




Effectiveness of Cognitive Behavioral Therapy and Muscle Relaxation on Fasting Blood Sugar Levels among Type 2 Diabetes Mellitus: A Systematic Review

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Artikel info	ABSTRACT
<p>Article history: Received: 06 Maret 2021 Revised: April 10th, 2021 Accepted: April 20th, 2021</p> <hr/> <p>Corresponden author: Meylani Anaabawati m.anabawati@gmail.com</p> <hr/> <p>DOI: http://doi.org.10.35654/ijnhs.v4i2.414</p>	<p>Abstract. Diabetes mellitus type 2 is a metabolic disease in the form of a collection of symptoms due to an increase in blood sugar. Interventions cognitive behavioral therapy and muscle relaxation focused on reducing fasting blood sugar levels shown to affect the management of diabetes mellitus. This literature study aimed to evaluate cognitive-behavioral therapy's effectiveness and muscle relaxation on fasting blood sugar levels in people with type 2 diabetes. This search systematic review was conducted with PRISMA using the electronic database method Science Direct, Proquest, PubMed, Scopus, Springer Link. The research study criteria used a randomized control trial, quasi-experimental, experimental, meta-analysis review published in 2015-2020. Based on 27 literature studies that found muscle relaxation intervention effectively controlling glycemic and lowering blood sugar levels. The study results were significant in muscle relaxation, improving blood sugar levels, and found multiple outcomes such as anxiety, depression, and quality of life. Cognitive-behavioral therapy and muscle relaxation can be applied to control and reduce blood sugar levels and improve the quality of life of people with type 2 diabetes mellitus.</p> <p>Keywords: Cognitive behavioral therapy, muscle relaxation, fasting blood sugar levels, type 2 diabetes mellitus.</p>
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Introduction

Diabetes mellitus is one of the main problems in the health system that needs global data because it predicted that there would be a significant increase. The World Health Organization (WHO) mentions that there are 4 types of non-communicable diseases, namely cardiovascular disease, chronic respiratory disease, cancer, and what is show a lot today is

Diabetes mellitus. The American Diabetes Association (ADA) classifies DM into four types: Type I DM, Type II DM, Gestational DM, and Specific Type DM. Among the four types, Type II DM has the highest prevalence from year to year (1,2).

Diabetes mellitus (DM) is a metabolic disease due to an increase in the amount of sugar in the blood (hyperglycemia) due to abnormal insulin secretion, insulin action, or even both. Failure is the result of reduced levels of the hormone insulin or insulin function defects. Type II DM is DM caused by a decrease in the amount of insulin produced (3,4).

A survey report from the International Diabetes Federation (IDF) in 2017 shows that the prevalence of Type II Diabetes Mellitus has increased relatively high in various countries, namely 425 million people aged 20-79 years who suffer from Diabetes Mellitus (3). The Endocrinology Association (PERKENI) states that the number of diabetics in Indonesia has reached 9.1 million people. Indonesia has shifted up from 7th place to the 5th top rank among countries with the number of diabetes mellitus sufferers (5).

The 2018 primary health research survey results showed that 10.9% of the Indonesian population was diagnosed with diabetes mellitus. The number increased by 2% from the previous five years and most of the sufferings dominated by women who live in cities. On average, they are residents who have diploma-level educators and above and work in government agencies (6). DM in Central Java ranks 2nd out of 34 Provinces after hypertension, with a prevalence of 16.42% or approximately 110,702 inhabitants. The health profile of Semarang City states that as many as 8,842 people have Type 2 diabetes (7). While the prevalence of DM sufferers in the Sronol Public Health Center in 2018 was 1143, not dependent on insulin and 7 dependent on insulin.

