

## BEHAVIORAL PROGRAMS FOR TYPE 2 DIABETES MELITUS: A SYSTEMATIC REVIEW

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### Abstract

**Introduction:** *Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. It is possible that behavioral programs can improve outcomes for people living with type 2 diabetes mellitus; however, there is a huge variety of behavioral interventions to choose from, and it is unclear how to maximize the efficacy of these programs.*

**The aim:** *This article discusses osteosynthesis in patients with femoral neck fractures.*

**Methods:** *By comparing itself to the standards set by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, this study was able to show that it met all of the requirements. So, the experts were able to make sure that the study was as up-to-date as it was possible to be. For this search approach, publications that came out between 2013 and 2023 were taken into account. Several different online reference sources, like Pubmed and SagePub, were used to do this. It was decided not to take into account review pieces, works that had already been published, or works that were only half done.*

**Result:** *In the PubMed database, the results of our search brought up 655 articles, whereas the results of our search on SagePub brought up 254 articles. The results of the search conducted for the last year of 2013 yielded a total 192 articles for PubMed and 89 articles for SagePub. In the end, we compiled a total of 33 papers, 21 of which came from PubMed and 12 of which came from SagePub. We included seven research that met the criteria.*

**Conclusion:** *Non-pharmacological interventions that can be carried out are complementary therapies such as controlling eating patterns, doing relaxation and regular physical activity. Exercise is a strong stimulus to increase glucose input (glucose uptake) into muscle cells.*

**Keyword:** *Behavioral programs; Education; Type 2 diabetes melitus*

## INTRODUCTION

Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both.<sup>1,2</sup> The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various glands, especially the eyes, kidneys, nerves, heart, and blood vessels. The World Health Organization (WHO) estimates that the global prevalence of type 2 diabetes mellitus will increase from 171 million people in 2000 to 366 million in 2030. The World Health Organization (WHO) estimates that Indonesia is ranked 4th in the world in terms of the number of diabetics after China, India and the United States.<sup>3</sup>

Type 2 diabetes mellitus consists of multiple dysfunctions characterized by hyperglycemia and resulting from a combination of resistance to insulin action, inadequate insulin secretion, and excessive or inappropriate glucagon secretion. Uncontrolled type 2 diabetes is associated with various microvascular, macrovascular and neuropathic complications.<sup>3</sup> Microvascular complications of diabetes include retinal, renal, and possibly neuropathic disease. Macrovascular complications include coronary artery and peripheral vascular disease. Diabetic neuropathy affects the autonomic and peripheral nerves.<sup>4,5</sup>

There are several goals in the management of patients with DM. Short-term goals to eliminate complaints and signs of DM, maintain a sense of comfort, and achieve blood glucose control targets; long-term goals to prevent and inhibit the progression of microangiopathy, macroangiopathy, and neuropathy complications; and the ultimate goal of management is to reduce DM morbidity and mortality. Many patients with type 2 diabetes are eventually treated with insulin. Because they retain the ability to secrete some endogenous insulin, they are thought to require insulin but are not insulin dependent.<sup>3</sup> Another older term for type 2 diabetes mellitus is adult-onset diabetes. Currently, due to the epidemic of obesity and inactivity in children can cause T2DM to occur at a younger age. Although type 2 diabetes mellitus usually affects individuals older than 40 years, it has also been diagnosed in children as young as 2 years who have a family history of diabetes.<sup>3</sup> It is possible that behavioral programs can improve outcomes for people living with type 2 diabetes mellitus; however, there is a huge variety of behavioral interventions to choose from, and it is unclear how to maximize the efficacy of these programs.<sup>6</sup>

This page provides information about behavioral treatments that are available for people with type 2 diabetes mellitus.

## METHODS

### Protocol

The author of this study made sure it met the standards by following the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 rules. This is done to make sure that the results of the investigation are correct.

