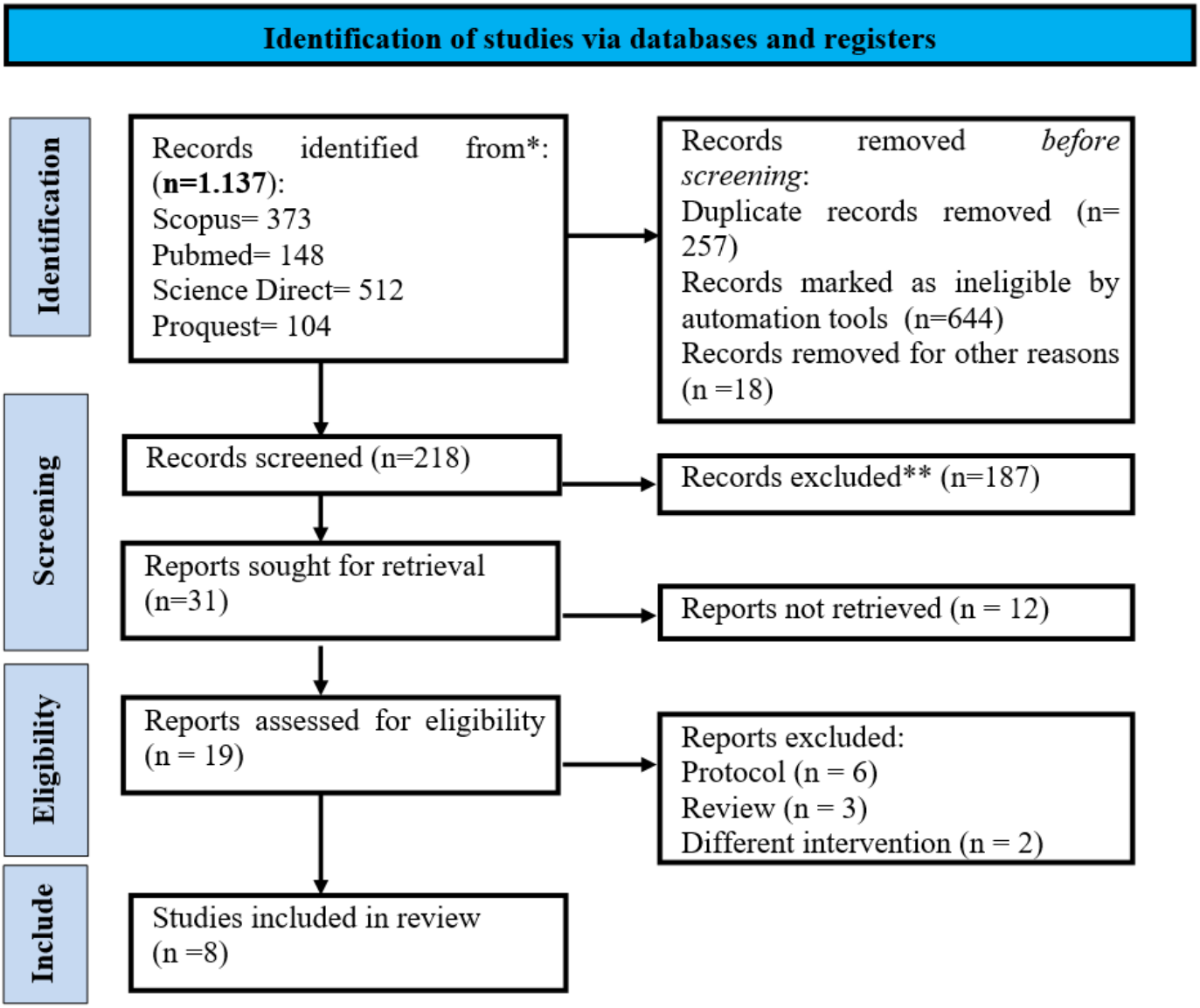

Figure 1 PRISMA flowchart of the literature search and screening process.

