



The Effectiveness of Cognitive Behavior Therapy on Psychological Stress, Physical Health, and Self-Care Behavior among Diabetes Patients: A Systematic Review

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ABSTRACT

Aims To evaluate the effects of cognitive behavior therapy among randomized controlled trials on psychological stress, physical health, and self-care behavior among type 1 and type 2 diabetes patients.

Information & Methods The preferred reporting items for systematic reviews and analysis statement was used in all review stages. Study selection and study quality were based on Jonna Briggs Institute. Relevant articles search from three databases, namely PubMed, CINAHL, and Google Scholar, was conducted. The search yielded 1143 articles and 19 randomized controlled trials met the inclusion criteria to evaluate the effects of cognitive behavior therapy.

Findings Cognitive behavior therapy significantly ameliorated depressive symptoms, anxiety, diabetes-related stress, glycemic control, quality of life, and self-care behavior such as self-blood glucose monitor, medication adherence, and physical activity. However, heterogeneity in terms of cognitive behavior therapy delivery modes, follow-up duration, various outcomes, and long-term effects are considered when interpreting results.

Conclusion Findings suggest that cognitive behavior therapy can be integrated into diabetes management to achieve diabetes outcomes regarding psychological and physical health as well as self-care behavior.

Keywords Cognitive Behavioral Therapy; Psychological Stress; Blood Glucose; Quality of Life; Self-Care; Diabetes Mellitus

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Introduction

Diabetes has become a high burden globally. Approximately 9.3% of adults have diabetes in 2019 and is projected to increase by 51% in 2045 worldwide [1]. Diabetes produces significant health, economic and psychological burden such as morbidity, mortality, increased annual health expenditure, and psychological distress [1]. Diabetes needs long-life management including having a healthy diet, engaging in physical activity, taking medication, controlling blood sugar, and body weight as well as maintaining mental health efficiently [2]. Many patients have sub-optimal diabetes care management [3]. As such, poor diabetes care could double health, financial, and psychological consequences.

Required diabetes care is difficult to follow and frequently results in a stressful situation. A previous study reported a significant clinical relationship between HbA1c level and depression [4]. Depression prevents patients' competence to perform diabetes care properly [5]. High depression increases the perceived burdens of routine diabetes care [6-9]. Moreover, diabetes triggers social stigma which worsens psychological stress [10-12]. People living with diabetes usually obtain social judgment, blame, and are negatively stereotyped for their failure in maintaining diabetes care [10]. For instance, developing self-blame results in guilty feelings, frustration, and disappointment for not reaching the targeted health outcomes, and end up deprecating themselves [13]. Integrating diabetes care and depression significantly improved glycemic control [14]. Thus, finding suitable health care that addresses diabetes care and psychological state is crucial.

Hence, assisting diabetes people with appropriate cognitive, coping, and problem-solving techniques integrated with diabetes care management may have potential benefits for health providers to manage psychological stress. Consequently, treating the psychological burden facilitates diabetes care management in achieving targeted health outcomes. The advantages of the cognitive-behavior approach could be necessary for people with diabetes. Many applications, populations, and settings of the cognitive-behavior approach were broadly implemented [15, 16].

The basic ideas of cognitive-behavior therapy (CBT) are how cognitive activity affects behavior and how cognitive activity could be monitored and altered which helps the patient sustain the suggested behavior [17]. CBT has been successfully applied to improve mental health [15, 18-20]. The benefit of CBT had been extended to physical health outcomes including fatigue, headache, pain, and glycemic control in several chronic diseases [21-23].

The previous review reported the efficacy of CBT in improving anxiety and depression and there were varied results in glycemic control and quality of life

in type 1 and 2 diabetes [20]. In contrast, another review observed that CBT was not significantly reduced glycemic control and diabetes-related distress [24]. These findings raise the question of whether CBT provides physically and psychologically merits consistently.

