International Journal of Innovative Research and Scientific Studies, 8(5) 2025, pages: 1943-1950

IJIRSS
International Journal of Innovative Research & Scientific Studies

ISSN: 2617-6548

URL: www.ijirss.com

Impact of home tele-monitoring in patients with type 2 diabetes under home health care at KAMC, Riyadh

Kholoud A. Bin Haikel[1*], Amjad Al Seraya[2], Bader Al Tulaihi[3], Ms. Wadha al shemmeri[4], Ms.Feryal Nashwati[5]

[1,2,3,4,5]*King abdulaziz medical city, King Abdullah International Medical Research Center's (KAIMRC), national guard health affairs, Saudi Arabia.*

Corresponding author: Kholoud A. Bin Haikel (*Email: dr-kholoud1@hotmail.com*)

Abstract

Type 2 diabetes (T2D) remains a prevalent chronic condition requiring consistent monitoring to prevent complications. The adoption of home tele-monitoring (HTM) has demonstrated potential in improving diabetes management and reducing healthcare demands for patients receiving home health care services. This study evaluates the implementation of HTM on glycemic control, medication adherence, and medical facility utilization among patients at King Abdulaziz Medical City (KAMC) in Riyadh. It is a retrospective observational study involving 139 adult T2D patients receiving home health care services. Participants were divided into two groups: those utilizing HTM services and those receiving standard home care interventions. Data collected included HbA1c levels, medication adherence rates, hospital visit frequency, and patient-reported outcomes over a six-month period. Statistical analysis was conducted using SPSS 26, employing paired t-tests and regression models. The sample consisted of 61.2% males and 38.8% females, with 72.1% aged over 60 years. Additionally, 60.6% of patients were classified as extremely obese, with a mean BMI of 39 (SD = 6). Insulin monotherapy was the most common treatment modality, used by 81.3% of patients. Blood sugar control was generally poor, with fasting blood glucose averaging 191.33 mg/dL (SD = 90.265) and post-meal readings averaging 214.26 mg/dL (SD = 85.069). Only 30.2% of patients maintained adequate daily glucose control. The analysis identified a significant association between sex and glycemic control, with females exhibiting 2.83 times higher odds of uncontrolled glucose levels ($p = 0.018$). The implementation of HTM systems in diabetes management was associated with improved blood sugar regulation and reduced healthcare service utilization. Further research should focus on the long-term effects of tele-monitoring and include economic evaluations to optimize home-based diabetes care strategies.

Keywords: Digital health, healthcare utilization, Home health care, Home tele-monitoring, Medication adherence, Patient engagement, Remote monitoring, Type 2 diabetes, Glycemic control.

DOI: 10.53894/ijirss.v8i5.9325
Funding: This study received no specific financial support.
History: Received: 2 July 2025 / **Revised:** 4 August 2025 / **Accepted:** 5 August 2025 / **Published:** 15 August 2025

Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Publisher: Innovative Research Publishing

1. Introduction

Worldwide diabetes ranks as a significant chronic disease epidemic because 463 million adults (aged 20–79 years) currently have diabetes, with experts forecasting that the total will reach 629 million cases by 2045. Diabetes ranks as one of the top 10 leading causes of adult mortality, and type 2 diabetes constitutes 90–95% of diagnosed cases. Diabetes treatment consumes 10% of global healthcare spending, which amounts to $760 billion per year [1].

Data estimates from 2020 show 34.2 million Americans, who represent 1 in 10 people, have diabetes. Adults aged 65 years and above demonstrate a rising trend in diabetes prevalence, with 26.8% diagnosed with the disease at this age. The morbidity and mortality rates from Type 2 diabetes become substantial because it leads to increased susceptibility to experiencing heart attacks and strokes. Patients with Type 2 diabetes encounter long-term care management needs that lead them to experience difficulties with the maintenance of their healthcare throughout their life [2].

The evolution of telehealth as a vital care management approach has gained greater significance because of the coronavirus disease 2019 pandemic. The effectiveness of home tele-monitoring (HTM) for type 2 diabetes patients was assessed through a meta-analysis of twenty randomized trials that evaluated how it impacted A1C, blood pressure, and BMI during a median monitoring period of 180 days. Research evidence shows that HTM resulted in a statistically significant reduction of A1C level by 0.42% ($P = 0.0084$) [3].

The significant blood pressure changes detected in both systolic and diastolic measures (0.10 mmHg [$P = 0.0041$] and 0.07 mmHg [$P = 0.044$], respectively) do not reach meaningful clinical significance in HTM practice. The rate of A1C reduction was greater in patients using health systems with moderate interaction between technology platforms compared to patients who depended on automatic transmission or manual upload methods. All studies, spanning from 84 days to 5 years, showed no statistically significant differences in A1C results. Through HTM, patients and health providers obtain real-time information, which leads to successful A1C improvement [4].

