Integrated Management for Patients with Diabetes Mellitus: A Literature Review

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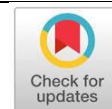
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Abstract

Background: Many factors contribute to DM, such as age, heredity, high-calorie meals, an unhealthy lifestyle, obesity, and stress. Inadequate glycemic control contributes to elevated blood glucose levels and potential complications. However, many people with DM have unmet proper DM management regularly due to many factors.
Objective: This study reviewed published articles about integrated management for people with DM through three databases.
Methods: We identified 1902 articles, and 13 articles were selected for full-text analysis.
Results: We revealed that in integrated DM management for patients with DM, they highly recommended monitoring their blood glucose, doing exercise, dietary plan, coping strategy, and continuous health education were the most effective DM management strategies for lowering HbA1c levels.
Conclusion: Nurses as healthcare providers should engage with people with DM to ensure they have good knowledge and understanding of how to maintain their disease.

Keywords: diabetes; dm management; exercise; coping; hba1c

INTRODUCTION

The prevalence of DM increases annually. According to the American Diabetes Association (ADA), 422 million people worldwide have diabetes mellitus (American Diabetes Association, 2020). The International Diabetes Federation (IDF) reported in 2019 that the prevalence of DM reached 537 million. Moreover, approximately 578 million people will be affected by the disease in 2030 and 700 million in 2045 (Saeedi et al., 2019). Therefore, based on the information, DM prevalence is expected to increase to 24.8% by 2030 or 51.2% by 2045.

China and India have the highest prevalences of DM in Asia, suggesting a global prevalence of 30% (Indaryati & Pranata, 2019). Indonesia experiences an increasing trend in DM prevalence in the world as well. There was an increase in DM from 6.9% in 2012 to 10.5% in 2018 (Indaryati & Pranata, 2019). Bureau

of Statistics Indonesia data indicates that 269 million Indonesians suffered from DM in 2020 (Indonesian Statistic Center, 2020). Based on data from the Bureau of Statistics Indonesia and the prevalence of DM in 2018, there was an increase of 28.2 million DM people. In the recent six years (2012-2018), the prevalence of DM has increased by 3.6%. Thus, the estimated DM prevalence in Indonesia will increase from 9.6 million to 37.3 million by 2024.

People with DM may encounter psychological challenges, including stress, which can impact their blood sugar levels (Widayati et al., 2018). Inadequate glycemic control contributes to elevated blood glucose levels and potential complications (Al Slail et al., 2018). A recent cross-sectional study reveals that seven out of ten people with DM reported altered glycemic test results associated with factors such as insulin therapy, obesity, age, and an increased risk of foot ulceration. It highlights specific subgroups within the diabetic population that are more susceptible to experiencing hyperglycemia (Rossaneis et al., 2019).

Trisnadewi et al. stated that self-management might be crucial in controlling DM patients' serum hormone levels. The hormone could be normalized, and insulin can be utilized effectively in a relaxed state. Since the hypothalamus-pituitary-adrenal axis regulates blood glucose levels, self-management may impact blood glucose levels (Trisnadewi et al., 2020). A key approach to assessing the efficacy of DM treatment involves periodic laboratory measurements of glycated hemoglobin (HbA1c) (American Diabetes Association, 2020). HbA1c signifies the percentage of hemoglobin bound to glucose, serving as a fundamental reference for glycemic control. This measurement is a crucial tool for health professionals in monitoring individuals with DM and evaluating the effectiveness of their therapeutic plans (International Diabetes Federation, 2021).

The ADA explains that self-management is key to DM management control (American Diabetes Association, 2022), coupled with ongoing support from their family and a healthcare team (Collaborators & Ärnlöv, 2020). Moreover, people with DM should check their blood sugar regularly, follow their doctor's instructions to ensure the proper use of medications and care for themselves, including monitoring their blood sugar at home, changing their diets, and increasing their physical activity (Collaborators & Ärnlöv, 2020; Kurniali, 2014; Rossaneis et al., 2019).

However, people with DM who disobey medication management may suffer from stress. In addition to competing for daily demands, frustration, and other emotional distress, low self-commitment is a barrier to success (Pamungkas et al., 2017). Lack of self-efficacy to administer an activity (American Diabetes Association, 2020), lack of social support from the family members (Miller & DiMatteo, 2013), and lack of family knowledge as the support system (Haris & Nugraheni, 2017) are strongly correlated to low DM self-management. This study aims to review published articles about integrated management for people with DM.

