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Review

Telehealth effectiveness for glycaemic control of older adults with Type 2 diabetes: An integrative review

Gabriel Boateng [a], Bosun-Arije Stella Foluke [b,*]

[a] University of Lancashire, School of Nursing and Midwifery, Flyde Road, Preston PR1 2HE, England, United Kingdom
[b] Department of Nursing, University of Doha for Science and Technology, Doha, Qatar

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ABSTRACT

This review aimed to highlight the relevance of telehealth in improving glycaemic control among older adults living with diabetes.

Articles published between 2015 and 2025 across Ovid MEDLINE database, Cumulative Index to Nursing and Allied Health Literature (CINAHL) database, Scopus Cochrane Library and Ovid Excerpta Medica Database (EMBASE) were reviewed by two authors. The methodological quality of the studies was appraised using the Critical Appraisal Skill Programme (CASP) framework.

In total, nine articles were reviewed and analysed to answer two research questions (3.5 and 3.7). The effectiveness of telehealth and digital interventions in supporting older adults with diabetes were highlighted and grouped into four themes: Digital self-monitoring and telehealth in diabetes management, technology-enabled exercise and lifestyle interventions, telehealth-based psychosocial interventions and effectiveness of telemedicine and remote care. Barriers such as limited digital literacy, privacy concerns, and insufficient technical skills continue to restrict widespread adoption of telehealth for the management of older people living with diabetes.

Telehealth and digital tools can complement traditional diabetes care for older adults who have limited access to in-person diabetes services. However, optimising outcomes for older people require a focus on digital literacy, equitable access, and age-friendly diabetes telehealth services.

1. Introduction

Telehealth has become a revolutionary means of diabetes management and treatment. Several studies indicated that telehealth interventions effectively improved glycated haemoglobin levels and patient engagement and minimised the costs of care delivery. It is important to explore the effectiveness of this model in older adults living with Type 2 diabetes (T2D).

Diabetes mellitus (DM) is a disorder that causes long-term metabolic problems, and it has become one of the most crucial global health issues in the 21st century [1]. T2D is the most common type of Diabetes worldwide [2]. T2D complications such as cardiovascular disease, kidney disease, neuropathy, and vision loss are more common in older adults due to factors such as comorbidities, functional impairments [3]. The most important factors in minimising the care burden attributable to diabetes-related complications are the achievement and maintenance of normal glycaemic control, which is determined by glycated haemoglobin (HbA1c) level [4]. Early and ongoing control of glycaemia is required to address diabetes complications, including halting the onset of diabetes complications in older people [5]. Diabetes Self-Management Education (DSME) is one of the key approaches to promote glycaemic control [6]. It refers to a structured educational approach to provide people with the knowledge and equipment needed to adequately address their clinical manifestations [7]. Teaching patients about eating well, physical activity, medication adherence, glucose monitoring, and problem-solving techniques are a common part of DSME. Although this model is effective, older adults have limited access to such models, many of whom may be residing in rural communities with limited access to transportation and other mobility issues [8].

To overcome these shortcomings, telehealth has become a revolutionary means of diabetes management and treatment. Telehealth describes various technologies, such as video consultations, mobile apps, phone calls, and wearable monitoring devices that make remote care delivery possible. Since the COVID-19 pandemic, the adoption of these devices has increased, with potential effectiveness in giving people with

* Corresponding author.
E-mail addresses: GBoateng@lancashire.ac.uk (G. Boateng), Folukestella.bosunarije@udst.edu.qa (B.-A.S. Foluke).

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chronic conditions, such as diabetes, continuity of care [9]. Several studies indicate that telehealth interventions effectively improve glycated haemoglobin.

Given such encouraging trends, the use and effectiveness of telehealth in adults aged 65 years and above have been, so far, sparse and uneven. The barriers to using digital health technology in older adults are unique, such as reduced digital literacy, cognitive- related disorders, or the absence of a caregiver [10]. Therefore, it is important to know how telehealth-based interventions will be adjusted to the needs of this population group and to determine their effects to generate meaningful improvements in glycaemic control. The aim of this review is to highlight the relevance of telehealth in improving glycaemic control among older adults living with diabetes.

2. Materials and methods

This integrative review followed the Preferred Reporting Items for Systematic Reviews and MetaAnalysis (PRISMA) guideline. The guideline ensures that the review is reported transparently, consistently, and comprehensively [11].

2.1. Research questions

- How does telehealth-based diabetes management impact glycaemic control in older adults with T2D?
- What components of telehealth interventions are most effective in improving glycaemic control among older adults with T2D?
- What barriers and facilitators influence the effectiveness of telehealth interventions for glycaemic control in older adults with T2D?

2.2. Search strategy

Two reviewers independently searched databases for eligible articles published in English language, between 2015 and 2025. A comprehensive literature search was conducted manually and electronically across five databases: Ovid MEDLINE, CINAHL, Scopus Cochrane Library and EMBASE. Please see a detailed list of search terms, search strings, keywords and search strategies in Table 1.

