



Evaluating the Effectiveness of Telehealth-Delivered Cognitive Behavioral Therapy on Glycemic Control in Adults with Type 2 Diabetes

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ABSTRACT

This review evaluated the effectiveness of telehealth-delivered cognitive behavioral therapy (tele-CBT) in improving glycemic control among adults with type 2 diabetes (T2D). Through a systematic synthesis of randomized controlled trials, observational studies, and meta-analyses, we demonstrate that tele-CBT significantly reduces HbA1c levels while concurrently improving psychological well-being and diabetes self-management behaviors. The intervention's mechanisms of action include cognitive restructuring of maladaptive thoughts, behavioral activation for better self-care, and reduction of diabetes-related distress. Tele-CBT overcomes traditional barriers to mental healthcare access through flexible delivery modalities including videoconferencing, telephone sessions, and digital self-help programs. However, implementation challenges persist, particularly regarding digital inequities in low-resource settings and the need for personalized treatment adaptations. This review employed a systematic analysis of clinical trials, observational studies, and meta-analyses to evaluate tele-CBT's impact on glycemic control in T2D patients. Policy recommendations emphasized infrastructure development for equitable telehealth access, reimbursement reform, and provider training to integrate tele-CBT into standard diabetes care. While current evidence supports tele-CBT as an effective adjunctive therapy, further research is needed to establish long-term outcomes and optimize delivery models across diverse populations. This review highlights tele-CBT's dual benefit in addressing both physiological and psychological aspects of T2D management, positioning it as a scalable solution in modern diabetes care paradigms.

Keywords: Telehealth-delivered CBT, Glycemic control, Type 2 diabetes management, Psychological interventions, Diabetes-related distress.

INTRODUCTION

Type 2 diabetes (T2D) is a chronic metabolic disorder characterized by insulin resistance and impaired glucose regulation [1, 2]. The global prevalence of T2D has escalated over the years, with an estimated 463 million people affected worldwide, a number expected to rise significantly in the coming decades. Effective management of T2D is critical to reduce the associated risks of cardiovascular diseases, neuropathy, nephropathy, and other long-term complications. Traditionally, glycemic control in T2D has been managed through pharmacological interventions and lifestyle modifications, including diet and exercise [3]. However, recent evidence suggests that psychological factors such as stress, depression, and poor self-management behaviors play a crucial role in glycemic control and overall disease progression. As a result, psychological interventions, particularly Cognitive Behavioral Therapy (CBT), have been increasingly recognized as integral components of diabetes management. CBT, a structured, goal-oriented psychotherapy, is grounded in the premise that altering maladaptive thoughts and behaviors can lead to better emotional regulation and improved self-management [4, 5]. Historically, CBT has been used to treat mood disorders, anxiety, and other mental health conditions. However, recent advancements have extended its application to chronic disease management, including T2D. The advent of telehealth has further expanded access to CBT, making it more feasible for individuals with diabetes, especially in resource-limited settings. Telehealth-based CBT

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(tele-CBT) utilizes digital platforms to deliver therapeutic interventions remotely, overcoming geographical barriers, time constraints, and logistical challenges that may limit in-person therapy [6–8]. This review aims to evaluate the effectiveness of telehealth-delivered CBT in improving glycemic control in adults with T2D. By synthesizing the findings from clinical trials, observational studies, and meta-analyses, the article examines the evidence supporting tele-CBT as a viable and effective adjunctive treatment for T2D management. The review also addresses the mechanisms through which tele-CBT influences glycemic outcomes, such as improving self-management, reducing diabetes-related distress, and enhancing coping strategies. Additionally, the article highlights the barriers and challenges to implementing tele-CBT in routine clinical practice, offering insights into its future potential in the management of T2D.

Mechanisms of Action of CBT in Type 2 Diabetes Management

The rationale for using CBT in managing Type 2 diabetes lies in the psychological and behavioral components of the disease [9, 10]. Managing T2D requires individuals to adhere to complex daily routines, including medication schedules, diet management, exercise regimens, and regular blood glucose monitoring. These demands can lead to stress, anxiety, and depression, which negatively impact on the individual's ability to manage their condition effectively. CBT targets these psychological barriers by helping individuals identify and challenge negative thought patterns, improve coping strategies, and develop healthier behaviors related to diabetes management.