METHOD
We searched for published articles through three databases (PubMed, Proquest, and Scopus) in June 2022. Search protocols were made based on search guidelines using the Population, Intervention, Comparison and Outcome model (PICO) with the search terms: diabetes OR diabetes mellitus OR DM OR t2d OR t2dm AND management DM. We performed inclusion criteria and exclusion criteria to answer the research question. The inclusion criteria for this study were as follows: (1) participants had diabetes aged ≥18 years old; (2) English-written articles; (3) type of studies: an experimental study, non-experimental study; (4) types of exposure: had DM management; (5) types of outcomes: at least one of blood glucose or HbA1c reduction level. The exclusion criteria were articles focused on animals or plants, a study-type publication with only abstracts such as a symposium, conference, protocol, and articles with secondary or tertiary data (i.e., systematic literature, meta-analysis, and literature review).

Two researchers (F.H. and A.I.F.) independently conducted the selection process, reviewing titles and abstracts of the identified studies in the literature against the inclusion and exclusion criteria. Subsequently, these researchers independently analyzed the selected studies (Haris et al., 2022). In the event of a disagreement

between the two researchers (F.H. and A.I.F.), a third researcher (A.R.) was consulted to reach a final decision. It is worth noting that no disagreements occurred regarding the articles selected for this review.

A matrix table was created for the systematic extraction of data from the chosen studies, with a focus on key aspects of DM management. The primary information to be collected included: 1)

Reduction in blood glucose levels and 2) Reduction in HbA1c levels towards optimal or normal values.

RESULT

Through title and abstract screening, we eliminated irrelevant articles following the search statement, inclusion, and exclusion criteria. A total of 22 articles were retrieved from the process. Among 22 articles, nine were eliminated. As shown in Figure 1, 13 articles were selected for further analysis.
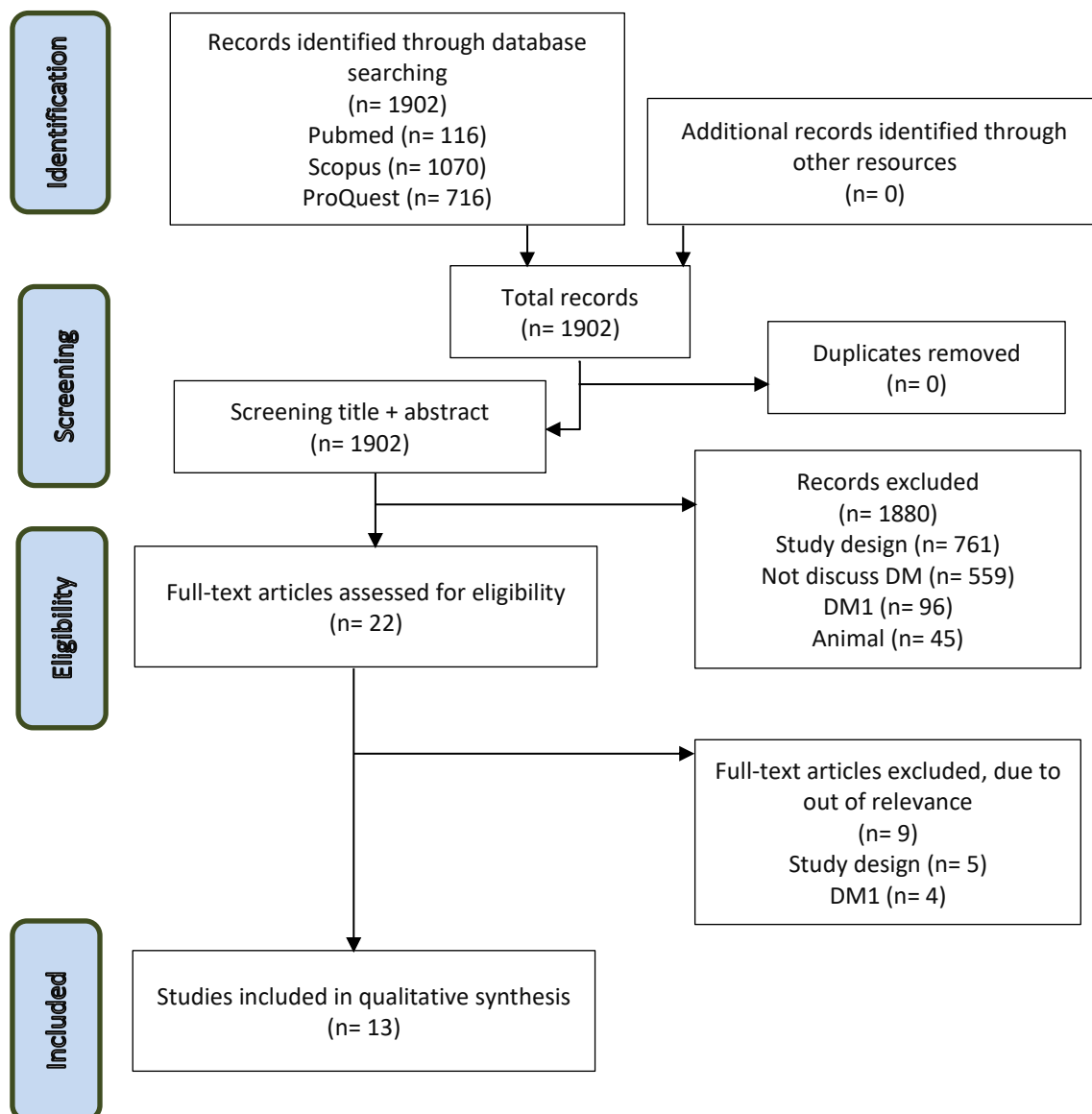

