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# THE MANAGEMENT OF COMPLEMENTARY THERAPIES TO STABILIZE GLUCOSE LEVELS IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

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**ABSTRACT**
Diabetes Mellitus (DM) is a chronic disease and a global public health challenge. The aim of this study is to review the most commonly used complementary therapies to control glycemic in patients with type 2 DM. The research contributes to the field of diabetes management by systematically reviewing and evaluating complementary therapies that are frequently employed for diabetes management. The literature searches are structured through online databases including Pubmed, Cochrane, and Science Direct. The population in this study was individuals with uncomplicated type 2 diabetes mellitus who were >18 years of age, the interventions were complementary and alternative therapies, the study types were RCT and Quasi Experimental, and the result was controlled lipid levels. A total of 12 articles were obtained that met the inclusion criteria. The results of the literature review through PRISMA showed that the majority of the articles were published in English and English. The majority of articles were randomized controlled trials (RCTs) that evaluated the efficacy of complementary therapies in reducing blood glucose, insulin resistance, and oxidative status in type 2 diabetic patients. In addition, this review can highlight gaps in the current literature, paving the way for future research initiatives aimed at exploring the effectiveness, safety, and mechanisms of action of various complementary approaches in diabetes management, thereby facilitating informed decision-making in patient care.

**Keywords:** Diabetes Mellitus, health, glycemic control, systematic review, complementary therapy

## INTRODUCTION

Diabetes Mellitus (DM) is a chronic disease and a global public health challenge. According to the International Diabetes Federation (IDF), in 2021 as many as 537 million people aged 20-79 years were diagnosed with diabetes mellitus. This figure is predicted to continue to increase to 643 million people in 2030 and 783 million people in 2045. Diabetes Mellitus often occurs in low- and middle-income countries, one of which is Indonesia (International Diabetes Federation, 2021a). Based on IDF data, Indonesia ranks in the 10 countries with the highest prevalence of diabetes mellitus, which is 10.8% or 19 million adult population out of 179 million adult population in 2021 (International Diabetes Federation, 2021b) and in 2045 it is estimated that mortality and treatment costs will become a major problem in social, financial, and health systems around the world (Juanamasta et al., 2021).

Diabetes Mellitus occurs when high levels of sugar in the body cannot be used optimally by the body. There are several subclassifications of diabetes mellitus, namely Type 1 DM, Type 2 DM, diabetes at a young age, gestational diabetes, neonatal diabetes, and steroid-induced diabetes (Sapra & Bhandari, 2023). However, the most common in adults is Type 2 DM. Type 2 Diabetes Mellitus occurs in about 90% of all cases of diabetes mellitus (Goyal et al., 2023).

Type 2 Diabetes Mellitus is a chronic disease characterized by hyperglycemia caused by dysfunction and insulin secretion that can harm organs and organ systems if not treated properly. DM patients are responsible for good DM management, in order to achieve glycemic control. Optimal glycemic control is the achievement of HbA1c values (Putri et al., 2022). Optimal glycemic control is the achievement of HbA1c values of <7% so that complications can be prevented (PERKENI, 2021). Complications can be prevented with good DM management.

Diabetes mellitus is associated with a number of adverse health effects. Diabetes mellitus increases the risk of cardiovascular disease and stroke significantly. The lifelong treatment process causes diabetic mellitus patients to experience fatigue, stress, and an increased burden of life. This will have an impact on the patient's biological, psychological, social, and spiritual disorders. Complex conditions further increase blood glucose levels in patients. Progressively uncontrolled blood glucose levels can lead to a variety of complications. Complications that occur are heart disease, stroke, kidney failure, diabetic melitus leg disorders, limb amputation, vision loss, and nerve damage (Juanamasta et al., 2021).

Comprehensive and holistic intervention management is expected to be able to improve the state of mind, emotions, and behavior of patients with diabetes mellitus so that blood glucose levels become regular, and quality of life improves. There are many challenges in the management of diabetes mellitus. The first treatment of diabetes mellitus is to use antihyperglycemic drugs, but the use of conventional drugs also has side effects so that complementary and alternative treatment is starting to become an option for the treatment of chronic diseases (Setiyorini et al., 2022).