The impact of diabetes mellitus that not regularly control will lead to acute and chronic complications. The acute complications themselves include hypoglycemia and hyperglycemia, whereas chronic complications are macrovascular and microvascular. Diabetes calls the silent killer because nearly one-third of people with diabetes do not know they have diabetes mellitus until the disease has become serious and affects other organs in the body. Hyperglycemia or increased blood glucose levels continuously can result in damage to blood vessels. It increases the risk of microvascular damage such as retinopathy, nephropathy, and neuropathy (8-9).

Chronic medical conditions in people with diabetes mellitus require involvement in lifelong therapeutic self-management to maintain glycemic control. Attempts made on self-management, especially lifestyle modifications, daily medication demands, and thinking about the risk of diabetes complications pose behavioral and psychological challenges. An estimated 50% of people with diabetes show a deterioration in their psychological state when diagnosing diabetes. The relationship between diabetes and psychological conditions affects each other. It is influenced by the biological, physiological, social, and mental conditions of the sufferer on the complications of the disease experienced by type 2 diabetes mellitus sufferers (10).

The obstacles to overcoming diabetes management are mostly the influence on cognitive and behavior. Lack of knowledge or skills in diabetes management can cause ineffective control of sugar levels and be challenging to control, causing increased sugar levels. This situation will cause the patient to undergo treatment in the hospital to manage blood sugar levels and other complaints resulting from the accompanying illness.

Management of diabetes mellitus takes a long time and is continuous. The Indonesian Association of Endocrinology (PERKENI) states that five pillars become efforts to treat diabetes mellitus, namely education, nutritional therapy, physical exercise, pharmacological therapy, and glucose control. Management aims to keep blood glucose levels within normal limits and prevent other diseases. Type 2 diabetes mellitus sufferers generally experience problems with lifestyle patterns, behavior, and lack of activity (9).

Complementary therapy is a traditional medicine that has been recognized and can be used as a companion to conventional or medical therapy. Complementary therapies include relaxation, exercise, reflexology, massage, prayer, hypnotherapy, creative therapy, including music, meditation, and herbs. Many complementary therapies can be used, such as therapeutic touch, which contains practice-specific therapeutic and diagnostic methods that require special training.

Cognitive Behavioral Therapy (CBT) is a form of counseling that aims to help clients become healthier, have satisfying experiences, and fulfill certain lifestyles by modifying certain thought patterns and behaviors. The CBT therapeutic approach focuses on placing an affirmation of thoughts and behavior towards consistency of oneself (11).

Empirical evidence can be seen from Abdul's research on cognitive behavior therapy on blood glucose levels in Type II diabetes. A total of 28 respondents said there was a significant effect of CBT on blood glucose levels seen from the value of $P = 0.003 < \alpha 0.005$.⁽¹¹⁾ This is in line with research by Wahyuningsih on Cognitive Behavioral Therapy (CBT-I) on insomnia and blood sugar levels, which states that CBT-I has an effect on blood sugar levels with a total sample of 43 respondents. Effect of CBT-I on blood sugar on days 1, 2, 3, 4 (p -value = 0.000) (12).

This study's results are by the theory that giving cognitive and behavioral psychotherapy will change dysfunctional thoughts into more effective thoughts, resulting in new feelings and good behavior habits. The basis of cognitive model psychotherapy is that behavior and emotions regularly interact with thoughts. A person's wrong thoughts or beliefs because of excessive emotional reactions and ineffective coping mechanisms. Its application to diabetic patients in the face of conditions that demand daily care is difficult, but it is not necessary to put the suffering of these demands in mind. This depends on individual perceptions (13).

Relaxation techniques improve physical and mental health by regulating the glucose axis of the hypothalamus, pituitary adrenaline (HPA), and the sympathetic nervous system (SNS). The HPA and SNS axes trigger in response to physical or psychological demands (stressors) that lead to a series of physiological, behavioral, and psychological work (14-15). Muscle relaxation can be used to lower blood glucose levels by inhibiting the glucogenesis process, relaxing muscles, contracting or tensing a muscle group, and stopping tension, then focusing on these muscles so that the body condition becomes more relaxed.