4. Discussion

Type 2 diabetes mellitus (DM) is a chronic noncommunicable disease caused by disturbances in insulin hormones that function in maintaining the body's homeostasis by decreasing blood sugar levels (American Diabetes Association, 2017) and is a global health problem affecting approximately 422 million people worldwide (Moura et al., 2019). In addition to the increasing number of cases, DM also causes many acute and chronic complications. The acute complications include diabetic ketoacidosis, nonketotic hyperosmolar syndrome, and hypoglycemia, while macroangiopathy, microangiopathy, and neuropathy are chronic (Papachristoforou et al., 2020). Once any of these conditions occur, survival costs increase, and quality of life is affected.

Table 1 Results of the reviewed studies (n=8).

Author, Year, Design, Theory	Total Sample	Duration	Intervention	Regular control/treatment	Instrument	Result
(Cheng et al., 2019), RCT, Self-Care Theory, Health Empowerment	242 patients (121 intervention and 121 control groups).	6 weeks	Patient-centered self-management empowerment intervention (PCSMEI).	Conventional treatment: Health education in general	Questionnaire of Empowerment Scale-Short Form (DES-SF) Diabetes Distress Scale (DDS) Audit Diabetes Dependent Quality of Life (ADDQoL).	The results of this study showed that the patient-centered method self-management empowerment intervention tends to improve the life quality and glycemic control of type 2 diabetes mellitus patients.
(Puffelen, Rijken, Heijmans, Nijpels, & Schellevis, 2019), RCT, Self Care Theory	168 patients (82 intervention and 86 control groups).	6 months	Group-based self-management support program	Regular treatment and provision of general health education about diabetes.	Questionnaire of Diabetes Self-Care Activities (SDSCA) Summary, Diabetes Attitude Scale (DAS-3)	Group-based self-management support led to short-term behavioral changes in terms of self-care management activities and distress in type 2 diabetes mellitus patients.
(Qi et al., 2021), RCT, Self-management behavior Model, Self Care Theory	571 type 2 diabetes mellitus patients	16 weeks	Self-management behavior program based on social support	Regular treatment	Questionnaire from the Chinese version of the Adjusted Diabetes-specific Quality of Life Scale (CN-ADDQOL), Multidimensional Scale of Perceived Social Support (MSPSS), and Type 2 Diabetes Self-care Scale (2-DSCS).	This study indicated that the self-management behavior model program based on social support improved the life quality of type 2 diabetes mellitus patients and improve the value of fasting blood sugar levels.
(Wichit, Mnatzaganian, Courtney, Schulz, & Johnson, 2017), RCT, Self-Care Theory, Self-Efficacy Theory	140 patients (70 intervention and 70 control groups).	13 weeks	Family-oriented self-care management program	Regular treatment	Questionnaire from Summary of Diabetes Self-Care Activities Scale (SDSCA), Diabetes Management Self-Efficacy Scale (DMSES), and Short-Form Health Survey (SF-12).	A family-oriented self-care management program significantly improved the self-efficacy and self-management of type 2 DM patients and reduced HbA1c levels, leading to better life quality.
(Rondhianto, Kusnanto, & Melaniani, 2018), RCT, Health Belief Model, Self Care Theory	120 patients (60 intervention and 60 control groups).	8 weeks	Diabetes Self-Management Education based on Health Belief Model	Regular treatment	Questionnaire for psychosocial outcomes of diabetes management self-efficacy scale (DMSES), diabetes distress scale (DDS), a summary of diabetes self-care activities (SDSCA), and diabetes quality of life scale (DQOL).	This study showed that both groups before the intervention experienced an increase in psychosocial scores on indicators of self-efficacy, self-care behavior, and life quality. Based on the intervention's posttest results, there was a significant difference between the two groups in psychosocial scores.
(Rasoul et al., 2019), Quasi experimental, Self-Care Theory, Life Quality Theory.	98 patients (49 intervention and 49 control groups).	5 months	Weblogs-based self-management education program	Regular treatment	Questionnaire from Diabetes Quality of Life (DQOL).	This study found that the intervention group using self-management education based on weblogs affected type 2 DM patients' life quality (p= < 0.0001).