2.3. Eligibility criteria

This study eligibility assessment relied on the Population, Exposure and Outcome (PEO) model.

The eligible population was (older adults OR elderly OR “aged 65 years” OR geriatric* with “type 2 diabetes” OR T2D). The exposure was (telehealth OR telemedicine OR mHealth OR “mobile health” OR “remote monitoring” OR “virtual care” OR eHealth). The outcome measure was (glycaemic control OR “glycaemic control” OR HbA1c OR “blood glucose” OR hypoglycaemia*). Designs as Randomised Controlled Trials (RCTs), quasi-experimental, cohort, mixed methods and qualitative studies and English-written peer-reviewed articles 2015–2025 were included.

2.4. Inclusion and exclusion criteria

Please see Table 2 for the parameters for inclusion and exclusion.

2.5. Data extraction and analysis

Data extraction was conducted systematically to ensure consistency and accuracy across all included studies. A standardised extraction table was developed to capture essential information such as study design, population characteristics, intervention type, outcomes measured, and key findings (Please see Table 3 for the reviewed articles and characteristics table). Following extraction, the data were organised into thematic categories to facilitate comparison across diverse study designs.

Table 1
Framework, keywords search strategy and search strings.

Framework	Keywords / Search Terms	Boolean / Truncation Strategy
Population (Older adults with T2DM)	“older adults” OR “elderly” OR “aged” OR “seniors” OR “geriatric” OR “65 years and above” AND “type 2 diabetes mellitus” OR “T2DM” OR “diabetes” OR “diabetic patients”	(“older adults” OR elderly OR aged OR seniors OR geriatric OR “65 years and above”) AND (“type 2 diabetes mellitus” OR T2DM OR diabetes)
Intervention (Telehealth /DSME delivery)	“telehealth” OR “telemedicine” OR “eHealth” OR “mHealth” OR “remote consultation” OR “virtual care” OR “digital health” OR “video consultation” OR “mobile applications” AND “diabetes self- management education” OR “DSME”	(“telehealth” OR telemedicine OR eHealth OR mHealth OR “remote consultation” OR “virtual care” OR “digital health” OR “video consultation” OR “mobile applications”) AND (“diabetes self- management education” OR DSME)
Outcome (Glycaemic control)	“glycaemic control” OR “blood glucose control” OR “HbA1c” OR “glycosylated haemoglobin” OR “blood sugar level” OR “glucose monitoring”	(“glycaemic control” OR “blood glucose control” OR HbA1c OR “glycosylated haemoglobin” OR “blood sugar level” OR “glucose monitoring”)
Study Type /Design	“randomized controlled trial” OR “RCT” OR “clinical trial” OR “intervention study” OR “observational study” OR “qualitative” OR “mixed methods” OR “systematic review”	(“randomized controlled trial” OR RCT OR “clinical trial” OR “intervention study” OR observational OR qualitative OR “mixed methods” OR “systematic review”)
Limits (Inclusion/ Exclu sion)	English language Humans Age ≥65 T2DM only	Applied through database filters

Table 2
Inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
Participants aged ≥65 with type 2 diabetes mellitus (T2DM).	Studies on gestational or type 1 diabetes.
Interventions involving telehealth modalities aimed at glycaemic control.	Non-English studies.
Peer-reviewed quantitative, qualitative, or mixed- method studies.	Editorials or opinion pieces lacking empirical data.
Published between 2015 and 2025	Published before 2015

Studies key findings were tabulated, coded and synthesised. This integrative approach allowed for the identification of patterns, similarities, and differences across studies, as well as the exploration of relationships between telehealth interventions and older adults’ glycaemic outcomes.

2.6. Risk of bias assessment

To minimise selection and interpretation bias, two reviewers independently selected and reviewed all the articles included. Two reviewers (GB and SB) independently extracted data, with discrepancies resolved through discussion and consensus to minimise bias. Reflexivity was applied during the process and has been used as much as possible to reduce bias. However, it is accepted that a different reviewer may have perceived the literature differently.

Table 3
Reviewed articles and characteristics.