There was no previous study observed on how CBT facilitates psychological state and its influence on self-care behavior as well as physical health. Therefore, this review aimed to evaluate the CBT effects on psychological stress, physical health, and self-care behavior among diabetes patients.

Information and Methods

This review investigated articles from three electronic databases: PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Google Scholar published from 2012 to 2022. PICO (population, intervention, comparator, and outcome) based on the Joanna Briggs Institute (JBI) was used to guide the study selection [25]. The PRISMA (preferred reporting items for systematic reviews and analysis) statement was used in all review stages. A combination of keywords was used "type 1 or 2 diabetes", "cognitive behavior therapy", "psychological stress", "physical health", "quality of life", and "self-care behavior". Available titles and abstracts of articles were systematically reviewed for their relevance to the topic of the short and long-term effects of cognitive-behavioral therapy (Figure 1).

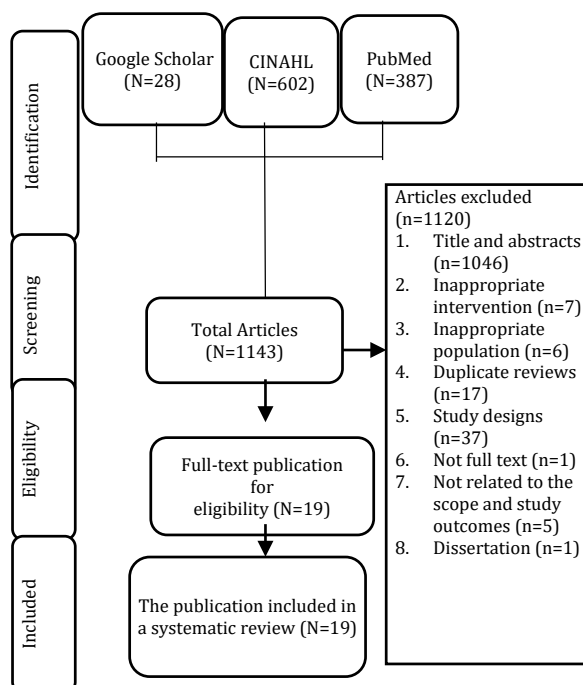


Figure 1) Article selection process

Studies were downloaded into Mendeley and duplications were removed. Two authors conducted a screening process. All titles and abstracts were

divided into two sets which were screened by pair of authors. If a disagreement occurred, the discussion was conducted to obtain an agreement. Duplicate articles were retrieved and screened by pair of authors. Full-text articles were reviewed to whether articles met the inclusion criteria. Both authors completed and cross-checked data extraction for the included articles. This included methods (location, design, and comparator), participants (sample size, diabetes type), intervention (provider, the component of CBT, length of intervention, and follow-up) and outcomes (psychological, physical health, quality of life, and self-care behavior). We included randomized controlled studies with CBT programs among adults aged 18 or older with type 1 or 2 diabetes and included the investigation of outcomes related to psychological stress, physical health, quality of life, and self-care behavior. This review excluded articles focusing on gestational diabetes and non-diabetes patients and written in non-English, or if the articles were observational studies, pilot studies, study protocol, dissertation, symposium or conference articles, not full-text articles, prospective studies such as editorials or narrative reviews. Finally, 19 articles [26-44] were included in the study.

A critical appraisal based on the Joanna Briggs Institute (JBI) checklist was used for experimental studies. The judgment of the study quality degree in each study was made. Completing the checklist was assessed by two reviewers independently in each study.

A narrative approach was delivered to explain the result: 1- the characteristics of cognitive-behavior therapy (CBT); 2- The effects of CBT on psychological stress, physical health, quality of life, and self-care behaviors.

Findings

An electronic database search revealed 1143 results. After screening titles and abstracts, as well as eliminating non-full-texts and duplicate articles, 97 articles remained for depth review. Nineteen articles were included in the final review (Table 1).

