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Research Paper

Addressing Emotional Well-being in Diabetes Management: A Review of Telemedicine Psychological Interventions in Adults with Type 2 Diabetes

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ABSTRACT

Background: Diabetes, is a global health challenge, with negative effects on a patient's emotional well-being. This psychological problem is often underdiagnosed and undertreated, yet adversely affect self-management, glycemic outcomes, and overall quality of life. **Aim:** To synthesize clinical evidence on telemedicine interventions in improving emotional well-being of individuals with Type 2 diabetes. **Methods:** Keyword searches of PubMed, Scopus, Web of Science, and Cochrane Library was conducted. The search was limited from January 2015 to January 2025. **Results:** A total of 25 articles were included for the qualitative synthesis of the role of telemedicine interventions in supporting the emotional well-being of T2DM patients.The central finding from the reviewed literature is that the impact of telemedicine on mental health outcomes is highly variable and largely dependent on the intervention's design and components. Interventions that incorporate structured psychosocial components, such as Cognitive Behavioral Therapy (CBT) or motivational interviewing, and involving human support from healthcare professionals, report greater success in reducing depressive symptoms and diabetes distress compared to standard care or fully automated tools. **Conclusion:** Telemedicine offers a promising, scalable approach to provide emotional support in diabetes care. As digital health technologies become more accessible, their thoughtful implementation can significantly improve both psychological and clinical outcomes, contributing to more holistic, patient-centered management of Type 2 diabetes.

Keywords: *Telemedicine, diabetes, emotional well-being, mental health, depression, diabetes distress, anxiety*

Diabetes is a metabolic disorder characterized by increased blood sugar levels. (Mukhtar et al., 2020) The global burden of diabetes has markedly increased in the past two decades, with the prevalence of diabetes in adults doubling from 7% in

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1990 to 14% in 2022.(World Health Organization (WHO), 2024) Most patients present with type 2 diabetes mellitus (T2DM). Common complications of diabetes are cardiac diseases, kidney disease, retinopathy, and peripheral neuropathy. (Tomic et al., 2022) Moreover, diabetes affects emotional well-being, presenting with psychological disorders like depression, anxiety, and diabetes distress. The Centers for Disease Control and Prevention (CDC) reported a two to three-fold increase in the risk of depression in patients with diabetes.(Centers for Disease Control and Prevention (CDC), 2024) Another systematic review reported that diabetes patients are at high risk of depression, with a pooled odds ratio of 1.33 between the two conditions.(Chireh et al., 2019) Addressing the emotional well-being of patients with diabetes is a crucial aspect of the management strategies to offer holistic care to the patient in the long term.(Holloway et al., 2023)

Diabetes management requires a patient-driven regimen, continuous decision-making, and high personal responsibility, which often contributes to elevated stress levels. (Varela-Moreno et al., 2022) Additionally, patients must ensure glycemic control, navigate healthcare systems, adapt to physical limitations, and perform daily activities. (Snoek, 2022) The multifaceted challenges faced by patients with diabetes increase mental stress and affect their emotional state. Conversely, emotional health also impacts diabetes. Evidence shows that psychological disorders impede diabetes self-management. Emotional imbalance may cause poor glycemic control, reduced health-related quality of life, increased occupational absenteeism, and higher medical costs. (Holloway et al., 2023) Therefore, it is important to adopt evidence-based interventions to timely mitigate the psychological problems associated with diabetes, thereby promoting improved self-care practices, quality of life, and clinical outcomes.

Despite the implications on mental and physical health, psychological disorders in the diabetic population remain widely undiagnosed, with only 25 to 50% of the patients receiving a clinical diagnosis and treatment. (Centers for Disease Control and Prevention (CDC), 2024) Psychological disorders can be managed with medications and psychosocial therapies. Commonly used psychosocial interventions include self-care education, cognitive behavioral therapy (CBT), and social support. (Mangoulia et al., 2024) Current research demonstrates that such interventions exert a beneficial effect in alleviating the emotional burden in patients with diabetes. (Liu, 2013) Most patients receive psychological therapies through in-clinic visits with the healthcare provider. However, in-person conduct of psychological treatments remains constrained by the limited availability and high cost of mental health services.