(Hailu, Moen, & Hjortdahl, 2019), RCT, Self Care Theory, Self Efficacy Theory	142 patients (78 intervention and 64 control groups).	6 months	Program self-management education	Regular treatment	Questionnaire from Diabetes Knowledge Scale (DKS), Summary of Diabetes Self-Care Activity (SDSCA), and Stanford Self-Management Resource Center (SMRC).	The results showed that the difference in the average knowledge score before and after the DSME intervention was significant with a p value = 0.004. Additionally, self-care behavior before and after the DSME intervention seen from the diet program, exercise, blood sugar monitoring, and foot care, had a significant difference (p = 0.027).
(Okafor et al., 2021), Quasi experimental, Self-Care Theory	382 patients (191 intervention and 191 control groups).	6 months	Program self-management education	Regular treatment	Questionnaire from Summary of Diabetes Self-Care Activity (SDSCA).	The educational intervention was highly effective within 6 months of improving self-management practices (dietary management, P = 0001; activity, P = 0003; and foot care, P = 0001) in type 2 DM patients, therefore diabetes education program interventions need to be included in all treatment planning.

A study in Palestine showed that almost 34% of DM patients experienced poor quality of life (Tietjen et al., 2021). Moreover, several results have shown that diabetes mellitus patients in Indonesia on average have a decrease in quality of life. According to previous studies, the influencing factors are education level, knowledge, family support, income, medication adherence, and disease complications (John et al., 2019). According to Karami et al. (2021), type 2 DM patients' quality of life is influenced by age, sex, education, complications, duration, control of blood sugar levels, social support, and therapy/medication. Furthermore, quality of life can be assessed by examining patients' metabolic control using parameters such as HbA1c (Bekele et al., 2021), aimed at indicating that diabetes has been well controlled to improve quality of life. Therefore, it is necessary to establish indicators that form self-care behavior to facilitate the intervention process to improve patients' quality of life.

The application of self-management, including diet regulation, physical activity/exercise, blood sugar monitoring, compliance with medication consumption, and self/foot care, is one aspect that plays an important role in the management of type 2 diabetes mellitus (Hidayah, 2019). Effective self-management is important for improving the achievement of goals in DM management. Nonadherence to diabetes medication hinders the regulation of blood sugar levels, leading to poor glucose control (Hsu et al., 2018). Therefore, patient compliance with diabetes self-management is needed to improve quality of life. Successful diabetes self-management depends on individual self-care activities to control the symptoms presented. Furthermore, regular self-management activities prevent complications from arising (Pereira et al., 2020).

Knowledge is one of the supporting factors in carrying out daily self-care, and its sufficiency helps people understand the body's present condition and become capable of proper self-management to achieve a constant healthy lifestyle and controlled blood glucose. According to Orem, self-care deficit theory focuses on each individual's ability to perform self-care, defined as the practice of activities that individuals initiate and perform on their own behalf in maintaining life, health, and well-being. The self-care or self-care deficit theory of nursing comprises three interrelated theories: (1) the theory of self-care, (2) the self-care deficit theory, and (3) the theory of nursing systems, which are further classified into wholly compensatory, partially compensatory and supportive-educative. The Nursing Agency is a complex property or attribute of people educated and trained as nurses that enables them to act, know, and help others meet their therapeutic self-care demands by exercising or developing their own self-care agency, as shown in Figure 2.

The implementation of diabetes self-management education adapted from the management strategy of the self-management support theory developed by Glasgow et al. (2003) is called Five A's Model of Self-Management Support, namely, assessment, advice, agreement, assistance, and arrangement. The self-management education-based self-management support provided by nurses is expected to enhance patients' self-care and behavior, thereby leading to an increase in quality of life and glycemic control (Figure 2). According to Bekele et al. (2021), diabetes self-management education is effective at reducing HbA1c in type 2 diabetes mellitus patients, and there are differences in the results obtained by Cunningham et al.

(2018), who showed that diabetes self-management education and HbA1c had nonsignificant effects, while quality of life had a significant effect. Therefore, diabetes self-management education optimizes metabolic control, prevents complications, and improves the quality of life of type 2 diabetes mellitus patients.