Author/Year	Country	Design	Sample Size	Key Findings
Aubert et al. (2022)	USA	Observational	740,602	Mixed diabetes outcomes during COVID-19 telehealth; continuity but inconsistent glycae
Esmailpour et al. (2025)	Iran	Randomized Controlled Trial (RCT)	102 (51 intervention, 51 control)	Improves self-management, HbA1c, and FB compared to controls (specific stats not prov abstract)
Bretschneider et al. (2025)	Europe	RCT	149	Mobile app Vitadio improved selfmanageme clinical outcomes
Egede et al. (2017)	USA	RCT	90 (of 241)	Telehealth psychotherapy improved glycaemic control
Glavas et al. (2024)	Europe	Feasibility RCT	50	Digital voice assistants feasible for exercise in older adults with T2DM
Guo et al. (2019)	China	Prospective Feasibility Study	62	A telehealth "hospital–community–family" ne chronic heart failure (including diabetic parti improved feasibility and self-care among old showing high engagement and
Kim et al. (2015)	South Korea	RCT	100	satisfaction. Real-time monitoring with feedback improves adherence and glycaemic control
Mihevc et al. (2025)	Europe	Multicentre RCT	128	12-month telemonitoring improved BP and m glycaemic outcomes
Zhang et al. (2025)	China	RCT	191 (of 198)	The home telemedicine plus Health Belief Model (HBM) health education intervention led to a significantly greater reduction in HbA1c levels compared to the control group (a 0.42% greater reduction, 95% CI 0.12% to 0.73%)

2.7. Quality appraisal

This review used the Critical Appraisal Skills Programme [12] checklists as the only appraisal method. CASP provides design-oriented checklists, which can be customized to qualitative, quantitative, and mixed-methods studies [13]. This ensures there is consistency in evaluation process, collection approaches, reflexivity, ethical considerations, the rigor of analysis, and the usefulness of the findings [14]. Only studies that achieved between 8 and 10 on the CASP rating list were included in this review.

3. Results

A total of nine articles from five electronic databases were reviewed. The effectiveness of telehealth and digital interventions in managing T2D among older adults were explored. We synthesised evidence from eight RCTs, one feasibility study and one observational study to reveal the impact of telehealth on glycaemic control, self-management behaviours, lifestyle outcomes, and psychosocial well-being of older adults with T2D. The findings were organised into four themes to how the key spheres of telehealth interventions. Please see Fig. 1 for the PRISMA flow diagram and Table 1 for the keywords and search terms used with the PICO framework.

3.1. Theme 1: digital self-monitoring and telehealth in diabetes management

Four of the nine reviewed studies support this theme, demonstrating that telehealth and digital self-monitoring technologies improve glycaemic control and blood pressure outcomes in adults with type 2 diabetes [15–19]. Across different geographical settings, these interventions share a focus on automation and personalisation to support cost-effective, self-directed diabetes management. Randomised controlled trials showed that continuous home monitoring combined with clinician feedback through u-healthcare or mHealth systems led to greater HbA1c improvements than standard care, reporting a significant reduction in mean HbA1c from 8.0% to 7.3% compared with minimal change in controls ($P<0.01$) [17]. Enhanced systems incorporating clinical decision support and real-time activity monitoring further strengthened patient self-management [17]. Consistent with self-regulation theory, these feedback-driven approaches improved motivation and accountability. Additional RCTs showed broader health benefits, including reductions in systolic blood pressure and HbA1c in older adults receiving home telemonitoring [18], as well as weight loss, reduced diabetes-related distress, and improved self-care among users of the Vitadio mobile application compared with usual care [16].

The digital monitoring intervention's participants experienced a significantly larger change in HbA1c (8.23% to 7.24%, −0.99%) than did the control group (8.17% to 7.75%, −0.42%) [19]. The intervention group also had significantly higher scores for diabetes self-management and self-efficacy, indicating that frequent digital monitoring led to increased participation in self-care activities and greater confidence in self-care [19]. These results show that digital self-monitoring can not only be used to record glucose data but can also help to improve patient engagement, aid clinical decision making and improve glycaemic control for older people with Type 2 diabetes.

Evidence from the COVID-19 pandemic further indicated that large increases in virtual visits with fewer in-person consultations did not adversely affect HbA1c levels, suggesting telehealth can effectively replace traditional care without compromising glycaemic outcomes. Methodologically, findings from large RCTs and real-world studies conducted in Asia, Europe, and the USA consistently indicate that remote and digital monitoring tools can sustain or improve glycaemic control across diverse healthcare settings [15,17,18]

Theme 2: technology-enabled exercise and lifestyle interventions

Two of the nine reviewed studies highlight the effectiveness of digitally delivered exercise interventions for older adults with type 2 diabetes [19,20]. The findings from the randomized controlled trials thematic synthesis by Glavas et al. (2024) and Zhang et al. (2025) highlight the transformative potential of conversational voice assistants and intelligent telemedicine systems in overcoming technical hurdles, boosting patient engagement, and delivering impactful clinical outcomes. A feasibility RCT using a digital voice assistant (Alexa) to deliver a home-based strength training programme to older obese adults with T2D was conducted [20]. Participants showed high adherence (85% of prescribed sessions), significantly reduced sedentary behaviour, and increased daily movement compared with controls ($P < 0.01$; Cohen's $d = 0.6$), with no reported adverse events and high satisfaction with the technology [20]. These findings suggest that voice-based, personalised coaching can effectively motivate physical activity and reduce sedentary time in older populations.