In this context, eHealth technologies have emerged as scalable alternatives. E-health initiatives provide additional benefits to conventional psychosocial approaches, including consistent delivery of therapy, better convenience, and privacy for the patients.(Tavares Franquez et al., 2023) Different types of digital health initiatives leverage information technologies, making medical resources, services, and knowledge accessible to everyone.(Mauco et al., 2020) Among these, telemedicine, which is also called telehealth, allows real-time remote consultations and is a promising approach to managing emotional well-being in patients with diabetes. Telemedicine was rapidly adopted following the COVID-19 pandemic, with 27% of diabetic patients using telemedicine during the lockdown. (Campion et al., 2022) Telemedicine can be broadly categorized into three modalities. (Mullur et al., 2022) Synchronous telemedicine is the real-time interaction between patients and healthcare providers, such as live video consultations. Asynchronous

telemedicine is the collection and transmission of clinical information, which is reviewed and evaluated later. Remote patient monitoring includes the continuous collection of physiological data, such as blood pressure or glucose levels. (Mullur et al., 2022)

Using telemedicine for patient communication, behavioral education, and clinical monitoring is relevant in fulfilling the unmet emotional needs of patients with diabetes. While significant efforts have been made to develop and validate the clinical use of telemedicine, its effect on emotional well-being is often overlooked. The present review aims to address the research gap by identifying the role of telemedicine in improving the mental health of patients. It synthesizes data from clinical studies to highlight the effectiveness of telemedicine in enhancing their emotional well-being.

METHODOLOGY

A literature search was conducted on different databases, including PubMed, Scopus, Web of Science, and Cochrane Library, to address the research gap by identifying the role of telemedicine in improving the mental health of patients. The literature search was based on different keywords and MESH terms, including Telemedicine, diabetes, emotional well-being, mental health, depression, diabetes distress, and anxiety. The search was limited from January 2015 to January 2025.

A total of 762 articles were identified after a literature search. After title and abstract screening, 300 articles were identified, and following full-text eligibility, a total of 25 articles were included for the qualitative synthesis of the role of telemedicine interventions in supporting the emotional well-being of T2DM patients. A qualitative search was conducted as the studies were heterogeneous and presented with varied study designs. Current research on telemedicine-based interventions in T2DM primarily emphasizes glycemic control, with a secondary focus on emotional and psychological outcomes. A critical research gap exists in identifying the psychological stressors in patients and tailoring interventions accordingly.

Implications of Emotional Distress in Diabetes

Emotional dysregulation in patients with diabetes often presents as diabetes distress (>20%), depressive disorders (10-15%), and anxiety (18%). (Chaturvedi et al., 2019; Sartorius, 2018; Skinner et al., 2020) Diabetes distress is a psychological condition characterized by feelings like worry, anger, and a sense of being overwhelmed. These emotions typically stem from the chronic and demanding nature of diabetes management, which requires continuous dietary control, glucose monitoring, and adherence to physical activity. (Rariden, 2019) Importantly, diabetes distress is distinct from clinical depression or generalized anxiety disorders, as it does not meet their threshold for diagnostic criteria nor exhibit the same symptom severity.

There are several psychological stressors faced by patients with diabetes. A systematic review investigated patients' experiences with diabetes distress and highlighted their struggle for perceived control. (Morales-Brown et al., 2024) Diabetes is a pervasive and dominating condition, where patients consider the attempts at management to be futile due to the fluctuating nature of the disease. Patients may feel powerless against a condition that constantly occupies their thoughts and daily lives, leading to diabetes distress.(Morales-Brown et al., 2024) The complications associated with diabetes worsen glycemic control and impair physical functioning, causing the onset or progression of depression and

anxiety.(Sharma et al., 2021) Furthermore, insulin resistance, which is common in diabetes, dysregulates serotonin, contributing to depression and anxiety.(Khawagi et al., 2024; Martin et al., 2021)

Concurrent diabetes and psychological problems may influence social and financial aspects. The economic ramifications of emotional distress in diabetes can be categorized into direct and indirect costs. (Trautmann et al., 2016) Direct costs refer to tangible healthcare expenditures of medications, clinical consultations, mental health services, and hospital admissions. Productivity losses, disability-related unemployment, premature mortality, and care-seeking behaviors may contribute to indirect costs for the patients. (Trautmann et al., 2016) Poor emotional status may affect interpersonal relationships, limit community engagement, and reduce a person's capacity to participate in meaningful activities. The additional social and economic burden of emotional distress, with the existing chronic condition, can reduce the quality of life in patients. Therefore, a patient's emotional well-being is important for living an overall healthy life in the long term.