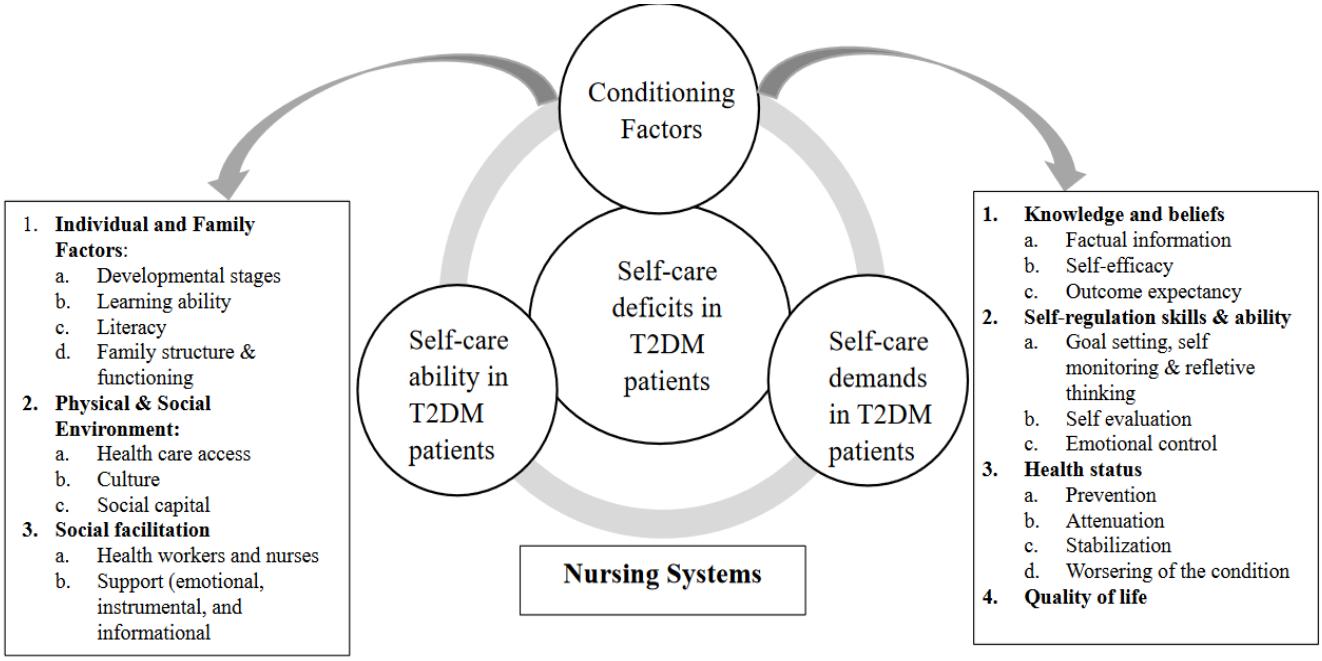

Figure 2 Framework Development of Nursing System-based Self-Care for T2DM Patients.

According to the results of several published studies (Table 1), diabetes self-management education (DSME) is an effective method for improving the health status and quality of life of type 2 DM patients via an epistemological approach (Rondhianto et al., 2018; Hailu et al., 2019; Rasoul et al., 2019; Okafor et al., 2021). DSME is an ongoing process carried out to increase the knowledge, skills, and ability of DM patients to perform self-care (Hailu et al., 2019). Another study used the Patient-Centered Self-Management Empowerment Intervention (PCSMEI), group-based self-management support, and social support-based self-management behavior programme (Cheng et al., 2019; Puffelen et al., 2019; Qi et al., 2021). This is the modification result of the Diabetes Self-Management Education (DSME) method.

Almost all the studies discussed in this literature review stated that self-management tends to improve the quality of life of diabetes mellitus patients. In this case, self-management ought to be an important concern for health professionals because it can be a reference for the success of an action/intervention or therapy. Furthermore, patients experience DM throughout their lifetime once self-management is not controlled, leading to a great influence on quality of life (Lin et al., 2017). A family-oriented self-care management programme significantly enhances the self-efficacy and self-management of type 2 diabetes mellitus patients and reduces HbA1c levels, thereby improving their quality of life (Wichit et al., 2017).