Complementary therapy is a type of treatment that is used as an adjunct intervention to conventional medical therapy. This therapy does not replace primary treatment, but it supports healthcare with a different approach to improving physical, mental, or emotional well-being. As many as 82% of patients choose complementary therapy because of the minimal complications that occur when compared to conventional therapy (Lindquist et al., 2014). Based on research by Ilhan (2016), conducted in Turkey as many as 81 people (26.9%) of diabetic mellitus patients are looking for alternative therapy, 50 people (16.6%) of diabetic mellitus patients continue to use alternative therapy, and as many as 43 (14.3%) diabetic mellitus patients use the product every day, and 24 (8%) diabetic mellitus patients use alternative therapy for 6 months. The results were obtained that there was a significant decrease in HbA1C levels.

Complementary therapies can provide economic benefits by reducing healthcare costs and improving patient treatment outcomes by preventing uncontrolled diabetes-related complications (Duarte et al., 2020). This study aims to review the most commonly used complementary therapies to control glycemic in patients with type 2 diabetes mellitus. Complementary therapeutic interventions for diabetes mellitus can be divided into three categories, namely nutritional approaches (including diet, herbal treatment, and probiotics), psychological approaches (including mindfulness), physical approaches (including massage and spinal manipulation), and Combination physical and psychological (including tai chi, yoga, acupuncture) (NCCIH, 2021).

This study aims to review complementary therapies commonly used in glycemic control in Type 2 DM patients. The research contributes to the field of diabetes management by systematically reviewing and evaluating complementary therapies that are frequently employed for glycemic control in patients with Type 2 Diabetes Mellitus. By synthesizing existing evidence on these therapies, the study aids healthcare professionals in understanding the potential benefits and limitations of various complementary approaches, thereby facilitating informed decision-making in patient care. Additionally, this review can highlight gaps in the current literature, paving the way for future research initiatives aimed at exploring the effectiveness, safety, and mechanisms of action of complementary therapies in diabetes management. Ultimately, the findings may enhance patient outcomes by promoting a more holistic and integrated approach to treatment.

## RESEARCH METHOD

The method used in this literature review is systematic review. The researcher used the PICO format with the population being type 2 diabetes mellitus patients, the intervention used was complementary therapy, There was no comparison or comparison, the outcome was a decrease in glycemic levels.

Furthermore, in the search for systematic reviews, the researcher used the Arksley O'Malley framework, and reported based on the Preferred Reporting Item for Systematic Review and Meta-analysis for Scoping Review (PRISMA-ScR) check-list. Article searches are structured through online databases including Pubmed, Cochrane, and Science Direct. The keywords used are "diabetes mellitus type 2" AND "complementary therapy" AND "blood sugar" from January 2019 to November 2024.

In this study, it is a non-English, non-full-text article. Observational, non-randomize control trials, and case control studies were not included in this review. The population in this study was individuals with uncomplicated type 2 diabetes mellitus who were >18 years of age, the interventions were complementary and alternative therapies, the study types were RCT and Quasi Experimental, and the result was controlled glycemic levels.

Complementary therapies are categorized into nutritional approaches (including diet, herbal medicine, and probiotics), psychological approaches (including mindfulness), physical approaches (including massage and spinal manipulation), and combination physical and psychological (including tai chi, yoga, acupuncture).

## RESULT AND DISCUSSION

Based on the results of the literature review through PRISMA, 12 articles were obtained that met the inclusion criteria.

**Table 1.** Articles that meet the inclusion criteria

| Title, Author, and Year | Purpose | Design, Sample, Research Location | Intervention | Result |
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| The effect of sesame seeds on fast blood sugar, haemoglobin | To see the effect of sesame seed consumption on | Planned: RCT<br>Sample: 60 | The genus and species of sesame seeds used *by* | The results showed that the serum levels of fasting |