Dian's research on Progressive Muscle Relaxation on Blood Glucose Levels of Controlled and Uncontrolled Type II Diabetes Mellitus as many as 26 respondents divided into two groups. It proves that there is an effect in both groups. Namely, the intervention group (controlled) was given PMR and breaths in the average yield of $133.69 \text{ mg/dl} \pm 30,546$ ($p=0.001 / \alpha < 0.05$). The control group (uncontrolled) given PMR and deep breaths; the average result was $271.54 \text{ mg/dl} \pm 60.363$ ($p=0.001 / \alpha < 0.05$). Both groups experienced a decrease in blood sugar levels but were still within normal limits. This study indicated a change in the uncontrolled group because it dominates by women (61.5%). The cause was due to hormonal changes in women who experienced menopause, which was known to women who were more likely to think excessively of problems that caused stress and depression (14).

The relaxation mechanism can suppress the stress hormone and the hormone cortisol, one of the triggers for the increase in blood sugar levels in people with diabetes mellitus. The increase in blood sugar levels influences by the hormones cortisol, glucagon, adrenocorticotrophic hormone (ACTH), corticosteroids, and thyroid. The liver is encouraged to release excess insulin so that blood sugar levels increase. If this hormone not control, hyperglycemia will occur, and sugar levels will become uncontrollable.

Some studies have found evidence of the effectiveness of applying-based interventions Cognitive Behavioral Therapy and Muscle Relaxation on blood sugar levels. Still, no studies have specifically discussed cognitive behavioral therapy and Muscle Relaxation to fasting blood sugar levels. Interventions Cognitive Behavioral Therapy (CBT) and Muscle Relaxation This technique is very easy to do every day, wherever and whenever the environment is prone to psychological disorders and requires a short time and does not require expensive costs to do this.

Cognitive Behavioral Therapy (CBT) and Muscle Relaxation are expected to manage psychological problems that will affect blood sugar levels to improve the quality of life of people with diabetes mellitus. If the intervention proves effective, it is hoped that the intervention can increase the choice of intervention for DM sufferers.

During the Covid-19 pandemic that occurred in Indonesia from March 2020 to the present, the government gave regulations to all communities and institutions such as offices, schools, and campuses to carry out home activities. So the solution from educational institutions recommends researching with a method systematic literature review. SLR is a synthesis of a systematic, clear, comprehensive literature study by identifying, analyzing, evaluating through collecting existing data with an explicit search method and involving a critical review process in selecting studies.

Based on the description above, the researchers conducted research. On the effectiveness of Cognitive Behavioral Therapy and Muscle Relaxation on Fasting Blood Sugar Levels in Type 2 Diabetes Mellitus Patients using a research method systematic review.

Objective

This literature study aimed to evaluate cognitive-behavioral therapy's effectiveness and muscle relaxation on fasting blood sugar levels in people with type 2 diabetes.

Methods

Literature Search

Review and reporting methods using PRISMA search for comprehensive data through accessible electronic databases such as MEDLINE, ProQuest, Academic Search Complete, Springer Link, Elsevier (SCOPUS), Emerald, PubMed, Science Direct, IGI Global, Portal Garuda, and National Library, using the chosen keywords, cognitive behavior therapy and muscle relaxation on fasting blood sugar levels in type 2 diabetes mellitus patients.

Literature Selection

The determination of keywords in the search based on predetermined criteria. Those studies applied cognitive-behavioral therapy on blood sugar levels in type 2 diabetes mellitus sufferers and muscle relaxation for blood sugar levels in type 2 diabetes mellitus sufferers. We analyzed the articles by reading the abstract and reviewed the contents through methods, designs, samples, interventions, and inclusion results at a later stage. it would include the relevant article in this literature review.