### Criteria for Eligibility

In this literature review, we talk about programs that help people with type 2 diabetes mellitus change their behavior. As the main goal of this piece of writing, showing how the problems that have been outlined are important will happen throughout the whole thing. For experts to be able to take part in the study, they had to meet the following requirements: 1) The paper needs to be written in English, and it will be about programs to help people with type 2 diabetes mellitus change their behavior. The manuscript needs to meet both of these standards before it can be considered for publication. 2) Several of the papers that were looked at came out after 2013, but before the time period that this systematic review thinks is important. Editorials, proposals without a DOI, review articles that have already been published, and entries that are almost exactly the same as journal papers that have already been published are all types of studies that are not allowed.

### Search Strategy

We used "behavioral programs" and "type 2 diabetes mellitus" as keywords. The search for studies to be included in the systematic review was carried out from July, 28<sup>th</sup> 2023 using the PubMed and SagePub databases by inputting the words: (*"behavior"[MeSH Terms] OR "behavior"[All Fields] OR "behavioral"[All Fields] OR "behavioural"[All Fields] OR "behavior s"[All Fields] OR "behaviorally"[All Fields] OR "behaviour"[All Fields] OR "behaviourally"[All Fields] OR "behaviours"[All Fields] OR "behaviors"[All Fields] OR "pattern"[All Fields] OR "pattern s"[All Fields] OR "patternability"[All Fields] OR "patternable"[All Fields] OR "patterned"[All Fields] OR "patterning"[All Fields] OR "patterning s"[All Fields] OR "patterns"[All Fields]) AND ("program"[All Fields] OR "program s"[All Fields] OR "programe"[All Fields] OR "programed"[All Fields] OR "programes"[All Fields] OR "programing"[All Fields] OR "programmability"[All Fields] OR "programmable"[All Fields] OR "programmably"[All Fields] OR "programme"[All Fields] OR "programme s"[All Fields] OR "programmed"[All Fields] OR "programmer"[All Fields] OR "programmer s"[All Fields] OR "programmers"[All Fields] OR "programmes"[All Fields] OR "programming"[All Fields] OR "programmings"[All Fields] OR "programs"[All Fields]) AND ("diabetes mellitus, type 2"[MeSH Terms] OR "type 2 diabetes mellitus"[All Fields])) AND ((y\_10[Filter]) AND (clinicaltrial[Filter])) used in searching the literature.*

### Data retrieval

The writers looked at each study's abstract and title to see if it met the inclusion standards. The writers then chose which studies from earlier research they wanted to use as sources for their piece. This conclusion was made after looking at a lot of different studies that all seemed to point to the same trend. All entries must be written in English and can't have been seen anywhere else.