The heterogeneity of the results was found regarding the CBT components and delivered types, study period, and measured outcomes. Among the reviewed studies, two studies used internet-based, one study delivered CBT by telephone, one study conducted cognitive-behavioral coaching and one study delivered Acceptance and Commitment Therapy. Remained studies conducted CBT with mindfulness therapy, combined with lifestyle counseling, and motivational enhancement. The majority of the studies delivered group CBT).

CBT was provided by certified, trained, experienced therapists including nurses, psychologists, psychiatric, and physicians. In general, CBT components were identified for both individual and

group-based intervention including defined problems, psychoeducation, behavior activations, attitude and cognitive restructuring, problem-solving, relapse prevention, assertive skill, proactive coping, psychological distress management, relaxation, motivational strategies, social support, empowerment and reinforcement, acceptance and commitment therapy, goal setting, time management, and reality building. Most of the intervention period was within the range of 2 to 6 months long (n=6).

Outcomes included various psychological outcomes (depression, anxiety, perceived stress, diabetes-related stress, regimen-related stress, psychological distress, emotional distress, self-efficacy, self-esteem, anger, diabetes acceptance, self-acceptance general health, determinants of behavior change, diabetes treatment satisfaction, health belief scale, diabetes-related cognitive and social factors, eating disorder, and history of suicide ideation); physiological outcomes (HbA1c, fasting blood glucose, Homeostatic Model Assessment [HOMA], glucose variability, blood pressure, weight, BMI, waist circumference, hip circumference, biomarker-related inflammatory, total cholesterol, HDL-cholesterol, LDL-cholesterol, physical symptoms, and fatigue); quality of life; self-care behaviors adherence (medication, healthy diet, hypoglycemia prevention, self-blood glucose, physical activity, and smoking status).

-The Effect of CBT on Psychological stress: Fourteen trials successfully improved depression, and only three trials did not show any change in depression. Moreover, studies showed the effectiveness of CBT in reducing anxiety, diabetes-related distress, and perceived stress. Besides, one trial stated a significant reduction in regimen-related distress in 12-month follow-ups.

-The Effect of CBT on Physical health: Physical health in terms of reducing HbA1c levels was achieved by participating in the CBT program. Only one study reported a significant reduction in FBG.

- The Effect of CBT on Quality of life (QoL): Three studies significantly established the impact on the total score of QoL. Moreover, several studies suggested that CBT provided benefits in specific subscales, including psychological, spiritual satisfaction, and either physical or mental function as well as sleep quality.

-The Effect of CBT on Self-care behaviors: One trial achieved a better self-care behavior level. Moreover, improvement in specific subscales was reported including physical activity, medication adherence, and self-blood glucose monitoring.

CBTs were found to be acceptable and feasible. Overall RCTs were adapted in an adult with diabetes population. Seventeen studies reported a low attrition rate. Also, a study found that most of the participants' testimonies that the interventions were helpful. Additionally, Researchers reported that

participants declared the programs were acceptable and satisfying as well as wanted to recommend them to other colleagues.

Table 2 presents the risk of bias for each reviewed study. All studies were RCTs that generally had high quality. Overall, the average score of the studies was 9 out of 11 on the JBI critical appraisal checklist.

Nine studies reported not blinding the participants to treatment allocation. The majority of the studies completed the measured outcomes and used intention-to-treat analyses with a dropout explanation during the program. Two studies did not attain the 80% sample size at follow-up according to JBI critical appraisal checklists.