Both studies used accessible hardware that was specifically designed to address the needs of older users in order to remove friction in the user-interface. Glavas et al. (2024) used a conversational agent (Amazon Alexa) in a home-based strength training programme to eliminate the need for complicated text-based navigation. Similarly, Zhang et al. (2025) created an intelligent touch-screen hub to automatically connect with the biometric data using Bluetooth. This user-centric design directly translated into high engagement. The voice-assisted intervention had an outstanding adherence rate of 85% and significantly reduced sedentary time and increased movement ($P < 0.01$) for the participants. In Zhang et al.'s (2025) study, the telemedicine platform improved the entire self-care capability and increased self-efficacy among the patients

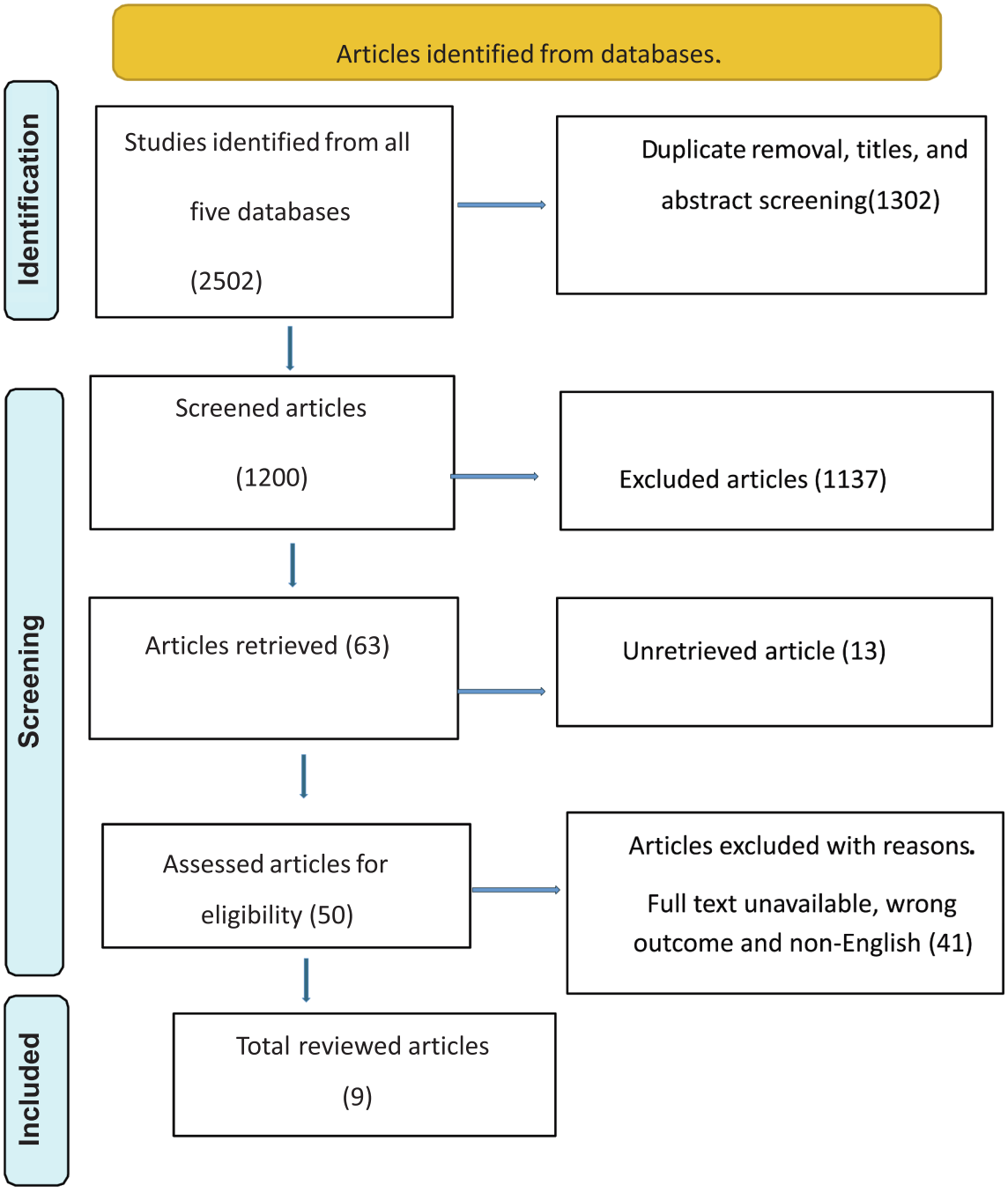

Fig. 1. PRISMA flow diagram for studies screened, included, and excluded.

with sustained remote feedback from the care team.