Inclusion and Exclusion

1.1 Criteria Inclusion Criteria Study

- a. The population is with type 2 diabetes mellitus and psychological problems that may affect uncontrolled blood sugar levels.
- b. The intervention method uses cognitive behavioral therapy and muscle relaxation.
- c. Study design Quasi-experimental, randomized trial, cross-sectional, and systematic review meta-analysis.

- d. The articles were published within 2015-2020.
 - e. Study results that report details of the effects of the intervention or data.
- 1.2 Exclusion Criteria
- a. Studies with literature design
 - b. Not associated with Cognitive behavioral therapy and Muscle relaxation
 - c. The study applied Cognitive behavioral therapy and Muscle relaxation but not for diabetes mellitus.

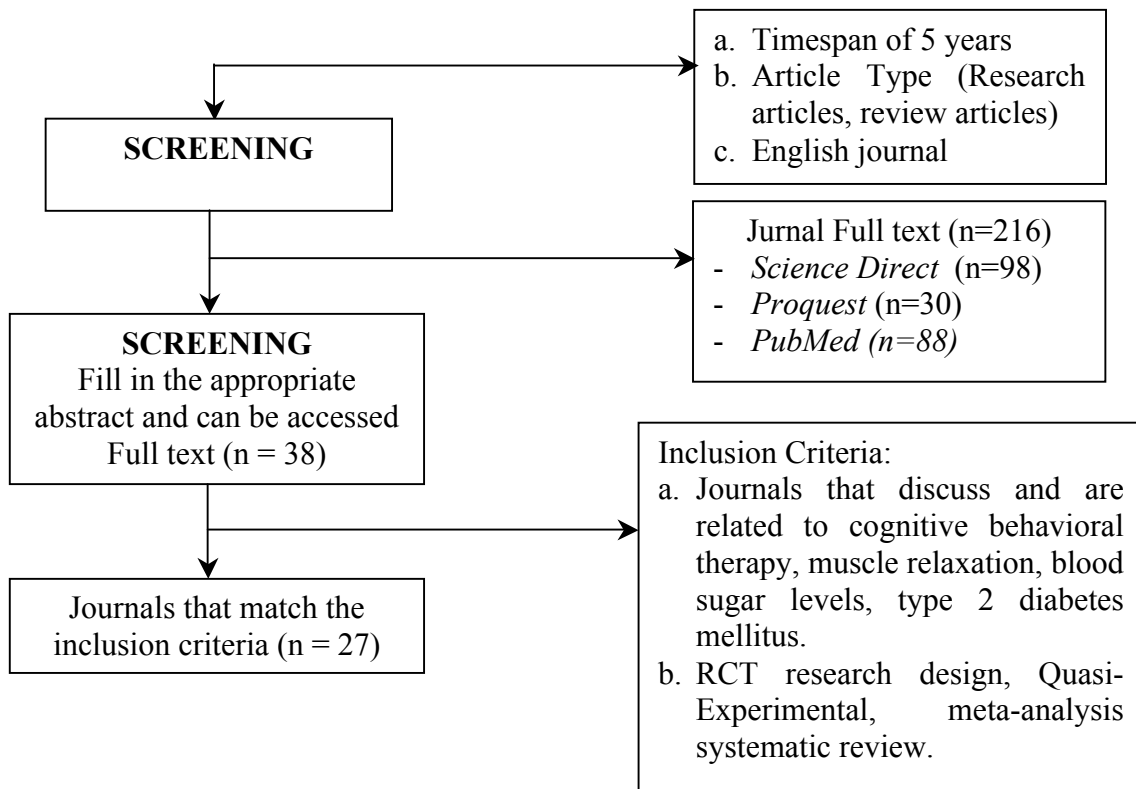


Figure 3.2 Diagram Flow the Literature Intervention Cognitive behavioral therapy and Muscle relaxation on fasting blood sugar levels in type 2 diabetes mellitus

2. Data Collection

Title: Effectiveness of cognitive-behavioral therapy and muscle relaxation on fasting blood sugar levels in type 2 diabetes mellitus sufferers

Article Type: Research article, Systematic review

Year publication: 2015 - 2020

Keywords: Cognitive behavioral therapy, muscle relaxation, blood glucose levels type 2 diabetes mellitus.