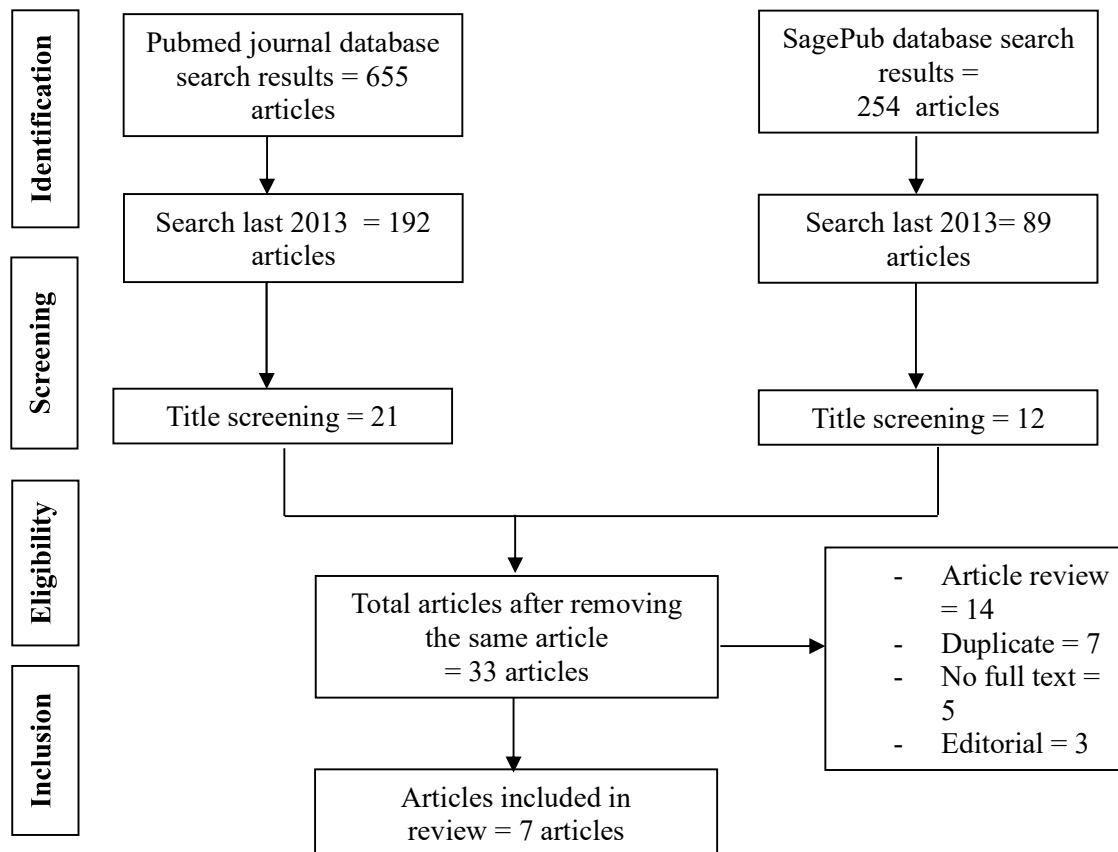


Figure 1. Article search flowchart

For the systematic review, only studies that met all of the criteria for inclusion were taken into account. This narrows down the list of results to only those that match the search. We don't take into account the results of any study that doesn't meet our standards. After that, the study results will be looked at in great depth. As a result of the research that was done for this study, the following pieces of material were found: names, authors, publication dates, location, study activities, and parameters.

**Quality Assessment and Data Synthesis**

Before deciding which publications to look into more, each author did their own research on the research that was in the title and summary of the publication. The next step will be to evaluate all of the articles that can be included in the review because they meet the criteria set up for that reason in the review. After that, based on what we've found, we'll decide which pieces to include in the review. This measure is used to choose papers that will be looked at more closely. So as to make the process of choosing papers to assess as easy as possible. Here, we talk about what research was done in the past and what about those studies made it right to include them in the review.

**RESULT**

In the PubMed database, the results of our search brought up 655 articles, whereas the results of our search on SagePub brought up 254 articles. The results of the search conducted for the last year of 2013 yielded a total 192 articles for PubMed and 89 articles for SagePub. In the end, we compiled a total of 33 papers, 21 of which came from PubMed and seven of which came from SagePub. We included seven research that met the criteria.

Lubia, et al (2023)<sup>7</sup> was showed only 7% of people knew enough about diabetes, and 56% knew enough to get by. Patients who knew enough about diabetes had a lower body mass index (p = 0.016), a lower percentage of fat (p = 0.008), and a lower amount of fat on their bodies (p = 0.018). They also followed a diet (p = 0.004), had been taught about diabetes (p = 0.002), and tried to find out more about their illness (p = 0.001). Patients who didn't know much about diabetes (odds ratio [OR] = 4.68; 95% confidence interval [CI] = 1.48–14.86; p = 0.009), didn't get diabetes education (OR: 2.17; 95% CI: 1.21-3.90; p=0.009), or didn't eat right (OR: 2.37; 95% CI: 1.01–5.55; p=0.046) were more likely to have glycosylated hemoglobin A1c (HbA1c) ≥7%.