According to the studies reviewed, some patients still do not know about diabetes self-management indepth or correctly. Various interventions to improve the self-management of patients are carried out in the form of diabetes mellitus self-care and self-management education, but the results are not yet optimal, and many people have not shown independence in managing their disease (Hailu et al., 2019). To manage the disease effectively, a spiritual approach is needed to control patients' emotions and self-concepts. Furthermore, increasing families' knowledge and skills in helping patients overcome their disease problems is necessary to improve quality of life.

5. Final considerations

This literature review discusses the effectiveness of self-management interventions in type 2 diabetes mellitus patients with several parameters, but similarities across the literature refer to quality of life. The implementation of self-management, including diet regulation, physical activity/exercise, blood sugar monitoring, drug consumption compliance, and self/foot care, plays an important role in type 2 DM management. The success of diabetes self-management depends on individual self-care activities to control the symptoms presented; therefore, regular self-management activities tend to prevent complications. Various interventions to improve the self-management of patients are carried out in the form of diabetes mellitus self-care and diabetes self-management education, but the results are not yet optimal, and many people have not shown independence in managing their disease. The development of self-management coaching interventions can be integrated through different theoretical approaches, namely, the spiritual approach, which is needed to control patients' emotions and self-concept.

Furthermore, increasing families' knowledge and skills in helping patients overcome their disease problems is necessary to improve quality of life.

This literature review study is expected to be useful for nursing science, specifically for medical-surgical nursing, in determining appropriate interventions for type 2 DM patients. Appropriate intervention selection supports the process of improving patients' health status, particularly in meeting their basic needs, thereby leading to quality of life improvement.

Ethical Considerations

Not Applicable.

Conflict of Interest

The authors declare no conflicts of interest.

Funding

The authors would like to thank the support and guidance provided by the Nursing Doctoral Program Promoter, Airlangga University and Mega Buana Palopo University, for the financial support and facilities provided in completing this research.

References

American Diabetes Association. (2017). Classification and diagnosis of diabetes. *Diabetes Care 40*, 11–24). https://doi.org/10.2337/dc17-S005

Cheng, L., Sit, J. W. H., Choi, K. chow, Chair, S. ying, Li, X., Wu, Y., … Yang, H. (2019). The effects of an empowerment-based self-management intervention on empowerment level, psychological distress, and quality of life in patients with poorly controlled type 2 diabetes: A randomized controlled trial. *International Journal of Nursing Studies*, *3*(21), 1–8. https://doi.org/10.1016/j.ijnurstu.2019.103407

Hailu, F. B., Moen, A., & Hjortdahl, P. (2019). 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. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, *12*, 2489–2499. https://doi.org/10.2147/DMSO.S223123

Hsu, H. C., Lee, Y. J., & Wang, R. H. (2018). Influencing Pathways to Quality of Life and HbA1c in Patients With Diabetes: A Longitudinal Study That Inform Evidence-Based Practice. *Worldviews on Evidence-Based Nursing*, *15*(2), 104–112. https://doi.org/10.1111/wvn.12275

Joyce, B., & Jane, H. (2014). *Keperawatan Medikal Bedah: Manajemen Klinis untuk Hasil yang Diharapkan* (8th ed.). Singapore: Elsevier (Singapore) Pte Ltd.

Kurniawan, T., Sari, C. W. M., & Aisyah, I. (2020). Self Management Pasien Diabetes Melitus dengan Komplikasi Kardiovaskular dan Implikasinya terhadap Indikator Klinik. *Jurnal Pendidikan Keperawatan Indonesia*, *6*(1), 26–36. https://doi.org/10.17509/jpki.v6i1.18256

Lin, K., Park, C., Li, M., Wang, X., Li, X., Li, W., & Quinn, L. (2017). Effects of depression, diabetes distress, diabetes self-efficacy, and diabetes self-management on glycemic control among Chinese population with type 2 diabetes mellitus. *Diabetes Research and Clinical Practice*, *131*, 179–186. https://doi.org/10.1016/j.diabres.2017.03.013

Mosleh, R. S. A., Jarrar, Y. B., Zyoud, S., & Morisky, D. E. (2017). Factors related to diabetes self-care management behaviors among patients with type II diabetes in Palestine. *Journal of Applied Pharmaceutical Science*, *7*(12), 102–109. https://doi.org/10.7324/JAPS.2017.71214