Home tele-monitoring (HTM) has evolved as a vital care management technology since the beginning of the decade, yet the COVID-19 pandemic heightened its importance. The World Health Organization defines telehealth as "a collection of means or methods for enhancing health care, public health, and support using telecommunications and virtual technologies" [5]. Telemedicine functions as a specific medical component within the broader category of telehealth. The term telemedicine specifically refers to direct clinical services, although telehealth encompasses all health-related services, including patient care, education, and remote monitoring [6].

The definition of HTM describes how patients' medical data moves automatically from their residences to healthcare facilities through the internet, utilizing digital devices such as computers and smartphones. HTM allows medical staff to monitor patients' vital signs so they can swiftly respond to any emerging health issues. The patient-oriented strategy enables accelerated access to highly convenient and cost-effective virtual support by leveraging telecommunication and information technologies. HTM technology emerged as a method to monitor medical cases with multiple comorbidities across the globe, according to Corbett-Nolan et al. [7]. The study explores how home telemedicine helps medical professionals support patients through patient visits at home and assesses patients' abilities to manage their glucose levels.

2. Aim of Work

To assess the control of glucose readings among diabetic patients in home health care at KAMC through home tele-monitoring.

3. Methods

3.1. Study Area/Setting

The study was conducted in the Home Health Care Department at National Guard Health Affairs, a large medical center in the Kingdom of Saudi Arabia.

3.2. Study Subjects

Inclusion Criteria: All adult diabetic patients who were enrolled in the Home Health Care program at KAMC, Riyadh.
Exclusion Criteria: All adult diabetic patients who were not part of the Home Health Care program at KAMC, Riyadh.

3.3. Study Design

A retrospective cohort study.

3.4. Sample Size

The sample size was calculated using the OpenEpi website. Adult type 2 diabetes patients (aged 18 years and older) who identified as male or female were part of this study. The researchers determined a 5% margin of error, a design effect of 1.5, and an estimated patient population of 1,000 to establish the sample size. Using a control rate of 16.6% (HbA1c at 7 or below) from the most recent study (reference 9), and including a 95% confidence interval, the required sample size was 326 patients. The sample size calculation was performed using the OpenEpi calculator, which can be accessed at https://www.openepi.com/SampleSize/SSPropor.htm.

3.5. Sampling Technique

Patients who received a type 2 diabetes ICD diagnosis (Code: E11) were included in the dataset extraction. A simple random sampling technique was used for participant selection. Stat Trek's simple random number generator determined which patients would be included in the study (accessible at: https://stattrek.com/statistics/random-number-generator.aspx)

3.6. Data Collection Methods, Instrument Used, Measurements:

The researchers collected data by reviewing patient charts. The evaluation variables focused on measuring fasting glucose and random glucose levels. The pilot study served to validate the fasting glucose and random glucose measurements as study variables. The data collection tools underwent validity and reliability tests, which utilized standard statistical methodologies and defined all relevant research terms through clear definitions.

3.7. Data Management and Analysis Plan

SPSS enabled the analysis of collected data. All statistical tests were operated at a 0.05 significance level. The statistical analysis used mean ± standard deviation (SD) or median with interquartile range to summarize quantitative data. Researchers calculated the odds ratio along with a 95% confidence interval for their analysis.

4. Results

Table 1.
Socio-demographic Characteristics of Patients Receiving Home Health Care at KAMC through Home Tele-monitoring.

Variable	Category	Count (n)	Percentage (%)
Sex	Female	54	38.80%
	Male	85	61.20%
Income Level	Average	95	68.30%
	Below Average	44	31.70%
Diabetes Treatment	On Insulin	113	81.30%
	On Insulin + Oral Medication	26	18.70%
Duration of Diabetes	< 20 years	61	43.90%
	≥ 20 years	78	56.10%
Age (Years)	< 60	36	27.90%
	60-69	44	34.10%
	70-79	35	27.10%
	≥ 80	14	10.90%
	Mean (SD)	69 (12)	
Weight Classification (BMI)	Normal and Overweight	10	7.30%
	Mild Obesity	30	21.90%
	Moderate Obesity	14	10.20%
	Extreme Obesity	83	60.60%
	Mean BMI (SD)	39 (6)	

A total of 139 patients who obtained home health care services at King Abdulaziz Medical City (KAMC) participated in the study through their use of home tele-monitoring systems. The patient demographic revealed that males accounted for 61.2%, and females made up 38.8% of the total study participants. A majority of patients (68.3%) maintained typical incomes, yet 31.7% received incomes below the average.

The majority of patients with diabetes (81.3%) received their treatment through insulin, while 18.7% received insulin in combination with oral medication. The patient population depends extensively on insulin-based therapy for their diabetes management. The study population's diabetes duration demonstrated that 56.1% of patients maintained diabetes for longer than 20 years, and the rest had diabetes for less than twenty years.