Figure 1. PRISMA Diagram of Eligibility of The Study

Using the data extracted from each article, the researchers summarized the information into a

Table, including the research design, disease, diabetes management, number of respondents, country, and results (table 1).

Table 1. DM Management Among 13 Selected Articles

No	Diseases	Study Type	DM Management	Indicator	Participants	Country	Results	Ref
1	T2DM	RCT	Counseling for 6 weeks and evaluated using diabetes education evaluation and problem-solving therapy	Exercise, Coping	Control group (n= 34), Intervention group (n= 33)	Turkey	Counseling can improve effective coping (p<0,05) 1. DM people have exercise regularly (12.1%) 2. Weakly exercise: 1.75 (± 2.6)	(Ağce & Ekici, 2020)
2	T2DM	RCT	Dulce Digital (educational motivation, invitation to take medication and check blood glucose)	A1c	Participants (n=126)	California	Dulce Digital's intervention at 6 months of follow-up lowered the mean of A1c (Δ −1.23%).	(Clark et al., 2020)
3	T2DM	RCT	Short message of Motivation (SMS)	HbA1c	Participants (n=572)	Kuwait	The rate of change in glycemic control decreased in the intervention group after 12 months.	(Al-Ozairi et al., 2018)
4	T2DM	RCT	Mind-STRIDE from Mindfulness-Based Stress Reduction (MBSR), gold standard mindfulness programs for people with chronic health conditions and DSMES	HbA1c	Participants (n=28)	Taiwan	Reported HbA1c reduction (16.4%) (1.3 ± 0.3) There is no statistical difference regarding the relocation of stress and depression.	(DiNardo et al., 2022)
5	T2DM	RCT	Sitagliptin medicine	HbA1c	Participants (n= 60)	Taiwan	In the intervention group, there was a decrease in HbA1c (0.01)	(Cardona et al., 2019)
6	T2DM	SCS	SRAT (Adherence to treatment)	HbA1c	Participants (n= 157)	Saudi	SRAT increased HbA1c (p= 0.41) and decreased through STRAT mediation (p= 0.24)	(Fayed et al., 2022)
7	T2DM	RCT	Multimodal vestibular stimulation action	HbA1c	Participants (n 30)	India	In the control group and the intervention group, there was a decrease in HbA1c (p= 0.006)	(Goothy et al., 2020)
8	T2DM	A Mixed-Methods	Self-efficacy (coping strategies used to manage the stressor)	(diet and physical activity)	Participants (n =47)	Toronto	Self-efficacy can reduce diabetes stress	(Im et al., 2022)
9	T2DM	QE	DSME	HbA1c	Participants (n=77)	Thailand	DSME intervention can reduce HbA1c and stress	(Nooseisai et al., 2021)
10	T2DM	RCT	Mindfulness programs (meditation, education, and exercise techniques)	HbA1c	Participants (140)	Taiwan	The control group showed a decrease in HbA1c.	(Chen et al., 2020)
11	T2DM	RCT	FBG (The effect of stress on fasting blood sugar)	HbA1c	Participants (37)	Indonesia	Stress has a significant effect on increasing HbA1c.	(Nopitasari et al., 2021)
12	DM	RCT	Text Messages (support, motivation, and reminders related to diabetes self-management	HbA1c	Participants (366)	New Zealand	After 9 months, the intervention group showed a decrease in HbA1c.	(Dobson et al., 2018)
13	T2DM	A Mixed-Methods	Autonomy Support (Family and Friends)	HbA1c	Participants (308)	USA	The average HbA1c is high (p = 0.023). If it is balanced with autonomy support, it shows that HbA1c has decreased (p = 0.002)	(Lee et al., 2018)