**Table 1. The literature include in this study**

Author	Origin	Method	Sample Size	Result
Lubia, 2023 <sup>7</sup>	Mexico	Cross sectional study	297 patients with type 2 diabetes	Patients with diabetes who have poor glycemia control often have insufficient knowledge of diabetes, a lack of diabetes education, and poor dietary adherence.
Chen, 2019 <sup>8</sup>	China	Cross sectional study	100 patients with type 2 diabetes	Glycemic control in individuals with type 2 diabetes was significantly improved when diabetes self-management education (DSME) was supplemented with simulation education and case management.
Thind, 2018 <sup>9</sup>	United State of America	Randomized controlled trial	66 patients with type 2 diabetes	Focus groups are conducted at the end of the intervention to explore participants' experience with the program and their perception of the potential utility of yoga for diabetes management.
Adam, 2018 <sup>10</sup>	Canada	Randomized controlled trial	21 eligible clients from Diabetes Care Guelph	The conversation maps (CMs) were able to have a considerable influence and are useful for the education of groups. The modifications that were seen might result in better self-management of diabetes, which would cut down on the expensive health problems that are associated with poorly controlled diabetes.
Dong, 2018 <sup>11</sup>	China	Randomized controlled trial	120 type 2 diabetes patients	The combination of conventional diabetes therapy with health education for diabetics delivered via the Wechat platform has the potential to improve glucose control and significantly influence other facets of diabetes self-care abilities.
Li, 2017 <sup>12</sup>	Germany	Randomized controlled trial	46 type 2 diabetes patients	The efficacy of fasting needs to be demonstrated in bigger confirmatory studies that also incorporate intermittent fasting in the follow-up sessions to enable the effects to be more pronounced and to last for longer.
Yu, 2013 <sup>13</sup>	China	Cross sectional study	211 type 2 DM patients	Patients living in the community who have type 2 diabetes are not managing their condition successfully through self-management activities. Glycemic control can be improved by engaging in satisfactory self-management behaviors, particularly those that focus on bringing 2hPG and HbA1C under control. By paying attention to the progression of the disease, the treatment approach, the contents of diabetes education, and its effect, we can help individuals with type 2 diabetes improve their ability to self-manage their condition.

Chen, et al (2019)<sup>8</sup> showed HbA1c, fasting plasma glucose, and postprandial blood glucose level improvements were superior in the experimental group compared with the control group ( $P < 0.05$ ) after 6 months. Self-care behavior adherence scores of healthy diet ( $P = 0.001$ ), physical activity ( $P = 0.043$ ), self-monitoring of blood glucose ( $P < 0.001$ ), and reducing risks ( $P < 0.001$ ) were significantly increased in the experimental group compared with the control group. In Thind, et al pilot randomized controlled trial, people with T2DM were given either a 12-week Iyengar Yoga program given twice a week or a 12-week traditional exercise program (like walking or stationary cycling) given twice a week. At the end of treatment (12 weeks) and 3 and 6 months after the intervention, assessments are done. The HA1C study will look at the program's feasibility and acceptability (e.g., attendance/retention rates, satisfaction with the program), glycemic outcomes (e.g., HbA1c, fasting blood glucose, postprandial blood glucose), and changes in physiological (e.g., salivary cortisol) and behavioral (e.g., physical activity, diet) factors that are important for managing T2DM. At the end of the

intervention, focus groups are held to find out how the participants felt about the program and what they thought yoga could do for diabetes control.<sup>9</sup>

Adam, et al (2018)<sup>10</sup> showed that there were statistically significant variations in the knowledge and attitude score changes between the beginning education (baseline) and after three months. The levels of A1C in both groups dropped significantly from their starting points three months after the intervention was completed. The findings of focus groups indicated themes that were shared by both of the groups, such as the advantages of receiving an early education, the requirements of modifying different lifestyle behaviors, and the sentiments of social support.

Dong, et al (2018)<sup>11</sup> showed significant difference of glycosylated hemoglobin A1c (HbA1c) concentration and Self-Efficacy (SE) were found between intervention and control groups at 6-month and 12-month ( $P < 0.05$ ). The effect of groups and health education duration times was found on reduced HbA1c concentration and increased the total score of SE ( $P < 0.05$ ). No significant difference of fasting plasma glucose (FPG) and 2-hour plasma glucose (2hPG) concentrations were found between intervention and control groups at 6 months and 12 months ( $P > 0.05$ ).