The relationship between T2DM and emotional well-being is bi-directional. While diabetes can contribute to stress, poor emotional health can exacerbate diabetes. Chronic hyperglycemia can be triggered by emotional stress. (Balakrishnanpillai et al., 2024) Stressful stimuli activate the sympathetic nervous system (SNS) and elicit a "fight or flight" response, which increases the sense of vulnerability among patients. Stress can also affect blood glucose levels due to elevated hormones such as glucocorticoids and catecholamines, resulting in the disruption of the hypothalamic-pituitary-adrenal axis (HPA). (Balakrishnanpillai et al., 2024; Sharma et al., 2022) Effective coping and stress management strategies may buffer the association between stress and blood glucose levels. A meta-analysis reported that patients with diabetes distress had increased blood glucose levels and poor glycemic control, with reported odds ratios (OR) of 0.46 and 0.52, respectively. (Mirghani, 2024)

Depression is a common psychological condition associated with diabetes. The pathophysiological association between depression and diabetes involves certain biological and behavioral aspects. Both diabetes and depression expression share common pathways, including dysregulation of the HPA, activation of the autonomic nervous system (ANS), and systemic inflammation. (Habib et al., 2022) Psychological or physical stressors increase the secretions of cortisol and catecholamine. (Golden et al., 2011) Higher levels of cortisol and catecholamines are known to impair insulin receptor binding, thereby contributing to insulin resistance and hyperglycemia. Additionally, behavioral factors linked to depression, such as poor diet, insufficient physical activity, and sleep disturbances, further impair glycemic control. (Habib et al., 2022) Given the detrimental consequences of emotional imbalance in diabetes, it is important to take active steps to effectively manage both conditions.

Current Therapies for addressing emotional well-being in diabetes patients

Management of psychological conditions associated with diabetes includes both psychotherapy and pharmacotherapy. Common pharmacotherapy interventions in clinical depression include the use of selective serotonin reuptake inhibitors (SSRIs). Other agents, such as tricyclic antidepressants (TCAs), monoamine oxidase inhibitors (MAOIs), sertraline, fluoxetine, and bupropion may be considered for comorbid depression. (Kreider, 2017) However, these drugs exhibit side effects, posing harm to patients after prolonged use. On the other hand, medications for anxiety disorders include SSRIs, benzodiazepines, and beta-

adrenergic blockers. However, these anxiolytic agents may hinder glycemic control and mask typical physiological cues of the onset of hypoglycemia.(Balhara, 2011) Therefore, alternative approaches to improve the emotional state in diabetic patients are warranted.

Pharmacological treatments have shown limited effectiveness and safety in managing emotional dysregulation. Hence, there is an increasing interest in psychological interventions as alternative or complementary therapeutic approaches, such as cognitive behavioral therapy (CBT), psycho-education, counseling, and motivational interviewing. CBT helps by restructuring dysfunctional cognitive patterns and modifying harmful patterns, like avoidance, into positive behaviors. This leads to improved mood and diabetes self-management. (Li et al., 2022; Yang et al., 2020) A recent clinical trial on T2DM patients reported alleviation of depression, anxiety, and distress following a 16-week CBT. (Abbas et al., 2023) CBT emphasizes psychological aspects such as optimism and resilience, which are associated with better health. Its versatility allows it to be tailored to a wide demographic. (Mangoulia et al., 2024) Therefore, CBT presents an effective treatment modality, with the potential to relieve anxiety, depression, and diabetes distress.

As a part of CBT, motivational interviewing and acceptance and commitment therapy have been implemented. It is a patient-centered approach developed to overcome hesitancy regarding health-related behaviors and to support adherence to treatment regimens in diabetes. (Bilgin et al., 2022) Motivational interviewing by nurses significantly improved blood glucose levels and treatment adherence in T2DM patients. (Steffen et al., 2021) This technique strengthens the patient's intrinsic motivation to achieve a defined objective by promoting self-acceptance and compassion. Motivational interviewing has positive outcomes in enhancing self-efficacy, reducing depressive symptoms, and alleviating emotional distress.(Bilgin et al., 2022) In addition, acceptance and commitment therapy is an emerging form of CBT that uses mindfulness, cognitive acceptance, and values-based behavioral change.(Sakamoto et al., 2022) Rather than eliminating distressing thoughts, acceptance and commitment therapy guides individuals to identify their core values and align their actions accordingly.(Sakamoto et al., 2022)

Moreover, structured psycho-educational interventions potentially improve patients' understanding of the physical and psychological consequences of diabetes. The programs provide the knowledge, skills, and motivation necessary for sustained glycemic control and emotional stability. (Silva et al., 2023) A meta-analysis confirmed the effectiveness of psychoeducational interventions in achieving glycemic control and alleviating emotional distress. (Perrin et al., 2019) The success of psychotherapy is contingent upon the involvement of well-trained healthcare providers. Healthcare professionals should possess the necessary competency to provide individualized guidance aimed at addressing the physical and psychological challenges associated with diabetes management. (Ahmad and Joshi, 2023)