Table 1) Article summary

| No. | Intervention | Intervention and follow-up duration | Outcomes |
|-----|---|-------------------------------------|--|
| 1 | Internet-based CBT | 10 weeks+3-month follow-up | Depression, HbA1c, diabetes-related distress, mental and physical well-being, anxiety, and physical symptoms |
| 2 | Acceptance and Commitment Therapy (ACT) | 1-day sessions+6-month follow-up | HbA1c, acceptance of diabetes-related thoughts, feelings, understanding, satisfaction, self-management activities, anxiety, and depression |
| 3 | Tailored CBT and lifestyle counseling | 6 months+6-month follow-up | HbA1c, regimen-related distress, depression, emotional distress, weight and blood pressure, and self-care behavior |
| 4 | CBT | 14 months plus an 8-month follow-up | Weight, waist and hip circumference, systolic, diastolic, lipid profiles, HbA1c, and HOMA |
| 5 | CBT | 4 months plus an 8-month follow-up | Medication adherence, self-glucose monitoring, depression, and HbA1c |
| 6 | Diabetes Motivation Strengthening | 12 months | Depressive symptoms, diabetes-related distress, self-care activities, psychological well-being, quality of life, and diabetes acceptance |
| 7 | CBT | 6 weeks+12-month follow-up | Blood pressure, BMI, quality of life, self-appraised general health, self-care activities, diabetes-related cognitive and social factors, health belief scale, HbA1c, and lipid profiles |
| 8 | Motivational enhancement therapy plus CBT | 3 months+3-month follow-up | Depressive symptoms, HbA1c, fasting blood glucose, BMI, physical and mental quality of life |
| 9 | Cognitive-behavioral coaching program | 9 weeks+6-month follow-up | Depressive symptoms |
| 10 | Web-based CBT blended with a face-to-face session | 5 months+6-month follow-up | Fatigue severity, functional impairment, HbA1c, and glucose variability |
| 11 | CBT | 12 weeks+12-month follow-up | Glycemic control, depression, quality of life, and diabetes-related distress |
| 12 | CBT | 8 weeks+9-month follow-up | Depressive symptoms |
| 13 | CBT and mindfulness-based cognitive therapy | 8 weeks+9-month follow-up | Depressive symptoms, emotional well-being, anxiety, diabetes-related distress, and HbA1c |
| 14 | CBT | 6 months+6-month follow-up | Blood pressure, HbA1c, lipid profile, smoking, quality of life, patient satisfaction, physical activity, eating behavior, depression, and determinants of behavior change |
| 15 | CBT | 4 weeks+2-month follow-up | Depressive symptoms and HbA1c |
| 16 | Group Cognitive Behavioral Therapy | 7 weeks+12-month follow-up | HbA1c, Depression, and anxiety |
| 17 | Study of Women's Emotions and Evaluation of a Psychoeducational (SWEET) treatment | 6 months+6-month follow-up | Depression, anxiety, anger, history of depression and suicide ideation, Glycemic control and quality of life, functional status, and diabetes knowledge |
| 18 | Peer-delivered Cognitive Behavioral Therapy | 3 months+12-month follow-up | Depressive symptoms and perceived stress |
| 19 | Cognitive Behavioral Therapy | 6 weeks+12-month follow-up | Sleep disturbance and HbA1c |

Table 2) Summary of quality of included literature

| Questions | Articles | | | | | | | | | | | | | | | | | | |
|--|----------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| Was the assignment to treatment groups random? | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Were participants blinded to the treatment allocation? | Y | Y | N | N | Y | U | Y | Y | Y | N | N | Y | Y | N | U | N | N | N | N |
| Was allocation to treatment groups concealed from the allocator? | U | Y | N | U | Y | Y | Y | U | Y | N | N | U | U | U | U | Y | N | N | Y |
| Were the outcomes of people who withdraw described and included in the analysis? | N | N | Y | Y | Y | Y | Y | Y | N | Y | Y | Y | Y | Y | N | N | Y | Y | N |
| Were those assessing outcomes blind to the treatment allocation? | Y | Y | Y | Y | Y | U | U | U | Y | N | N | N | N | Y | U | Y | N | N | Y |
| Were the control and treatment groups comparable at entry? | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Were groups treated identically other than for the named interventions? | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Were outcomes measured in the same way for all groups? | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Were outcomes measured reliably? | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Was there adequate follow-up (>80%) | N | Y | Y | Y | Y | Y | Y | Y | Y | Y | N | Y | Y | Y | Y | Y | Y | Y | Y |
| Was appropriate statistical analysis used? | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