Li, et al (2017)<sup>12</sup> examined 32 (n=16 per group) of 46 registered participants completed the trial. Fasting was safe and well-accepted. After 4 months, fasting reduced weight by 3.5 kg and control by 2.0 kg ( $p=0.03$ ) and abdominal circumference by 0.001. Fasting decreased systolic/diastolic blood pressure ( $p=0.01$ ;  $p=0.003$ ) and boosted quality-of-life ( $p=0.04$ ), but HbA1c, insulin, and HOMA-index did not improve. This study suggests that prolonged fasting may be safe and helpful. To demonstrate fasting's long-term benefits, larger confirmatory trials should incorporate intermittent fasting in follow-ups.

Yu, et al (2013)<sup>13</sup> showed patients living in the community who have type 2 diabetes are not managing their condition successfully through self-management activities. Glycemic control can be improved by engaging in satisfactory self-management behaviors, particularly those that focus on bringing 2hPG and HbA1C under control. By paying attention to the progression of the disease, the treatment approach, the contents of diabetes education, and its effect, we can help individuals with type 2 diabetes improve their ability to self-manage their condition.

## DISCUSSION

Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. Diabetic chronic hyperglycemia is associated with long-term damage, dysfunction, and failure of various glands, especially the eyes, kidneys, nerves, heart, and blood vessels.<sup>14</sup> Type 2 diabetes mellitus consists of multiple dysfunctions characterized by hyperglycemia and resulting from a combination of resistance to insulin action, inadequate insulin secretion, and excessive or inappropriate glucagon secretion. Uncontrolled type 2 diabetes is associated with various microvascular, macrovascular and neuropathic complications.<sup>15</sup> Persistent hyperglycemia in uncontrolled DM can cause several complications, both acute and chronic.<sup>16</sup>

There are several goals in the management of patients with DM. Short-term goals to eliminate complaints and signs of DM, maintain a sense of comfort, and achieve blood glucose control targets; long-term goals to prevent and inhibit the progression of microangiopathy, macroangiopathy, and neuropathy complications; and the ultimate goal of management is to reduce DM morbidity and mortality.<sup>17</sup> Patients with type 2 diabetes residing in the community are not managing their condition effectively through self-management activities. Self-management behaviors that focus on bringing 2hPG and HbA1C under control can help to enhance glycemic control. By focusing on the progression of the disease, the treatment strategy, the content of diabetes education, and its efficacy, we can assist individuals with type 2 diabetes in enhancing their ability to self-manage their condition.<sup>12</sup>

Type 2 diabetes generally occurs when lifestyle and behavior patterns are well established. Empowerment of people with diabetes requires the active participation of patients, families and communities. The health team accompanies the patient towards changing healthy behavior. To achieve successful behavior change, comprehensive education and efforts to increase motivation are needed. Knowledge of self-monitoring of blood glucose, signs and symptoms of hypoglycemia and how to deal with it should be given to patients. Monitoring blood glucose levels can be done independently, after receiving special training.<sup>18</sup>

Medical nutrition therapy is part of the total management of diabetes. The key to the success of medical nutrition therapy is the overall involvement of team members (doctors, nutritionists, other health workers as well as patients and their families). Every person with diabetes should receive medical nutrition therapy according to their needs in order to achieve therapeutic goals. The principles of eating arrangements for people with diabetes are almost the same as the recommendations for eating for the general public, namely food that is balanced and according to the calorie and nutrient needs of each individual.<sup>19,20</sup>

People with diabetes need to emphasize the importance of eating regularly in terms of meal schedules, type and amount of food, especially for those who use blood glucose-lowering drugs or insulin.<sup>19,20</sup> Daily physical activity and regular physical exercise (34 times a week for approximately 30 minutes). Physical exercise in addition to maintaining fitness can also lose weight and improve insulin sensitivity, which will improve blood glucose control. The recommended physical

exercise is in the form of aerobic physical exercise such as walking, leisurely cycling, jogging and swimming. Physical exercise should be adjusted according to age and physical fitness status.<sup>15</sup>

## CONCLUSION

Non-pharmacological interventions that can be carried out are complementary therapies such as controlling eating patterns, doing relaxation and regular physical activity. Exercise is a strong stimulus to increase glucose input (glucose uptake) into muscle cells.

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