Psychological treatments are often delivered in person by trained professionals. However, during the COVID-19 pandemic, telemedicine gained recognition when physical contact was restricted. (Crossen et al., 2022) Telemedicine, as the name suggests, “tele” and “medicine”, is the provision of remote diagnosis, treatment, and prevention using communications technology. It further encompasses research and assessment tools and knowledge resources for medical professionals. (Ghosh et al., 2020) Telemedicine allows patients and healthcare providers to share medical data across distances. Given the

integration of technologies into the daily lives of most people, management of chronic disease is also expected to shift to online platforms. (Borries et al., 2019)

Telemedicine in Diabetes Care

The adoption of telemedicine in T2DM care holds significant importance due to its potential to improve patient outcomes and address healthcare disparities. Telemedicine is a transformative approach in diabetes management, which leverages technology to overcome geographical barriers. Telemedicine strategies can be broadly categorized into five types, each with a distinct focus and methodology. First, tele education is the remote dissemination of education, training, or support to patients. Teleconsultation provides virtual clinical interactions between patients and healthcare providers. (Dhediya et al., 2023) Telemonitoring allows the continuous collection and remote transmission of health data from patients to healthcare providers. Telecase management supplements primary care by coordinating services that improve patient care. Lastly, telementoring offers personalized guidance and mentoring, especially useful for newly diagnosed individuals unfamiliar with diabetes management. (Dhediya et al., 2023) Telemedicine strategies can be adopted on various technological platforms such as web portals, mobile applications, computers, and telephone calls.

Mobile applications and web portals are prominent tools for telemedicine delivery that may be integrated with blood glucose monitors to improve self-management practices in patients, Bluetooth-connected and wearable devices such as weight scales, pedometers, accelerometers, smartwatches, and tensiometers, offer a more holistic view of patient's health status.(Mannoubi et al., 2024) Some of the examples of targeted interventions for T2DM patients include electronic mental health programs like mycompass(Baldwin et al., 2020), integrated care models involving community health workers such as the TIME program (Vaughan et al., 2022), and pharmacist-led telemedicine diabetes treatment programs (Cohen et al., 2020).

The benefits of telemedicine interventions for T2DM patients are well-documented. A key advantage is the effective glycemic control, which is significantly relevant in T2DM patients. A meta-analysis reported a significant reduction in blood glucose levels among diabetes patients following 12 months of telemedicine use.(Ma et al., 2022) Similarly, Getie et al. (2025) reported a significantly better blood glucose control in the telemedicine group compared to controls, with a mean difference of 0.2.(Getie et al., 2025) Telemedicine interventions also help special populations like pregnant women by offering cost-efficient, time-saving, and remote consultations.(Ebekozien et al., 2024) Patients managed by physicians trained through a telehealth program, Extension for Community Healthcare Outcomes (ECHO), exhibited a higher likelihood of achieving HbA1c concentrations below 64 mmol/mol (8%) compared to those receiving care from non-ECHO-trained physicians.(Ehrhardt et al., 2023)

Hence, telemedicine allows the continuous monitoring of health indicators, such as detecting blood glucose fluctuations for immediate control. It can deliver patient-specific recommendations, such as medicine reminders and nutrition guidance.(Mannoubi et al., 2024) Furthermore, telemedicine platforms serve as valuable repositories of educational resources on T2DM, empowering patients with knowledge to take active steps in managing their condition.(American Diabetes Association Professional Practice Committee, 2022; Diabetes Canada, 2018; Ivers et al., 2019) Features like appointment reminders and tracking

tools within these platforms further promote patient engagement and motivation.(American Diabetes Association Professional Practice Committee, 2022; Diabetes Canada, 2018) Additionally, mHealth options on mobile phones can have language and cultural adaptations that increase their relevance and reach. The accessibility of mHealth potentially reduces inequities in diabetes care by extending into patients' homes and daily lives. (Ebekozien et al., 2024)

Telemedicine-based strategies have some beneficial effects on non-glycemic parameters, including reduction in body weight and blood pressure through the use of standardized scales and automated sphygmomanometers, respectively.(Mullur et al., 2022) Telemedicine interventions can significantly improve the mental and physical quality of life.(De Groot et al., 2021) Structured telemedicine programs, such as the Diabetes Tele Management System (DTMS®), led to statistically significant improvements in QoL scores, diabetes-related complications, and self-management practices in T2DM patients.(Jothydev et al., 2023) Moreover, telemedicine interventions may offer a cost-effective and convenient alternative for the patients.