Finally, this e-learning experience led to strong clinical outcomes on glycaemic control. The intelligent platform used by Zhang et al. (2025) helped the patients reduce their HbA1c by a mean of -0.99% over six months, whereas standard care reduced the HbA1c by -0.42% over the same period. These trials collectively demonstrate the safety, feasibility and effectiveness of remote digital lifestyle interventions, and offer a scalable pathway to addressing personalized chronic disease management directly in the home.

3.2. *Theme 3: telehealth-based psychosocial interventions*

Three out of the nine reviewed articles constitute this theme [16,19,21]. Another relevant area is the psychosocial support of patients with diabetes, in particular, the comorbid depression. In a subgroup analysis of a RCT, the researchers compared Behavioural Activation Therapy (BAT) done by home telemedicine with call-in [21]. The telemedicine and control group had superior glycaemic control among older adults with T2D and depression. In particular, 12 months later, the telemedicine cohort retained their baseline mean A1c (6.9), but the A1c of the in-person group increased by 7.3–7.7% [21]. The difference adjusted was −0.82 percent in favour of the telehealth arm. These results imply that delivering psychotherapy remotely was more effective than face-to-face therapy for stabilizing blood sugar. Telehealth offered from home may have provided increased access and convenience which could help patients maintain adherence for both mental health and diabetes care [21].

Complementary evidence is provided from digital coaching

interventions, like Vitadio, which are primarily technology focused but also have some psychological gains as reported by users. App users saw a larger reduction in diabetes distress scores compared to users in the control group [16]. While the study is focused on a technological diabetes care tool, the outcome is psychosocial as diabetes distress is a negative emotional state. The link is clear, the provision of technology assisted behavioural health programs (like apps and video calls) may positively impact a person's emotional health and it is then clinically beneficial for diabetes [16].

Social and behavioural support in the form of a telehealth intervention based on the Health Belief Model showed that psycho-social and behavioural support is a viable health approach to better manage diabetes in older adults with Type 2 diabetes [19]. This intervention was based on an intelligent glucose monitoring system together with individualised health education, behavioural counselling and on-going remote communication with health care professionals. These components aimed to enhance participants' understanding of the advantages of diabetes self-care, boost their motivation towards healthy behaviours, and boost their confidence in self-care. Participants in the telehealth intervention experienced significant improvements in self-efficacy, health beliefs and diabetes self-management behaviours during the 6-month intervention period compared with those who received routine care [19]. These included increased self-care confidence, which was correlated with increased adherence to blood glucose monitoring, dietary recommendations, medication management and physical activity. The clinically significant decrease in HbA1c (−0.99%) was paralleled by these psychosocial and behavioural improvements, compared with a decrease of (−0.42%) among participants receiving standard care [19].

Much of the literature suggests that telepsychology is less effective compared to care. For the subgroup in question, remote delivery of care was superior to in person delivery. It may be that home sessions eliminate stigma and other logistical challenges. It also speaks to the fact that mood is a powerful determinant of diabetes control. Patients are likely to have better diabetes control when telehealth improves their mood and self- efficacy. Egede's work is an RCT subgroup analysis while Bretschneider's is a primary RCT. They are both quantitative, but neither is qualitative. Thus, the "psychosocial" theme is supported by controlled trials demonstrating physiological (A1c) and patient-reported (distress) outcomes. However, a notable gap is lack of qualitative insight: we do not hear from patients about why telehealth worked better. This remains an area for future inquiry.

3.3. Theme 4: effectiveness of telemedicine and remote care

Three out of the nine reviewed articles constitute this theme [15,19,21]. A good number of studies revealed that in comparison to face-to-face care, telemedicine allows equal or superior health outcomes. This is particularly true among the elderly and people with multiple health issues [15,21]. This serves the broader purpose of understanding how health care access and delivery can be modified and is especially relevant for the disruptions to care that were commonplace with the onset of the COVID-19 pandemic. One of the more extensive natural observational studies in remote care when evaluating more than 740,000 veterans who have T2D [15]. They determined that the mean Hba1C levels did not change despite a 55% decrease in in person appointments and an 821% spike in virtual consultations. On the other hand, other scholars conducted a randomized study comparing telemedicine and in person Brown Adipose Tissue (BAT) sessions with older patients who have T2D and are depressed. BAT is a promising therapeutic target for treating T2D, due to its ability to burn glucose and lipids to generate heat [21].

In the 12 month follow up those who were part of the telemedicine BAT group had lower levels of Hba1c than in-person group, suggesting that remote psychological care optimise the glucose regulating systems. The reviewed studies support the idea that telemedicine helps during emergencies. However, there were notable research limitations. The number of A1c tests conducted, and the amount of laboratory surveillance done during the pandemic greatly decreased, indicating that virtual care may have done more harm than good in regard to keeping patients physically monitored [15].