Methods: Randomized control trial, quasi-experiment, meta-analysis systematic review.

Results and Discussion

Search Process

Based on 27 research studies that meet the inclusion criteria, 14 journals discuss cognitive behavioral therapy as the primary intervention and muscle relaxation as many as 13 journals divided into several different interventions. Research from several researchers shows that intervention is muscle relaxation more effective than Behavioral cognitive therapy as a

mediator in coping strategies for psychological problems that affect blood sugar levels in patients with type 2 diabetes mellitus.

Results of selection for inclusion and exclusion criteria

Selected the search process based on inclusion and exclusion criteria. This process gets 27 journals and then scanning the data.

a. Effectiveness of muscle relaxation intervention

Based on research conducted by Akbar (2017) ⁽¹⁶⁾ with a quasi-experimental research design that examines muscle relaxation on blood sugar levels in patients Type 2 diabetes mellitus with a total of 30 samples divided into 2 groups, namely 15 respondents in the intervention group and 15 respondents. The control group with an independent t-test showed a significant difference in the mean deviation of blood sugar levels between groups with a value of $p=0.015$. The paired t-test results obtained a value of $p=0.000$, which means that progressive muscle relaxation effectively reduces blood sugar levels (16).

In the intervention group, muscle relaxation was administered three times a day for three days with a duration of 25-30 minutes. Meanwhile, the control group only carried out daily activities while undergoing rounded care, indicating that the highest reduction in blood sugar levels was in the intervention group pre-test of 292.07 mg/dl and 211.60 mg/dl in the post-test with a decrease difference of -80.47 (27.5%). Meanwhile, in the control group, the average pre-test blood glucose levels were 294.13 mg/dl and 230.33 mg/dl with a difference of -63.8 (27.6%).

The intervention group with the provision of progressive muscle relaxation effectively reduced blood sugar levels with an effect size of 0.94, which proved that progressive muscle relaxation had a strong effect on reducing blood sugar levels in patients with type 2 diabetes mellitus. Clinically, it shows that progressive muscle relaxation has not effectively reduced blood sugar levels because the average decrease in blood sugar levels is still not normal, which is still >200 mg/dl.

b. Mechanism to muscle relaxation decrease blood sugar levels

The technique is a self-management technique based on the workings of the sympathetic and parasympathetic nervous systems. Muscle Relaxation is a relaxation movement that can cause a decrease in muscle tension caused by chronic illness, psychological tension, anxiety, depression, and pain so that the patient's quality of life can be improved or improved.

The psychological conditions experienced by people with Type 2 Diabetes Mellitus are due to a bad lifestyle. Both diet and the use of drugs consumed during Type 2 Diabetes Mellitus can increase blood glucose levels. Hyperglycemia is affected by the neuroendocrine system and the sympathetic nervous system. It activates the hormones epinephrine, cortisol, glucagon, ACTH, corticosteroids, and thyroid.

Muscle Relaxation can reduce blood sugar levels in DM patients by creating a relaxed condition. In this condition, there is a decrease in nerve impulses in the brain's efferent pathway where activation becomes inhibition. These changes in nerve impulses cause a feeling of calm both physically and mentally, such as reduced heart rate, decreased metabolic rate, in this case, prevents an increase in KGD.