Clinical evidence: Telemedicine intervention for emotional well-being

a. Depression

Numerous telemedicine interventions have been developed to address glycemic control in individuals with T2DM, while psychological interventions are still scarce. For instance, an RCT compared pharmacist-led versus nurse-led telehealth disease management for veterans with diabetes and depression. Neither group showed statistically significant changes in depression scores after 6 months of telemedicine intervention.(Cohen et al., 2020) Similarly, Crowley et al. (2022) reported no significant change in depressive symptoms in T2DM patients after a comprehensive telemedicine intervention was provided to patients.(Crowley et al., 2022) On the other hand, another RCT by Gerber et al. (2023) found that a mHealth intervention delivered by clinical pharmacists and health coaches improved HbA1c in adults with T2DM, but no significant change in depression scores was reported compared to the control group.(Gerber et al., 2023) Contradictory findings have been shown with telemedicine in improving emotional health status. This can be attributed to the programs lacking targeted components addressing emotional needs, in turn resulting in limited effectiveness in reducing depressive symptoms.

Interventions that mindfully integrate psychosocial support, delivered by trained personnel via telemedicine, have shown more consistent and sustained positive effects in elevating the emotional status of patients. The TELE-DD trial investigated a proactive, monthly telephonic intervention delivered by nurses using motivational interviewing for T2DM patients with comorbid depression. (Hoyo et al., 2022) The psychoeducational approach resulted in statistically significant and sustained reductions in Patient Health Questionnaire-9 (PHQ-9) scores in the treatment group compared to those on standard care over an 18-month follow-up. Magee et al. (2021) conducted a pilot study assessing the feasibility of co-delivering a mental health intervention (using CBT principles and behavioral activation) alongside an intensive diabetes "Boot Camp" care management program. (Magee et al., 2021) The program had initial in-person visits, followed by telemedicine follow-ups. The study found a 2.4-point reduction in PHQ-9 over 12 weeks. Another intervention combining CBT and mindfulness exercises, delivered through computers and mobiles, reported a decrease of 3.1 points in the PHQ-9 score. (Alodhialah et al., 2024) However, a meta-

analysis observed a small pooled effect (-0.06) of e-health interventions for reducing depressive symptoms in T2DM patients. (Fernández-Rodríguez et al., 2024)

Some studies highlight the potential of telemedicine to support emotional well-being in specific contexts. Yin et al. (2022) studied obese T2DM patients using a telemedicine app offering remote glucose monitoring and diet/exercise guidance during COVID-19. (Yin et al., 2022) The mHealth intervention significantly reduced Self-Rating Depression Scale (SDS) scores at 6 months compared to baseline, whereas the control group showed an increase in SDS scores. The study underscores telemedicine's value in mitigating depression during periods of restricted access and heightened stress as experienced during the pandemic. Furthermore, a long-term (15-year) retrospective cohort study by Jothydev et al. (2023) found that participants receiving care via telemedicine performed significantly better in the anxiety/depression domain of the EuroQol five dimensions (EQ-5D), compared to controls, suggesting potential long-term mental health benefits of telemedicine. (Jothydev et al., 2023)

Web-based or mobile application interventions that include direct human therapeutic support are more likely to be effective compared to those that offer limited or no human interaction. A recent RCT investigated a smartphone app providing behavioral activation sessions with minimal nurse assistant support for patients with diabetes and depressive symptoms. (Araya et al., 2021) The telemedicine cohort group had a 60% higher odds of achieving at least a 50% reduction in PHQ-9 scores at 3 months compared to the group receiving standard care. Similarly, the Springboard trial evaluated "myCompass," a fully automated, self-guided web program for depression and anxiety in T2DM patients. (Baldwin et al., 2020) The intervention group received access to myCompass, and a control group received a generic health literacy program. There was no significant difference between the groups in the PHQ-9 score following intervention.

The existing evidence indicates that integration of telemedicine into the traditional standard of care for diabetes management has the potential to strengthen emotional well-being in patients with depression. The inclusion of targeted psychosocial elements, structured intervention frameworks, and adequate involvement of healthcare professionals has been shown to enhance the effectiveness of interventions in alleviating depressive symptoms. Low-intensity digital tools like apps have shown the possibility for short-term gains, but sustainability appears challenging without integrated human support. Factors such as intervention intensity, duration, the specific therapeutic approach, the nature and frequency of human support, baseline severity, and patient engagement play crucial roles in determining the long-term outcome of emotional regulation. Future research should identify optimal models for integrating mental health care within telemedicine frameworks to better manage depression in people with T2DM.