CBT has been shown to improve emotional well-being by reducing symptoms of depression and anxiety, both of which are common in individuals with T2D. Depression, for instance, is a significant risk factor for poor glycemic control, as it can impair motivation and disrupt self-care routines. Through cognitive restructuring and behavioral activation, CBT helps individuals reframe their thoughts about their condition, thus fostering a more proactive approach to disease management. For example, a patient who views their diabetes as an insurmountable burden may benefit from CBT's focus on cognitive reframing, enabling them to perceive their management tasks as achievable and within their control. Additionally, CBT promotes behavioral changes through goal setting and problem-solving techniques, which can directly enhance diabetes self-management behaviors such as medication adherence, dietary changes, and physical activity. By learning how to break down large goals into smaller, manageable tasks, individuals are better equipped to integrate healthy behaviors into their daily routines, ultimately leading to better glycemic control. Furthermore, CBT can help individuals address diabetes-related distress, a form of emotional burden that often leads to avoidance of medical care and neglect of self-care practices.

Telehealth and the Delivery of CBT

The delivery of CBT via telehealth platforms offers several advantages over traditional in-person therapy, particularly for individuals with chronic conditions like T2D. Telehealth allows for greater flexibility, as patients can access therapy sessions from their homes, reducing the need for travel and minimizing barriers related to time constraints and geographical location [11, 12]. Additionally, telehealth can provide more consistent access to therapy, particularly for individuals in rural or underserved areas who may have limited access to mental health services. There are several modalities through which tele-CBT can be delivered, including video conferencing, telephone therapy, and self-guided online programs. Video-based tele-CBT offers real-time interaction between the therapist and the patient, which closely mirrors the structure of traditional in-person therapy. Telephone-based CBT provides an alternative for individuals without internet access or those who prefer more personal interaction. Self-guided online programs, which often include pre-recorded sessions and interactive exercises, offer a low-cost and highly scalable option for individuals who may not have access to a therapist or prefer more autonomy in their treatment.

Research suggests that telehealth-delivered CBT can be just as effective as in-person therapy for treating a variety of psychological conditions. Studies have shown that tele-CBT is effective in reducing symptoms of depression and anxiety, improving self-management behaviors, and enhancing overall quality of life for individuals with T2D. Given the chronic nature of diabetes and the need for ongoing support, tele-CBT presents a promising intervention for individuals who may require long-term psychological care to manage their condition effectively.

Effectiveness of Telehealth-Delivered CBT on Glycemic Control in Type 2 Diabetes

Numerous clinical trials and observational studies have investigated the effectiveness of telehealth-delivered CBT on glycemic control in adults with T2D [13]. A key finding from these studies is that tele-CBT can lead to significant improvements in HbA1c levels, a primary marker of long-term glycemic control. In a randomized controlled trial (RCT) by Watts et al. (2021), patients who received 12 weeks of tele-CBT demonstrated a significant reduction in HbA1c levels compared to the control group, which received only standard diabetes education. The intervention group also reported improvements in diabetes-related distress and self-efficacy, both of which are associated with better adherence to diabetes self-management practices. Another large-scale RCT by Anderson et al. (2020) examined the impact of tele-CBT on a diverse group of adults with T2D [14]. The study found that participants

who completed tele-CBT had a 0.7% reduction in HbA1c compared to those who received usual care. Furthermore, participants in the tele-CBT group showed improved psychological well-being, including reduced levels of depression and anxiety, which are common in individuals with diabetes. These findings suggest that the benefits of tele-CBT extend beyond glycemic control to include emotional and psychological improvements, which may in turn enhance diabetes self-management. In addition to clinical trials, observational studies have also highlighted the positive effects of tele-CBT on glycemic outcomes. A cohort study by Zhao et al. (2022) found that patients who participated in a tele-CBT program showed greater improvements in their HbA1c levels compared to those who received in-person therapy. These findings underscore the feasibility and efficacy of telehealth-delivered interventions in diverse populations, including those with limited access to in-person care.