A T2DM structured telemedicine-based diabetes management system that implemented intelligent blood glucose monitoring, remote clinician monitoring, and individualized feedback showed good clinical effectiveness in improving glycaemic control among older people with T2DM [15]. The intervention allowed for real-time monitoring of blood glucose levels remotely, and when levels were out of the norm, the healthcare professional could intervene immediately and offer individualized advice without frequent visits. The continuity of care and timeliness of clinical decisions were enhanced with this model of care. After 6 months, the participants who received the telemedicine intervention had a significant decrease in HbA1c level from 8.23% at baseline to 7.24% (−0.99%). In the usual care group, it declined from 8.17% to 7.75% (−0.42%) [15]. The results suggest that the use of telemedicine is more successful in improving glycaemic control than traditional community-based approaches, if it includes real-time or near real-time monitoring, feedback, and integrated education of the patient. The results demonstrate the importance of remote care models for the reduction of the need for regular face-to-face consultations, while still achieving satisfactory clinical results, especially for older people, who may face challenges with mobility or access.

3.4. Contextual and demographic influence

The reviewed literature reflects diverse geographical, demographic, and methodological contexts that significantly influence intervention design and outcomes. Asian studies from Korea, China, and Indonesia tend to emphasise integrated health technologies and community-based care models, while Western studies from the USA, Europe, and Australia more often focus on consumer technologies and healthcare system responses [15,17,20]. For example, Kim's RCT and Chen's Chinese trial prioritised universal monitoring and community engagement, with a study that developed a "hospital–community–family" telehealth network to enhance self-management and family involvement [22]. In contrast, [15] examined a system-wide transition to virtual diabetes care during a national emergency in the USA, while [20] evaluated the use of a consumer voice assistant for home-based exercise in Australia.

Study populations also varied, shaping outcomes and feasibility. Most diabetes-focused trials targeted older adults, often aged 65 years and above [17–20] including elderly veterans in [15] while Vitadio participants were predominantly middle-aged [16]. Methodologically, the evidence base includes randomized controlled trials across Europe, Asia, and Australia. While this diversity strengthens the evidence, most studies rely heavily on quantitative outcomes, with limited qualitative insight into patient experiences, cultural influences, or implementation barriers. Few studies reported patient satisfaction beyond basic usability measures, suggesting a need for mixed-methods research.

The COVID-19 pandemic is a further contextual factor, addressed primarily in Western research. The impact of lockdowns and rapid telehealth expansion on diabetes care delivery was uniquely explored [15]. Overall, the findings demonstrate that telehealth interventions must be tailored to local healthcare systems, cultural contexts, and population needs. Asian studies prioritise infrastructure-integrated solutions, Western studies focus on consumer technologies and system-level change, and demographic characteristics shape target outcomes such as glycaemic control or cognitive health. Collectively, the literature confirms that there is no universal telehealth model, underscoring the need for context-specific. The two research questions are:

3.5. What components of telehealth interventions are most effective in improving glycaemic control among older adults with T2D?

One of the nine reviewed articles constitute this category [20].

Behavioural change and lifestyle modification remain one of the pillars of diabetes management. Overall, the reviewed studies suggest that psychosocial and physiological improvements can be achieved more effectively with the aid of exercise and diets supplemented with motivational reinforcement and support [20,21]. These results support behavioural theories that state that self-efficacy and goal setting, facilitated through the use of reinforcements and support, are significant in maintaining change.

Using digital voice assistants (DVAs) is a novel approach to improve glycaemic outcomes of older people with T2D [20]. In their feasibility trial with older adults with obesity and T2D, they showed high adherence (85%) and usability (mean 70/100) along with significant decreases in sedentary duration [20]. They were methodologically sound in this research as they used accelerometers and self-reported measures in order to lessen self-report bias. The small sample, however, is a limitation as it reduces statistical significance and generalizability.

3.6. Digital intervention that focus on Older Adults with comorbidities

Three out of the nine reviewed articles constitute the stated theme [17,18,20]. Their research demonstrate that organized technology systems can be assimilated by people over 60 years of age. Their u-healthcare programme resulted in statistically important improvements in glycaemic control and lipid levels. Its greatest strength is how the automated transmission of health data to healthcare providers is combined with clinician control to reduce the likelihood of misinterpretation and disengagement. [18] extends this work to older adults with comorbid hypertension and verifies that multiple chronic conditions can be addressed with tele monitoring. Both studies have a completion rate that exceeds 90% and utilizes a randomized control trial design which increases internal validity [17,18]. However, they suffered from selection bias which is a common issue within digital studies that focus on the elderly who lack technological savvy as well as participants who have cognitive disabilities.

3.7. What barriers and facilitators influence the effectiveness of telehealth interventions for glycaemic control in older adults with T2D?