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| A1C, liver enzymes and lipid profile in patients with type 2 diabetes: a randomised clinical trial<br><br>(Ghoreishi et al., 2022) | several biochemical factors in people with type 2 diabetes | DM type 2 patients (30 controls, 30 experimental)<br><br>Location: Iran | *Sesamun indicum*. In the experimental group, patients received 60 grams of sesame seeds/day and consumed for 2 times for two months. Meanwhile, the control group did not receive sesame seeds. After two months, blood samples were taken from both groups, and biochemical parameters were measured. | blood glucose, HbA1C, cholesterol, triglycerides, *low density lipoprotein* (LDL), alanine transaminase (ALT) and alkaline phosphatase (ALP) decreased significantly ($p < 0.05$) in the experimental group compared to the control group. |
| A Complementary Therapy with Whey Protein in Diabetes: a Double-Blind Randomized Controlled Clinical Trial<br><br>(Pezeshki et al., 2023) | To see the effect of whey *protein consumption* on the glycemic index of type 2 DM patients. | Planned: RCT<br><br>Sample: 58 DM patients (29 interventions, 29 placebo)<br><br>Location: Iran | All samples consumed 12.5 grams of *whey protein* powder and 5 grams of caramel corn powder dissolved in warm water as much as 150-200mL and drank it before breakfast for 12 weeks. | The results showed a significant decrease in HbA1c in the intervention group, but no significant decrease was found in the placebo group. No complications occurred in either group |
| The effect of saffron (Crocus sativus L.) on glycemia, lipid profile, and antioxidant status in patients with type-2 diabetes mellitus: A randomized placebo-controlled trial<br><br>(Tajaddini et al., 2023) | To see the effects of saffron supplementation on glycemic status, lipids, atherogogenic index, and oxidative status in type 2 DM patients. | Rancangan: RCT<br><br>Samples: 70 samples (35 interventions, 35 placebos)<br><br>Location: Iran | For 8 weeks, each group took saffron powder (1mg) in capsule form daily. Patients are asked to maintain food intake or physical activity. During the intervention, the patient is always monitored via phone to see for side effects. | The results showed that saffron consumption could reduce GDP, except for high-density lipoprotein [HDL-C] cholesterol), atherogenic index, and liver enzymes. In addition, saffron can improve oxidative status (nitric oxide [NO] and malondialdehyde [MDA] are reduced by 26.29% and 16.35%, respectively). |
| Effect of Photo-Bio modulation on lipid | To see the efficiency of | Planned: RCT | The intervention group underwent | There was a decrease in blood |

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| profile in Patients with type 2 diabetes mellitus: A Randomized Clinical Trial<br><br>(Fares et al., 2023) | Low-Level Laser Therapy (LLLT) by using a laser clock as an adjunct therapy for dyslipidemia in patients with type 2 DM | Samples: 60 samples (30 interventions, 30 controls)<br><br>Location: Egypt | LLLT on the wrist for 12 weeks (3 sessions/week) accompanied by the consumption of hypoglycemic drugs (Metformin and vildagliptin). Meanwhile, the control group only consumed hypoglycemic drugs. | sugar levels and serum lipid profile in both groups, but the intervention group showed more significant results. |
| The efects of Chlorella supplementation on glycemic control, lipid profle and anthropometric measures on patients with type 2 diabetes mellitus<br><br>(Hosseini et al., 2021) | To evaluate the effects of chlorella supplementation on glycemic control, lipid profile, and anthropometric index in patients with type 2 DM | Planned: RCT<br><br>Samples: 84 samples (42 interventions, 42 placebos)<br><br>Location: Iran | Both groups received chlorella 500 mg supplements as many as 3 capsules for 8 weeks without changing physical activity, diet, medication during the study. Patients are monitored every 2 weeks. | There were no significant changes in either group. Chlorella does not improve anthropometry, glycemic status, and lipid profile in patients with type 2 DM. |
| The effect of acupressure on fasting blood glucose, glycosylated hemoglobin and stress in patients with type 2 diabetes<br><br>(Mood et al., 2021) | To find out the effect of acupressure on GDP and HbA1C in type 2 DM patients. | Planned: RCT<br><br>Samples: 66 samples (33 interventions, 33 placebos)<br><br>Location: Iran | The intervention was performed at the Xingjian (LR2) point (on the instep, between the 1st and 2nd toes) and HeGu (LI4) (at the highest point of the adductor muscle when the thumb and index finger are brought together).<br>The patients were then asked to apply gentle pressure to the acupuncture point for 60 seconds and gradually increase the pressure until they noticed a change in the color of the nail base with a load of 3 kg. Then, they placed | There was a decrease in GDP in 60 patients, but there was no significant difference in HbA1c levels in the two groups. |