Challenges and Limitations

Despite the promising evidence supporting tele-CBT, several challenges and limitations must be addressed to ensure its widespread adoption and effectiveness in managing T2D [15, 16]. One of the primary challenges is ensuring equitable access to telehealth platforms, particularly for individuals in low-resource settings or those without reliable internet access. While tele-CBT has the potential to reach underserved populations, it relies on digital infrastructure that may not be available in all regions. Another limitation is the lack of personalized care in some tele-CBT programs. Although self-guided programs can be cost-effective and scalable, they may not offer the same level of personalized support as individualized therapy sessions. Tele-CBT programs that rely on video conferencing or phone sessions may be better suited to addressing individual needs, but they require trained therapists and can be resource-intensive to implement.

Additionally, while tele-CBT has been shown to improve glycemic control and psychological outcomes, its long-term effectiveness remains uncertain. More research is needed to evaluate the sustained impact of tele-CBT on glycemic control and quality of life, particularly in diverse populations with varying levels of diabetes severity.

Policy and Practical Implications

For tele-CBT to be successfully integrated into routine diabetes care, several policies and practical considerations must be addressed. First, healthcare systems must invest in digital health infrastructure to ensure that all individuals have access to telehealth services [17]. This includes expanding internet access, providing training for healthcare providers, and ensuring that tele-CBT programs are culturally and linguistically appropriate for diverse populations. Moreover, reimbursement policies should be updated to include telehealth-based therapies, as insurance coverage for tele-CBT varies by region. Ensuring that tele-CBT is reimbursed at a similar rate to in-person therapy will be critical to its widespread adoption. -Finally, healthcare providers must be trained in delivering tele-CBT and integrating it into comprehensive diabetes care. This may involve incorporating tele-CBT into existing diabetes management programs, such as group education sessions or individual counseling, to ensure that psychological interventions are a regular part of diabetes care.

CONCLUSION

The evidence presented in this review underscores the significant potential of telehealth-delivered cognitive behavioral therapy (tele-CBT) as an effective adjunctive treatment for improving glycemic control in adults with type 2 diabetes (T2D). Clinical trials and observational studies consistently demonstrate that tele-CBT leads to meaningful reductions in HbA1c levels, alongside improvements in psychological well-being, diabetes-related distress, and self-management behaviors. These benefits are particularly notable given the accessibility and scalability of tele-CBT, which overcomes geographical and logistical barriers that often limit traditional in-person therapy. By addressing both the psychological and behavioral aspects of diabetes management, tele-CBT offers a holistic approach that complements standard medical interventions. Despite its promise, the widespread implementation of tele-CBT faces challenges, including disparities in digital access, the need for personalized care, and uncertainties regarding long-term efficacy. Ensuring equitable access to telehealth platforms, particularly in low-resource settings, is critical to maximizing the intervention's reach. Additionally, further research is needed to evaluate the durability of tele-CBT's effects on glycemic control and to refine delivery methods for diverse populations. Future studies should also explore hybrid models that combine tele-CBT with in-person support to optimize outcomes. To fully integrate tele-CBT into routine diabetes care, systemic changes are necessary. Policymakers must prioritize investments in digital health infrastructure and advocate for reimbursement policies that support telehealth interventions. Healthcare providers should receive training in tele-CBT delivery to ensure high-quality, patient-centered care. By addressing these barriers, tele-CBT can become a cornerstone of comprehensive diabetes management, offering a scalable and effective solution to improve both metabolic and mental health outcomes for individuals with T2D.

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CITE AS: Wambui Kibibi J. (2025). Evaluating the Effectiveness of Telehealth-Delivered Cognitive Behavioral Therapy on Glycemic Control in Adults with Type 2 Diabetes. Research Output Journal of Public Health and Medicine 5(3):62-66. <https://doi.org/10.59298/ROJPHM/2025/536266>