Table 1: Findings on telemedicine's role in improving emotional well-being in T2DM

Intervention	Type of Intervention	Participants	Outcome Assessed	Results Summary (Emotional Parameters)
TELE-DD Trial(Hoyo et al., 2022)	MI, CBT	Intervention: 192 Control: 192	Depression: PHQ-9 Diabetes distress: DDS	Significant decreases in depression severity and diabetes distress were observed in the intervention group compared to the control group over 18 months
Boot camp Intervention (Magee et al., 2021)	CBT, BA	Intervention: 18	Depression: PHQ-9 Anxiety: GAD-7.	Preliminary results showed significant within-group improvements in depression (PHQ-9, p=0.01) and anxiety (GAD-7, p=0.001) symptom scores at 90 days post-intervention.
Diabetes Tele Management System® (Jothydev et al., 2023)	Long-term structured telemedicine diabetes management	Intervention: 267 Control: 184	EQ-5D (anxiety/depression domain)	Intervention group reported significantly better anxiety/depression outcomes than controls, ($P < 0.001$).
HOPE (Vaughan et al., 2022)	Behavioral, collaborative, and goal-setting	Intervention: 136 Control: 89	Diabetes distress: PAID	HOPE showed greater reductions in total diabetes distress, especially emotional and social domains, at 6 and 12 months
Health Buddy ®(Cohen et al., 2020)	Educational prompts	Intervention: 13 Control: 14	Depression: PHQ-9	No statistically significant difference in depression outcomes between telemedicine and usual care was observed.
Comprehensive Telehealth (Crowley et al., 2022)	Telemonitoring by a psychiatrist in patients with >10 PHQ-8 score	Intervention: 101 Control: 99	Depression: PHQ-9 Diabetes distress: DDS	Significant improvement in diabetes distress was reported in the intervention group compared to control. However, no depressive symptoms did not improve.
mHealth (Yin et al., 2022)	Glucose monitoring, diet/exercise advice via app	Intervention: 52 Control: 47	Depression: SDS	Significant reduction in SDS scores in the telemedicine group. The change in depression was not significantly different between the two groups.
myCompass(Baldwin et al., 2020)	CBT	Intervention: 368	Depression: PHQ-8 Anxiety: GAD-7	Equivalent improvements in depression, anxiety,

Intervention	Type of Intervention	Participants	Outcome Assessed	Results Summary (Emotional Parameters)
		Control: 355	Diabetes distress: DDS	and diabetes distress across both arms; no added benefit of myCompass over control.
mHealth (Baron et al., 2017)	Self-monitoring, feedback, education	Intervention: 45 Control: 36	Depression: CESD-10 Anxiety: STAI-6 (Anxiety)	Although not statistically significant, a protective effect of the intervention on depression was noted. No significant effect on anxiety.
mHealth (Gerber et al., 2023)	MI, goal setting, stress reduction, and coping skills	Intervention: 109 Control: 112	Depression: PHQ-9 Diabetes distress: DDS	No statistically significant difference in depression and diabetes distress outcomes between the mHealth and usual care group.
mHealth (Araya et al., 2021)	BA	Intervention: 657 Control: 655	Depression: PHQ-9	A significant reduction in depressive symptoms was reported following intervention in diabetes and hypertension patients.
Virtual clinics (Almarzooq et al., 2025)	Telemonitoring, dietary consultations, and educational content.	Intervention: 657 Control: 655	Diabetes distress: DDS	Diabetes distress levels were similar in virtual, and in-person clinic visits.

**Note: BA: Behavioral Activation; CBT: Cognitive Behavioral Therapy; CESD-10: Center for Epidemiologic Studies Depression Scale 10-item; DDS: Diabetes Distress Scale; EQ-5D: EuroQol 5-Dimension; GAD-7: Generalized Anxiety Disorder 7-item scale; HOPE: Healthy Outcomes through Patient Empowerment; MI: Motivational Interviewing; PAID: Problem Areas in Diabetes scale; PHQ-8: Patient Health Questionnaire 8-item; PHQ-9: Patient Health Questionnaire 9-item; SDS: Self-Rating Depression Scale; STAI-6: State-Trait Anxiety Inventory 6-item*