Among 13 articles, we found 12 (92.3%) articles discussed HbA1C for DM management. Two (15.3%) of the 13 articles found the implementation of the exercise. One article (7.6%) discussed relieving diabetic stress. Furthermore, one article (7.6%) discussed coping strategies (figure 2).
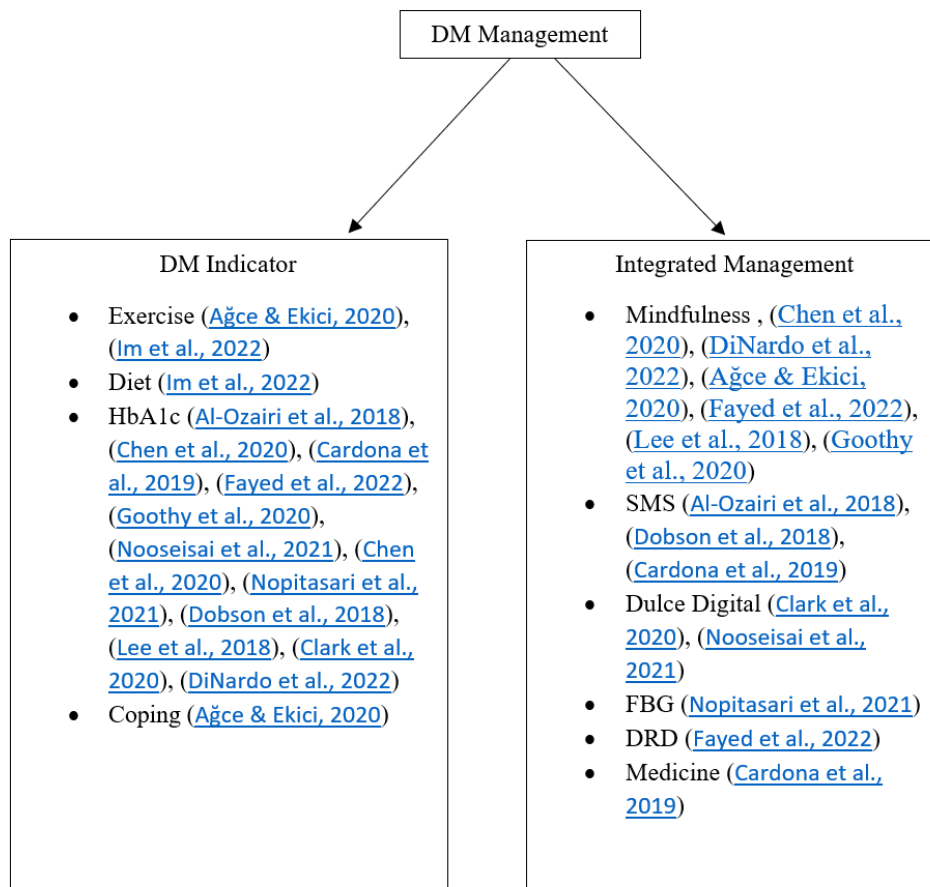

Figure 2. The Mind Map of The Integrated DM Management

Six (46%) articles analyzed the integrated management discussion about mindfulness. Furthermore, SMS motivational messages were implemented in three (23%) articles, and Dulce Digital was implemented in two (15%) articles.

DISCUSSION
DM management was evaluated using HbA1c implementation, which was more prevalent (92.3%). The glycated hemoglobin level, HbA1C, monitors DM patients' glycemic control (Safyanty et al., 2020). Tarawifa and colleagues reported that chronic DM complications included macrovascular and microvascular complications that may negatively impact patients' quality of life (Tarawifa et al., 2020). People with type 2 diabetes can avoid microvascular complications by controlling their blood sugar adequately (Kesuma et al., 2021).

Diabetic nephropathy is one of the microvascular complications of the kidney that can lead to kidney failure (Tangkelangi & Berelaku, 2019).

To maintain excellent glycemic control in diabetic type 2 patients with HbA1c less than 6.5%, blood glucose level monitoring is crucial (Amran, 2018). Microvascular complications could be reduced by 60% with the encouragement and strict control of blood glucose, combined with independent blood glucose monitoring. When DM is properly controlled, renal function can be stabilized, and the blood creatinine level can be optimized (Ismawati, 2020).