Y: Yes; N: No; U: Unclear

Discussion

This review suggests the effectiveness of CBT on psychological stress, physical health, quality of life, and self-care behavior. Fourteen out of nineteen studies observed an improvement in psychological stress among diabetes patients. These findings were supported by previous research among patients with chronic disease [45-48]. Studies reported that higher depression was significantly associated with lower diabetes self-care [6, 14, 49], and improvement of depressive symptoms simultaneously improved HbA1c [14, 50] and quality of life [51-53]. These findings indicate that facilitating psychological health may stimulate behavior modification and achieve targeted metabolic status as well as subsequently expected quality of life.

This review has several factors that may influence CBT effectiveness and provide some consideration while interpreting the results. We found various and inconsistent components of CBT had been used. The combination of CBT with other interventions such as motivational enhancement, lifestyle counseling, and commitment therapy may raise the question about the origin of CBT components' usefulness.

Therapists' backgrounds and experiences varied across the studies and may become potential factors influencing the result. Only 6 of 19 trials declared that an experienced and trained psychologist conducted CBTs therapy, four trials were delivered by nurses and psychologists, and trained general practitioners delivered two CBT trials. The remaining studies unclearly reported the clinical background of the therapist. Hence, it is difficult to compare the effectiveness of the CBT delivered by trained or experienced against untrained or inexperienced and also therapists with clinical background psychologists against trained nurses.

Therapy-delivered types, such as group-based or individual-based CBT as well as internet or face-to-face-based CBT may have a similar positive outcome to CBTs [54, 55]. Indicating any type of CBT could be delivered and suitable to patients. Additionally, the intervention type could also potentially affect the effectiveness. Tovote *et al.* [31] reported for both Mindfulness-based Cognitive Therapy (MBCT) and Cognitive Behavioral Therapy (CBT) had similar benefits in psychological distress and well-being. Moreover, Tovote *et al.* [32] found no identified variables that influenced the effectiveness of MBCT and CBT [32]. Indicating the CBTs program could independently benefit expected outcomes and could be used in a broad diabetes population.

Furthermore, several effects (HbA1c, depression, physical activity, and quality of life) disappeared after the intervention [27, 35, 40]. This may about raise a concern about the long-term effect of CBT on the diabetes population. However, it is difficult to conclude since the authors did not declare whether the participants continuously participated in CBT

after receiving the intervention. According to follow-up duration, it may be inadequate to measure the physical and psychological outcomes for less than eight weeks. This duration may be insufficient to gain the benefits of CBT.

We also noticed the heterogeneity of the included studies in terms of participant characteristics, settings, and component types of CBT. Non-English language studies were excluded and it may influence the findings. Additionally, there were several limitations regarding the RCTs' quality of the included studies in this review. The average study quality was 9 out of 11 which indicated relatively high quality on the JBI critical appraisal checklists. Only eight studies reported trending for the participants. Two studies stated the blinding of the participants or coaches was not possible due to the nature of the psychological intervention [28, 38].

The outcomes across studies vary. Hence, it might be challenging to compare the findings. The outcomes of the current review highlight the CBT's positive impact on physical health such as metabolic status; psychological stress including depression, anxiety, perceived stress, diabetes-related stress; and quality of life as well as self-care behavior. As such, future studies may standardize the significant outcomes that could be put in the inclusion criteria. Furthermore, this review suggests that each study may report whether participants continuously participate after the intervention, particularly during the follow-up period. Moreover, identifying similar CBT components or types may be necessary to gain homogenous results.

Conclusion

Integrating CBT into nursing intervention regarding diabetes care provides positive outcomes for diabetes patients. The effects of CBT were successfully observed to improve psychological stress, physical health, quality of life, and self-care behavior.

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