Moura, N. D. S., Lopes, B. B., Teixeira, J. J. D., Oria, M. O. B., Vieira, N. F. C., & Guedes, M. V. C. (2019). Literacy in health and self-care in people with type 2 diabetes mellitus. *Revista Brasileira de Enfermagem*, *72*(3), 700–706. https://doi.org/10.1590/0034-7167-2018-0291

Ningrum, T. P., Alfatih, H., & Siliapantur, H. O. (2019). Faktor-Faktor Yang Memengaruhi Manajemen Diri Pasien DM Tipe 2. *Jurnal Keperawatan BSI*, *7*(2), 114–126. Retrieved from http://ejurnal.ars.ac.id/index.php/keperawatan/article/view/136

Okafor, C. N., Pauline Ojinaka, E., Chinedu Charles, O., Kenneth Umezulike, A., Chika Chioma H, O., Adaobi Maryann, I., & Vera Ijeoma, O. (2021). Effect of Educational Intervention Programme on Self- Management Practices of Individuals with Type 2 Diabetes Mellitus in South-East, Nigeria. *International Journal of Diabetes and Clinical Research*, *8*(3), 1–9. https://doi.org/10.23937/2377-3634/1410145

Papachristoforou, E., Lambadiari, V., Maratou, E., & Makrilakis, K. (2020). Association of Glycemic Indices (Hyperglycemia, Glucose Variability, and Hypoglycemia) with Oxidative Stress and Diabetic Complications. *Journal of Diabetes Research*, *2020*, 1–17. https://doi.org/10.1155/2020/7489795

Puffelen, A. L. van, Rijken, M., Heijmans, M. J. W. M., Nijpels, G., & Schellevis, F. G. (2019). Effectiveness of a self-management support program for type 2 diabetes patients in the first years of illness: Results from a randomized controlled trial. *PLoS ONE*, *14*(6), 1–15. https://doi.org/10.1371/journal.pone.0218242

Qi, X., Xu, J., Chen, G., Liu, H., Liu, J., Wang, J., … Jiao, M. (2021). Self-management behavior and fasting plasma glucose control in patients with type 2 diabetes mellitus over 60 years old: multiple effects of social support on quality of life. *Health and Quality of Life Outcomes*, *19*(1), 1–15. https://doi.org/10.1186/s12955-021-01881-y

Rasoul, A. M., Jalali, R., Abdi, A., Salari, N., Rahimi, M., & Mohammadi, M. (2019). The effect of self-management education through weblogs on the quality of life of diabetic patients. *BMC Medical Informatics and Decision Making*, *19*(1), 1–12. https://doi.org/10.1186/s12911-019-0941-6

Rondhianto, Kusnanto, & Melaniani, S. (2018). The effect of diabetes self-management education, based on the health belief model, on the psychosocial outcome of type 2 diabetic patients in Indonesia. *Indian Journal of Public Health Research and Development*, *9*(11), 1718–1723. https://doi.org/10.5958/0976-5506.2018.01691.1

Tietjen, A. K., Ghandour, R., Mikki, N., Jerdén, L., Eriksson, J. W., Norberg, M., & Husseini, A. (2021). Quality of life of type 2 diabetes mellitus patients in Ramallah and al-Bireh Governorate–Palestine: a part of the Palestinian diabetes complications and control study (PDCCS). *Quality of Life Research*, *30*(5), 1407–1416. https://doi.org/10.1007/s11136-020-02733-w

Umam, M. H., Solehati, T., & Purnama, D. (2020). Gambaran Kualitas Hidup Pasien Dengan Diabetes Melitus. *Jurnal Kesehatan Kusuma Husada*, *11*(1), 70–80. https://doi.org/https://doi.org/10.34035/jk.v11i1.419

Wichit, N., Mnatzaganian, G., Courtney, M., Schulz, P., & Johnson, M. (2017). Randomized controlled trial of a family-oriented self-management program to improve self-efficacy, glycemic control and quality of life among Thai individuals with Type 2 diabetes. *Diabetes Research and Clinical Practice*, *123*(2017), 37–48. https://doi.org/10.1016/j.diabres.2016.11.013