Muscle Relaxation is easy physical activity therapy. Active muscles will improve insulin circulation by increasing the dilation of cells and blood vessels, which can inhibit leptin's secretion. It helps sugar entry into cells because inactive muscles' sensitivity to insulin receptors will increase so that sugar intake increases. This is due to the sensitivity of the insulin receptors that are active when doing physical exercise. These blood flow

increases cause the capillaries to open so that more insulin receptors on the muscles' intracellular or insulin receptors are active.

c. Comparison with other studies

Based on Tahereh (2017)⁽¹⁷⁾ with a 12-week randomized controlled clinical trial technique divided into two groups, namely a control group that only received drug therapy and an intervention group that was given intervention in the form of progressive muscle relaxation involving 16 muscles. which aims to reduce levels of HbA1c obtained results that the intervention group experienced a decrease in HbA1c higher than the control group with a value of $p=0.04$, which indicates that PMR is effective in reducing HbA1c with an effect size of 0.02, which is still weak (17).

This is in line with research conducted by Park (2015)⁽¹⁸⁾ with the technique used by a randomized control group for 2 months in 15 type 2 DM patients who divide into 2 groups, namely the control group who given drug therapy. Meanwhile, in the intervention group given the treatment of progressive muscle relaxation techniques for 40 minutes, the results showed that HbA1c decreased more in the intervention group than in the control group with significant results $p < 0.005$ with an effect size of 0.41, which classified as moderate (18).

The research conducted by Sai (2020) with experimental research design on 30 subjects divided into 2 groups: the control group, who only received drug therapy. The intervention group, which received progressive muscle relaxation given for 12 weeks, obtained significant results with a p -value < 0.005 , and the effect size value of 0.14 is in the weak category. In this study, the intervention group experienced a higher reduction in HbA1c than the control group(19).

Research conducted by Devi (2018) is a descriptive study with a correlation study approach on 27 respondents who were given drug therapy, while in the intervention group given in the form of movements that relaxed the limbs with results showing differences in blood sugar levels before and after. given intervention, namely the average value of blood sugar levels before the intervention (188.85%) to (179.22%) after being given the intervention with an effect size value of 0.54 in the moderate category (20).

Several studies conducted by several researchers regarding muscle relaxation (progressive muscle relaxation) on blood sugar levels with varying administration times show a difference in the value of blood sugar levels. In general, these studies show that in the intervention group, given muscle relaxation, the value of blood sugar levels, HbA1c decreased significantly compared. The control group, who only received drug therapy without any additional activity in the form of muscle relaxation, but only in routine activities—obtained at the hospital or daily activities in general.

In general, between studies conducted by Akbar (2017)⁽¹⁶⁾ and other studies both experienced a decrease in the value of blood sugar or HbA1c levels with a significant p -value, namely $p < 0.05$ with varying time and duration of administration, wherein the study that conducted by Akbar (2017) with 9 treatments with a duration of 25-30 minutes. It has shown a decrease in blood sugar levels, whereas, in other studies, changes in results or a decrease in blood sugar / HbA1c levels occurred in the provision of intervention for 2-3 months and duration. 30-40 minutes. In general, the study conducted by Akbar (2017) and several other studies experienced a decline. They were statistically significant and not clinically significant because the decrease in blood sugar / HbA1c levels was still in the abnormal category. However, in research conducted by Akbar (2017) compared to other studies, it lies in the effect size value. In a study conducted by Akbar (2017), the effect size value was in a strong category. In other studies, the average effect size value was in the weak or moderate category (16).

So can conclude that the length of time and duration of giving muscle relaxation is not a benchmark for changes or decreases in blood sugar / HbA1c levels in type 2 diabetes mellitus patients. Still, it can be related to the technique or method of giving muscle relaxation or how the respondent can follow the steps. -Step muscle relaxation correctly and precisely so that it can affect the muscles' changes during the movement that affect reducing blood sugar / HbA1c levels.

Conclusion

Based on the findings of 27 studies that analyzed, cognitive behavioral therapy and muscle relaxation can control and reduce blood sugar levels and improve the quality of life of people with type 2 diabetes and psychological problems. It can also apply various aspects of psychological problems. With this intervention because many of the variables found can also affect the psychological state. Both of these interventions are very effective for nurses in the management of diabetes patients in hospitals. However, based on several researchers' research results, muscle relaxation was more effective than cognitive-behavioral therapy.

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