b. Diabetes Distress

The role of telemedicine programs for addressing diabetes distress is widely discussed. Katz et al. (2019) compared mHealth, community health worker (CHW) support, and a combined mHealth+CHW approach. (Katz et al., 2019) All three groups showed significant improvements in diabetes distress from baseline over 12 months, with no significant differences between the groups. Furthermore, the virtual diabetes specialty clinic model, which integrated glucose monitoring support, education, and behavioral health, demonstrated significant reductions in Diabetes Distress Scale (DDS) scores over 6 months in patients with diabetes.(Aleppo et al., 2023) Conversely, Baldwin et al. (2020) and Gerber et al. (2023) found no significant difference in diabetes distress symptoms between the patients receiving telemedicine interventions and the control group.(Baldwin et al., 2020; Gerber et al., 2023)Fernández-Rodríguez et al. (2024) conducted a meta-analysis and found that e-health interventions were effective in diminishing diabetes distress (pooled SMD: −0.14), achieving clinically meaningful reductions.(Fernández-Rodríguez et al., 2024)

Promising results were reported in interventions specifically designed with established psychosocial frameworks. A goal-setting, behavioral, collaborative telemedicine program called HOPE was studied in patients with uncontrolled diabetes and depression. The telemedicine group reported a decrease of 17.4 points in the diabetes distress measure, Problem Areas in Diabetes (PAID) scale, at the 12-month follow-up period.(Vaughan et al., 2022)Hoyo et al. (2023), reported that monthly telephone-based motivational interviewing delivered to patients with T2DM and comorbid depression resulted in significant reductions in Diabetes Distress Scale (DDS) scores over 18 months compared to the control group.(Hoyo et al., 2022) A novel Time2Focus application, including evidence-based behavioral content and gamification, reduced DDS by 0.45 in patients completing all stages of the intervention.(Batch et al., 2021)

Innovative strategies, like virtual clinics and digital logbooks, are being developed to remotely manage the diabetes distress and emotional burden in T2DM patients. A digital diary called mySugr PRO was provided to patients, and after 12 weeks of its use, the reduction in diabetes distress was nearly double compared to controls.(Ehrmann et al., 2024) Participants using Onduo Virtual Diabetes Clinic for 6 months reported statistically significant reductions in DDS, with the most pronounced effect on regimen-related and emotional distress.(Polonsky et al., 2020) Conversely, a cross-sectional study conducted in Saudi Arabia reported no significant relationship between the number of virtual clinic visits and diabetes distress levels.(Almarzooq et al., 2025)

However, the results revealed that individuals with suboptimal glycemic control reported significantly higher diabetes distress, particularly emotional and regimen-related burdens. This reaffirms the link between metabolic state and emotional well-being, which telemedicine aims to address. The collective evidence suggests that telemedicine interventions can be effective in reducing diabetes distress, but the degree of success varies depending on the process of implementation. Telemedicine interventions that incorporate evidence-based psychosocial approaches, such as CBT, motivational interviewing, problem-solving, or goal-setting frameworks, have proven effective in addressing emotional distress in individuals with diabetes. In contrast, interventions focused solely on glycemic control, without addressing psychological factors, may not yield significant improvements in emotional well-being.

c. Anxiety

The impact of telemedicine interventions on generalized anxiety symptoms remains limited. Baron et al. (2016), in a 9-month RCT comparing standard care supplemented with mobile telemedicine (self-monitoring, data transmission, nurse feedback, education) to standard care alone for insulin-requiring patients, found no significant effect of the intervention on anxiety symptoms.(Baron et al., 2017) Similarly, Cohen et al. (2019) reported no significant changes in anxiety score post-telemedicine interventions.(Cohen et al., 2020) A fully automated, self-guided web program had comparable effects on anxiety symptoms with the control health literacy program.(Baldwin et al., 2020) Magee et al. (2021) conducted a 12-week trial using CBT intervention delivered in-person and via telemedicine visits, reporting statistically significant reductions in anxiety symptoms in the telemedicine group.(Magee et al., 2021)Telemedicine interventions have the potential to positively impact generalized anxiety symptoms, although further research is needed to fully understand their effectiveness.