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| | | | their hands on the area for 3 seconds and reduced the pressure on the spot within 60 seconds (each hand and foot took 5 minutes and 20 minutes total). The patient performs acupressure on his own at the desired point for a month, 20 minutes a day. They applied pressure to the Xingjian point (LR2) in the morning (9–10 am) and at the He-Gu point (LI4) at night (5–6 pm). | |
| Evaluation of the Effect of Pistacia atlantica Oleoresin on Blood Sugar, Pressure and Lipids in Patients With Type 2 Diabetes: A Single-Blind, Placebo-Controlled Trial<br><br>(Memariani et al., 2024) | To see the effectiveness of *Pistacia atlantica oleoresin* in improving lipid profiles, glucose index, and blood pressure in type 2 DM patients. | Planned: RCT<br><br>Samples: 42 samples (21 interventions, 21 controls)<br><br>Location: Iran | The intervention group was given capsules of 500 mg for 2x/day for 3 months with the simultaneous consumption of 500 mg of metmorphine. Meanwhile, the control group only consumed 500 mg of metmorphine. | There were no significant differences between the two groups in glucose index and lipid profile. However, in the context of blood pressure there was a significant decrease in the intervention group. |
| Efficacy of Qurs-e-Gulnar in Ziabetus (type 2 Diabetes Mellitus): a single blind randomized controlled trial<br><br>(Eqbal et al., 2021) | To test the effectiveness of Qurs e-Gulnar in the management of type 2 DM patients. | Planned: RCT<br><br>Samples: 40 samples (20 interventions, 20 controls)<br><br>Location: India | The intervention group received Qurs-e-Gulnar at a dose of 2 times a day and the control group only consumed 2 diabetes capsules twice a day before meals. | There was a significant decline in GDP in the intervention group. However, there was no change in HbA1c levels. In addition, the symptoms of polyuria, polydipsia, and polyphagia also decreased. |
| Effects of Satureja Khuzestanica supplementation on glycemic indices and lipid profile in type | To determine the effect of SK supplementation on glycemic and lipid outcomes in | Rancangan: RCT<br><br>Samples: 78 samples (39 | All patients received three bottles of SK capsules (500 mg) and were taken | The results showed that taking SK supplements could improve glycemic index levels and |

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| 2 diabetes patients: a randomized controlled clinical-trial<br><br>(Roosta et al., 2024) | type 2 DM patients. | interventions, 39 placebos)<br><br>Location: Iran | daily after lunch for 12 weeks. | lipid profiles in type 2 DM patients. |
| Effects of fitness qigong and tai chi on middle-aged and elderly patients with type 2 diabetes mellitus<br><br>(Li et al., 2020) | To evaluate the effectiveness of qigong and tai chi intervention therapy in middle-aged and older adults with type 2 DM. | Planned: RCT<br><br>Samples: 103 Samples (35 controls, 35 qigong, 35 tai chi)<br><br>Location: | - Qigong: Consists of 3 sessions (10 minutes of doing breathing techniques, 30 minutes of intervention, 10 minutes of relaxation) carried out for 12 weeks.<br>- Tai Chi: Consists of 3 sessions (10 minutes of breathing techniques, 30 minutes of intervention, 10 minutes of relaxation). | The results showed that qigong *exercise* did not show results on changes in HbA1c. Meanwhile, tai chi *excercise* showed results in an increase in HbA1c levels so *that tai chi* is at risk for people with obesity. |
| Propolis supplementation improves glycemic and antioxidant status in patients with type 2 diabetes: A randomized, double-blind, placebocontrolled study<br><br>(Afsharpour et al., 2019) | To determine the effect of oral propolis supplementation on blood glucose, insulin resistance and antioxidant status in type 2 DM. | Planned: RCT<br><br>Samples: 62 samples (31 interventions, 31 placebos)<br><br>Location: Iran | Each patient received 500 mg of propolis capsules taken after meals 3 times a day for 2 months. | After two months, GDP, 2-hp, insulin, IR, HbA1c decreased significantly in patients treated with propolis compared to the placebo group. In addition, propolis intake significantly increased blood levels of TAC and GPx and SOD activity. |
| Effectiveness of Laughter Therapy Versus Humour Therapy On Blood Glucose Level Among Individuals Diagnosed With Type 2 Diabetes Mellitus<br><br>(Jaisingh et al., | To determine the effectiveness of laughter therapy compared to humor therapy on blood glucose levels in type 2 DM patients. | Planned: RCT<br><br>Samples: 150 samples (50 control groups, 50 laughter groups, 50 humor groups) | Humor therapy is provided through a comedy video in a regional language that is shown on television for 8 sessions for 4 weeks for 30-40 minutes. | Laughter therapy and humor therapy have been shown to be effective in lowering glucose levels in the blood. In comparison, humor therapy is better than laughter therapy because it can stimulate the |

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| 2019) | Location: India | Laughter therapy includes warm-up exercises, spontaneous laughter, and laughter with stimulants. The control group did not receive any intervention. | whole body. |

**Discussion**

***Psychological Approaches***

The psychological approach to complementary therapy for diabetes mellitus aims to help patients manage psychological conditions that can affect the management of diabetes. Diabetes is considered a major global health problem that causes sufferers to experience stress or commonly known as diabetes distress. This diabetic stress arises due to blood glucose instability and the need for long-term treatment (Khasanah, 2024). Stress in diabetes triggers the release of excess glucocorticoid hormones that interfere with glucose production in the liver and reduce cell sensitivity to insulin, thus causing hyperglycemia (Arifin et al., 2017).