Interventions within these studies conducted by [17,18,20] implement the principles of gerontechnology which emphasizes the need for digital problem solving that considers the sensory, cognitive, and physical capabilities of senior citizens. These studies endorse practical approaches to the digital literacy training of older adults that includes the design of training materials, the use of simple user interfaces, and blended digital human assistance. The studies also affirm that age is not a barrier to technology acceptance. Provided that the ease of use and value placed on the technology is high. However, prolonged use of the technology for older adults is likely to depend on the active involvement of family members or caregivers. Therefore, future initiatives need to incorporate the training of family members to enhance their engagement with the elderly.

The studies show that adherence and self-efficacy have a significant role to play for both clinical outcomes and the intervention exposed to [16,21]. Their results fit the social cognitive theory which suggests change begins through self-reflection, self-efficacy, and self- feedback. [16] applied the same theory to digital interventions. Users of the Vitadio app reported higher self-care and motivation which suggests that goal setting, reminders, and educational components are powerful enough to replace clinician motivation. [21] describes another aspect of self-efficacy that intersects with mental and metabolic health. The emotional resilience theory suggests that Behavioural Activation Therapy delivered via telemedicine improves mood and glycaemic control, resulting in mastery over emotional behaviour.

4. Discussion

4.1. Summary of key findings and alignment with other similar studies.

The reviewed studies revealed that continuous glucose monitoring, teleconsultations, mobile health applications, and digitally supported exercise programmes improved glycaemic control, decreased blood pressure, and increased adherence to self-management practices. For example, [17] revealed that real-time self-monitoring with automated feedback was superior to conventional care with respect to glycaemic control. Similarly, [18] have shown that a one-year telemonitoring intervention on older individuals with T2D and hypertension was found to reduce blood glucose and systolic blood pressure more significantly than standard care. These findings proved the physiological advantages of the implementation of technology in the management of chronic diseases.

[16] demonstrated that participants who used Vitadio mobile application had more improvements in HbA1c, body mass index, and blood pressure than those in the standard care received. Also, there was an improvement in psychological wellbeing in terms of decreased diabetes related distress, which means that digital interventions had an effect on emotional as well as physiological outcomes. Equally, [20] reported that digital voice assistants (Alexa) could be used to facilitate exercise adherence and minimize sedentary behaviour.

In addition to clinical and lifestyle consequences and telepsychology interventions [21] resulted in better medication adherence scores and improved depressive symptoms and glycaemic control, respectively. [15] obtained observational data, which demonstrated that a significant change towards virtual visits instead of in-person ones did not lead to a significant drop in HbA1c levels, but remote care can replace the traditional clinical follow-ups without affecting diabetes outcomes.

4.2. Findings and contextual meaning interpretation

The results of the review demonstrated that digital and telehealth interventions significantly improved clinical, behavioural, and psychosocial outcomes in older adults with type T2D. The improvements might be explained in the context of the behavioural change theories, self-regulation principles, and chronic care models, which focused on continuous monitoring, feedback, and empowerment. The enhanced glycaemic control that was evident in several studies [16–18] showed that self-monitoring supported by feedback promoted accountability and diet, medication, and activity modifications on time. It meant that patients who were involved in digital self-tracking became more aware of the course progress. This increased self-efficacy and promoted further behaviour change. [23] stipulated that self-efficacy, feedback, and goal setting are significant in health behavioural change.

4.3. Comparison of results with past studies

The reviewed article demonstrates that digital self-monitoring and telehealth improve glycaemic control in older adults with T2D. [17,18] demonstrated decreased levels of HbA1c associated with telehealth. The results of these studies align with those of past studies. For example, [24] reported a weighted decrease of -0.49% in HbA1c in a review of 41 RCTs. Similarly, the levels of HbA1c also proved to be more consistent in older adults with T2D [24,25].

More intensive telehealth interventions had a higher reduction of HbA1c [26]. These results are more pronounced compared to the more subtle gains reported in observational studies during the COVID-19 pandemic, indicating that active, carefully designed interventions are better positioned to meet their purposes than passive replacement of face-to-face care with online access.

Beyond glycaemic control, digitally supported physical exercises [20] demonstrated high adherence and several clinically relevant T2D management benefits. These included less sedentary behavior and

enhanced cognitive functioning. Similarly, [27] revealed that mobile health applications and personalized digital coaching improved HbA1c and adherence to recommended lifestyle changes.

However, recent studies incorporated telehealth with additional outcomes, such as sedentary time and cognitive function. This indicates an evolution in the appreciation of the role of digital health technologies among patients with T2D. However, [28] showed that low digital literacy leads to lower uptake of these tools. Therefore, voice assistant and streaming interventions may exclude some individuals. Tai Chi has documented benefit of improving cognitive functions of older adults [29]. It was also advised that Tai chi could be integrated into existing cardiac rehabilitation programs for adults with chronic health failure [29], However, further strategies that involve modalities like Tai Chi may be more effective in China but may not be accepted by other populations.