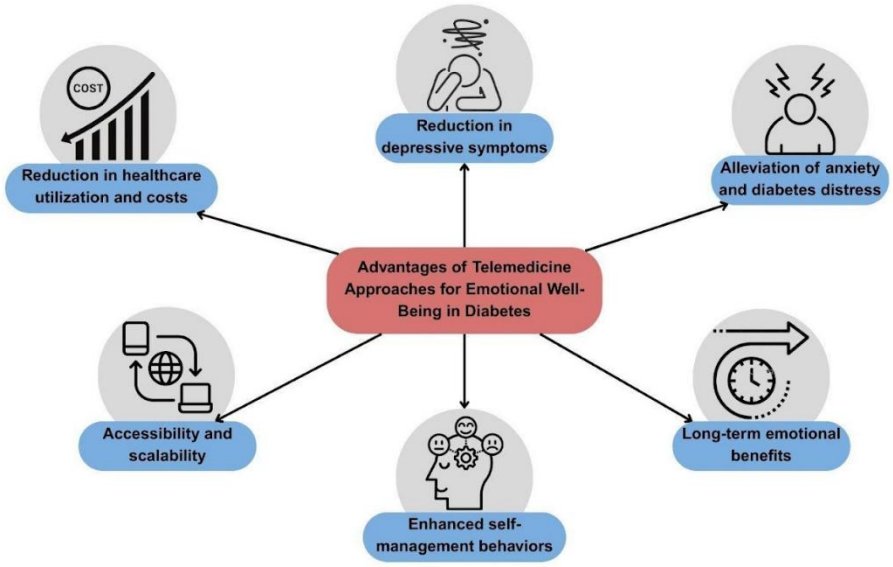

Figure 1: Benefits of implementing telemedicine strategies for improving emotional well-being in patients with diabetes.

Challenges and Future Directions

Telemedicine integration within the healthcare framework requires substantial investment in staff, training, and developing clinical workflows.(Mullur et al., 2022) Currently, there is a lack of infrastructure, integration with electronic health records, competent professionals, and standardized protocols, impeding telemedicine use.(Getie et al., 2025) Furthermore, telemedicine interventions have inconsistent outcomes due to differences in healthcare policies, funding models, and delivery systems, particularly between urban and rural areas. Elderly and lower-income patients may have limited access to digital devices or internet services. (Getie et al., 2025) Efforts to address these technological, social, and cultural barriers are necessary to integrate telemedicine programs into routine clinical practice.

Current research on telemedicine-based interventions in T2DM primarily emphasizes glycemic control, with a secondary focus on emotional and psychological outcomes. A critical research gap exists in identifying the psychological stressors in patients and tailoring interventions accordingly. Most of the existing research included heterogeneous intervention designs, varied outcome measures, and short-term follow-ups. Future studies should prioritize the development of targeted telemedicine interventions designed to address the primary emotional burdens in patients. Additionally, research exploring the long-term efficacy and cost-effectiveness of such specialized psychological telemedicine programs is warranted. To promote telemedicine adoption, a user-centered design is required that ensures cultural adaptability and integration into existing healthcare frameworks. Increasing digital literacy, improving data security, and involving healthcare providers in digital intervention delivery can improve patient engagement. Policymaker support through reimbursement frameworks and infrastructural investment will be critical for scalable, equitable telemedicine implementation in diabetes care.

There exist several gaps in the existing literature. Large-scale multicenter studies are absent. There is a need for future research to focus on developing and rigorously testing targeted telemedicine interventions designed specifically to address psychological stressors in T2DM patients. Using artificial technology is lacking in this domain, which can be used in future

models. Interventions must also take into account the feasibility and ease of integration with the existing healthcare systems.

Several limitations in the review must be addressed. First, the current review does not address the cost-effectiveness, feasibility, or safety outcomes of telemedicine interventions, which are critical for informing large-scale implementation in real-world clinical settings. Second, the substantial heterogeneity in the design, delivery mode, and psychosocial components of the interventions limits the strength and generalizability of our conclusions. Third, no comparisons were drawn between interventions delivered via different telemedicine platforms. Lastly, the review does not systematically evaluate barriers to implementation, which are important to integrate telemedicine into clinical practice. Notwithstanding the limitations, the review provides a comprehensive synthesis of existing clinical evidence on telemedicine interventions supporting the emotional needs in adults with T2DM. It highlights that telemedicine is an effective option to support mental health in diabetes care.

CONCLUSION

The review presents a comprehensive overview of recent evidence on the effectiveness of telemedicine interventions in supporting the emotional well-being of T2DM patients. Across multiple studies, interventions delivered through telemedicine platforms reported positive outcomes in reducing depressive symptoms, anxiety, and diabetes distress, especially in interventions with a focused psychological element and human support. Future research should prioritize well-designed clinical trials that directly address psychological outcomes, employ standardized metrics, and assess cost-effectiveness compared to traditional care models. Overall, telemedicine offers a promising, scalable approach to provide emotional support in diabetes care. India is too vast a country with a very high population that the public health system alone will not be sufficient to provide such service. Family physicians and general physicians with a special interest in diabetes in the private sector can be motivated and trained to deliver telemedicine interventions. As digital health technologies become more accessible, their thoughtful implementation can significantly improve both psychological and clinical outcomes, contributing to more holistic, patient-centered management of T2DM.

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