Psychological interventions have an important role in the management of suboptimal diabetes care, and there have been various studies examining various aspects of psychological interventions to optimize diabetes. There is evidence that certain psychological interventions such as cognitive behavioral therapy (CBT), motivational interviews, and attention control may be effective in reducing diabetic stress and improving diabetes management (Doherty, 2022).

One of the attention controls that can be done is laughter therapy and humor therapy. Laughter therapy stimulates all body systems. Negative emotions such as anxiety, agitation, unexplained irritability, fear, lack of attention, extreme lethargy, confusion, and sadness are factors that increase blood glucose levels (Jaisingh et al., 2019). Laughter therapy can stimulate positive emotions and a more positive outlook. In addition, laughter therapy can also improve the overall performance of heart muscle function as well as suppress increased blood glucose levels.

***Nutritional Approaches***

The use of nutrition in complementary therapy is increasingly popular for DM sufferers as one of the ways to manage DM. In type 2 DM patients, the use of nutrition aims to manage blood sugar levels, reduce the risk of complications, and improve the patient's quality of life. Proper nutrition supports the effectiveness of medical treatment and helps reduce the strain on certain medications by maintaining stable blood sugar levels. The application of nutrition can be through diet and dietary supplements. The most commonly used dietary supplements for diabetes include: herbs, vitamins, minerals, and other dietary components (Deka et al., 2023).

Herbal supplements are the most widely used dietary supplements for diabetes and are believed to help manage diabetes symptoms by improving insulin sensitivity, lowering blood glucose levels, and improving overall glycemic control (Deka et al., 2023). Herbal medicine and traditional medicine are complementary and alternative types of treatment used by diabetic patients. This is because traditional medicine offers many advantages, including a lower risk of side effects of chemical drugs, effectiveness in the treatment of chronic diseases, lower costs, greater accessibility, and cultural acceptance.

People in Indonesia have used more than 400 types of medicinal plants to treat DM, including the crown of the god, ciplukan, bitter melon, and sambiloto. In addition, herbal plants that are used by the community as antidiabetics are generally plants that are efficacious as astringents (avocado, mung beans, corn, guava, lamtoro, mahogany, and others). Or as a substance that can accelerate the excretion of blood sugar from the bloodstream by increasing metabolism, such as garlic, candlenut, cat's whiskers, cactus, and others (Utomo et al., 2022).

***Combination physical dan psychological***

Complementary therapies for managing type 2 DM often combine physical and psychological interventions to deal with the body and mind. This can address the physiological and emotional challenges faced by people with DM. One intervention that combines physical and psychological interventions in DM management is Qigong and Tai Chi. This intervention is a light exercise that emphasizes slow, controlled movements with deep and focused breathing. These exercises help to improve physical flexibility, balance, and relaxation, which can contribute to better glucose control and mental well-being (Li et al., 2020).

In addition, there is photo biomodulation as a combination of physical and psychological interventions. This therapy is a safe, non-invasive technique that uses low-intensity red or near-infrared light to affect biological processes in the body. Based on the results of the study, the use of lasers or infrared can reduce glucose, cholesterol, LDL, and very low density lipoprotein (VLDL) levels and improve immune and hormonal function in people with type 2 diabetes mellitus (Fares et al., 2023).

## CONCLUSION

Complementary therapy for Type 2 Diabetes Mellitus aims to enhance conventional medical treatment through natural or holistic methods that can improve insulin sensitivity, reduce stress, support mental health, and aid in blood sugar control. While these therapies can boost productivity and efficiency within the health system when applied correctly, not all approaches yield the desired outcomes, and some may be unsuitable for certain individuals. Therefore, their application should be evidence-based, guided by healthcare professionals, and approached with caution to ensure effectiveness and avoid unnecessary expenses or health risks. Future research should investigate the efficacy and safety of specific complementary therapies, such as dietary supplements, acupuncture, and mindfulness techniques, while also considering individual variability in treatment responses. Additionally, exploring the role of healthcare professionals in integrating these therapies into conventional

treatment plans and conducting longitudinal studies on their long-term effects could provide valuable insights for practitioners and policymakers.

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