Adherence support using SMS enhances T2D [30]. All these interventions regarded adherence as a behavioural issue, which is why patient-centred communication when managing chronic conditions is important. To corroborate the present results, [31] found a decrease in HbA1c after mobile health intervention among T2D patients. However, a mobile-based insulin dosage reminders when compared against manual tracking, improved glycaemic control in a RCT [32].

Research indicates that some telehealth psychosocial care offerings, such as behavioural activation therapy, improve mental health outcomes and glycaemic control [21]. Similarly, [26] revealed that telehealth depression support leads to improvements in HbA1c reinforcing the connection between emotional health and metabolic control. Although [33] demonstrated that telemedicine improves HbA1c, few studies have explicitly emphasized psychosocial outcomes. The [16]) trial that reported reduced diabetes-related distress on users of the Vitadio app helps fill this gap in the literature and complements the findings of [34] that MHealth interventions with embedded behavioural strategies are effective. On the other hand, [21] findings suggest telehealth options are superior to in-person psychotherapy. A telehealth model was compared against in-person visits regarding HbA1c levels at the 6-month follow-up, with significant improvement in glucose metrics and health-related quality of life [35].

The reviewed literature points out how telehealth outcomes demonstrate significant variability depending on context and demographic factors. Integrated care along with contextual appropriateness were highlighted in some Asian studies [17]. On the contrary, the Western focus had been primarily on consumer technology and systemic changes [15,20,26]. The observation is based on variations in healthcare systems and has also been noted by [22] who discuss the feasibility of the so-called hospital-community-family model in China.

Most participants in the studies were older adults [18–20]. This is consistent with [36] who explored the benefits of telehealth for enhancing the health of older people. Nonetheless, [28] have observed that technological illiteracy, especially among older individuals, may render high technological interventions ineffective for them. However, the generalisability of [26] was constrained as the researcher focused mainly on Black male veterans.

The socioeconomic and cultural factors are also not much explored. Although research has been conducted on cultural barriers in telehealth, there is a literature gap regarding socioeconomic barriers. Similarly, [34] highlighted the inconsistency of telehealth applications and patient outcomes based on different contextual factors, highlighting the need to develop population specific telehealth interventions. Non ownership of a technological device was a common barrier to telehealth acceptance during the Covid 19 pandemic [37].

4.4. Strengths and contributions of the findings to clinical practice and policy

The findings revealed important theoretical and practical applications of telehealth and digital interventions in the control of T2D in older adults. One of the key strengths was the diverse methodologies represented in the studies reviewed. The quality of evidence of the causal relationships between digital interventions and enhanced clinical outcomes was high in randomised controlled trials, such as those by [16–18].

Another strength was the scope of digital intervention modalities depicted in this review: smartphone applications, digital voice assistants, telepsychology, and pharmacist-led adherence programmes. This multimodal evidence base implied that telehealth was not a single construct but a continuum of interrelated strategies that dealt with the behavioural, physiological, and psychosocial domains. This diversity showed the holistic aspects of diabetes management and proved that digital interventions can address multiple patient needs and technological abilities.

4.5. Research limitations

Although the review fulfilled its goal of synthesising evidence on the use of digital interventions in diabetes care, multiple limitations were found. First, the studies had methodological heterogeneity regarding the duration of interventions, their intensity, and outcome measures. As an example, [38] used a short one-month training programme in the form of the app, while one of the articles reviewed in this research [18] used 12-month-long telemonitoring RCT. This variability decreased the comparability of findings, and it was difficult to establish the best length and intensity of digital interventions. Second, some of the studies had small sample sizes [19,20] which decreased the statistical power and the generalisability. Therefore, infrastructural obstacles such as access to the internet and digital literacy are going to be an issue in low-resource settings. Lastly, most studies reported quantitative outcomes; no studies included the use of qualitative data to obtain the lived experiences of the patients. This limited knowledge is about the impact of cultural, social, and emotional determinants on telehealth use.

5. Conclusion

Early use of telehealth in diabetes care for older adults improves glycaemic control and helps prevent complications through proactive remote monitoring and timely interventions. Behavioural tools such as reminders and goal tracking enhance patient accountability and treatment adherence. To support widespread adoption, national policies should integrate telehealth by investing in affordable digital technologies, expanding internet access, ensuring strong data protection, and subsidising telemonitoring equipment while encouraging digital innovation. Effective telehealth systems require collaboration between technology developers, healthcare professionals, and patients to create user-friendly and culturally appropriate platforms. Additionally, digital skills, ethics, and virtual patient engagement should be embedded into healthcare education and ongoing professional development. Telehealth should be viewed as an essential component of holistic, patient-centred healthcare rather than a standalone technological addition.

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CRediT authorship contribution statement

Gabriel Boateng: Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization. **Bosun-Arije Stella Foluke:** Writing – review & editing, Writing – original draft, Formal analysis, Methodology, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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