An excellent glycemic control is the hemoglobin measurement, HbA1c, which measures the blood glucose level for the preceding two or three months. When an individual's HbA1c level exceeds 6.5%,

they are considered to be suffering from DM. In contrast, if the HbA1c level exceeds 7%, the individual may increase complications. Therefore, checking up on and monitoring HbA1c levels is important to diagnose, manage, and promote the prognosis of DM type 2. A study found that most DM patients in Indonesia had poor HbA1c levels (Wulandari et al., 2020).

According to the study, DM management, such as exercise, came in second after HbA1c monitoring level. Two articles discussed exercise. Adequate exercise is crucial to maintaining good health (Suryani & Septiana, 2016). Regarding DM management, the World Health Organization recommends addressing age and physical status through physical activities (WHO, 2007). The recommended exercises for DM patients are aerobics exercises, such as walking, jogging, cycling, and swimming (American Diabetes Association, 2020). Exercise must be performed 3 to 5 times a week regularly for at least 30 to 45 minutes to improve blood glucose levels in people with DM (Nooseisai et al., 2021). Exercise increases blood glucose absorption by more than 20-fold compared with sedentary individuals (Webster, 2011).

Indonesian Society of Endocrinologists explains that the dietary pattern for DM patients, based on 3J (*jadwal* means right meal schedule, *jumlah* means the right amount of food, and *jenis* means the right type of food) is important for DM people (Perkumpulan Endokrinologi Indonesia, 2011). DM people must calculate their calorie necessity and nutritional status despite their blood glucose level (Fayed et al., 2022). DM people with routine glycemic index check-ups on each meal ingredient could prevent further DM complications (Suryani & Septiana, 2016). A proper and scheduled dietary plan should apply three main meals, twice or thrice, with a longer pause period and moderate portion (Hartono, 2006). This action is useful to maintain and reach the proper glucose level and fat in the blood at a normal level. The meals consumed by DM patients must consider the types, amounts, and schedules. This behavior will influence blood glucose (Tjokroprawiro, 2015).

Managing stress, such as mindfulness, is one of the most important aspects of integrated DM management. Mindfulness has two important aspects. The first one is the consciousness of every event without any judgment. Secondly, the vital aspect is the attitude of acceptance (Assumpcao et al., 2019). Mindfulness also refers to an individual consciousness that considers three matters: on purpose, in the present moment, and non-judgmentally (Keng et al., 2011). Mindfulness therapy facilitates individuals to avoid destructive response habits and observe personal thoughts, emotions, and events without judgment or direct reaction (Assumpcao et al., 2019).

Technology facilitates health care with simple reminders to improve the obedience of chronic disease patient medication (Safaruddin & Permatasari, 2022). The obedience of medicine could be improved by implementing SMS, text, audio, and specific application reminders. Thus, the patients would remember the medicine consumption schedule due to smartphone reminders. This technology also allows broader access for many clients. Therefore, SMS reminder offers a promising method to improve the obedience of patients, especially those with a chronic condition who must consume medicine for a long period (Alihosseini et al., 2016).

One of the health education realization and support for people with DM is Diabetic Self-Management Education and Support, DSME/S. Diabetic Self-Management Education, DSME, is a continuous process to improve the knowledge, skill, and capability of personal self-care of DM patients. On the other hand, Diabetic Self-Management Support, DSMS, provides the necessary support to keep and maintain the coping strategy and required behavior to continuously promote DM patients' self-management (Powers et al., 2017). DM patients with health knowledge and self-care guidelines would improve their life patterns. They could control their blood glucose level excellently (Haris & Kristianti, 2020; Spencer et al., 2018).

One of the therapy modalities to decrease the prevalence of complications is pharmacological therapy, such as anti-diabetic oral medicine and combined anti-diabetic oral medicine and insulin. The anti-diabetic oral medicine is an anti-diabetic medicine that controls the glycemic level by

reducing insulin resistance, stimulating the pancreas to produce more insulin, and preventing carbohydrate absorption in the intestines. In the beginning, the DM type 2 medication only used anti-diabetic oral medicine to improve the medicine's effectiveness in controlling the glycemic level. Sometimes, the administration is more than one anti-diabetic oral medicine or combined with insulin therapy (Seino et al., 2010).

CONCLUSION

Monitoring blood glucose, exercise, dietary plan, coping strategy, and continuous health education were the most effective DM management strategies for lowering HbA1c levels. People with DM should promote self-management through exercise, monitor their blood glucose and HbA1c levels, and perform effective coping strategies (starting with attitudes, thoughts, and feelings as responses to the encountered stressor). Therefore, nurses as healthcare teams should engage people with DM with integrated DM management to maintain their blood glucose and HbA1c to further minimize complications.

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