The majority of patients were elderly individuals above age 60, according to the age distribution data, which comprised 72.1% of the total population. The majority of the patients (n=275) were aged 69 years on average, with a standard deviation of 12 years. The patients exhibited high obesity rates, as 60.6% were extremely obese, and their mean BMI reached 39 (SD = 6). This data supports the notable relationship between diabetes and obesity, since less than 8% of patients had normal or overweight BMI measurements.

Table 2.
Descriptive Statistics of Blood Glucose Monitoring in Home Tele-monitoring Patients.

Measurement	Median	Range	Mean	Std. Deviation	p-value
Fasting (Before Meals)	170	49-503	191.33	90.265	< 0.001
Postprandial (2 hours after 1st meal)	201	87-525	214.26	85.069	
Postprandial (2 hours after 2nd meal)	164	55-410	200.42	89.413	
Postprandial (2 hours after 3rd meal)	190	76-526	203.23	86.703	

Note: The Friedman test was used to analyze differences between fasting and postprandial glucose levels.

Table 2 and Figure 1 showed the blood glucose monitoring data for patients receiving home tele-monitoring at KAMC revealed elevated glucose levels across all measurements. Fasting blood glucose measurements demonstrated a median value of 170 mg/dL and a higher mean value of 191.33 mg/dL (SD = 90.265), which is beyond the normal fasting glucose targets for diabetic management. A p-value less than 0.001 indicates that the monitoring data demonstrate a significant statistical change in blood glucose levels.

Postprandial glucose levels measured two hours after meals also remained high. Glucose levels following the first dinner rose to 201 mg/dL in median results and averaged 214.26 mg/dL (SD = 85.069) as the primary mealtime measurement. Results from the second postprandial test showed lower glucose levels, with patients achieving both median and average measurements of 164 mg/dL, while maintaining a standard deviation of 89.413. The third post-meal testing indicated prolonged hyperglycemia, producing a median result of 190 mg/dL and an average of 203.23 mg/dL (SD = 86.703). The clinical findings demonstrate inadequate glycemic control among this patient cohort, who maintained elevated glucose concentrations across all measurement periods. Blood sugar control requires better monitoring, along with adjustments in medication and lifestyle modifications to prevent complications.

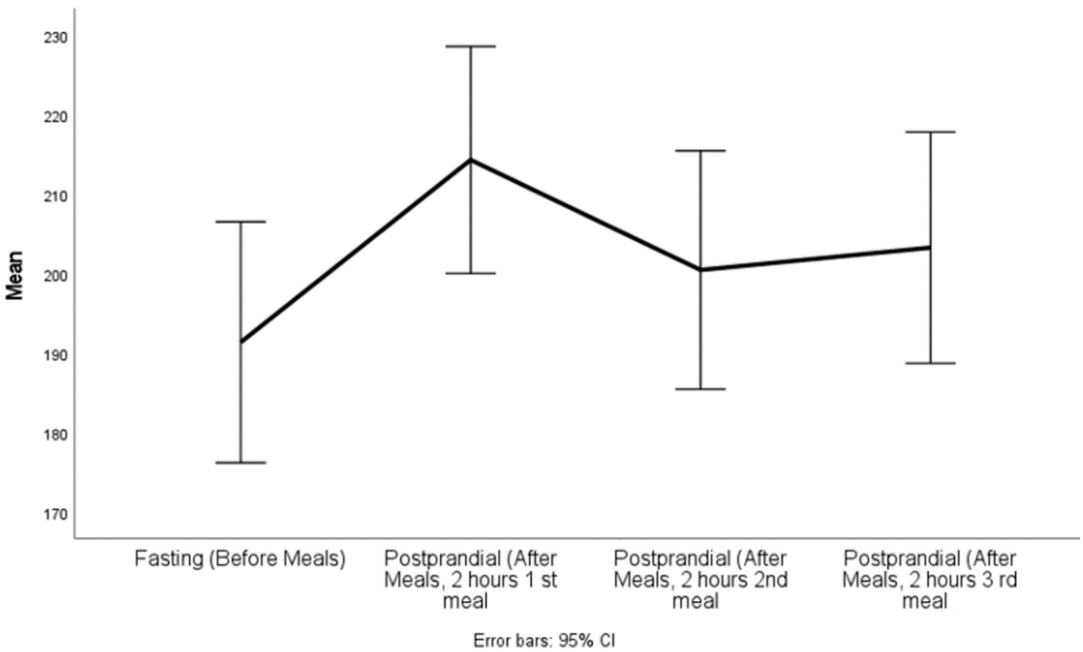

Figure 1.
Level of control of glucose across different readings per day.

Table 3.
Glucose Control Levels Across Different Readings Per Day.

Measurement	Controlled (n, %)	Uncontrolled (n, %)
Fasting (Before Meals)	44 (31.7%)	95 (68.3%)
Postprandial (2 hours after 1st meal)	59 (42.4%)	80 (57.6%)
Postprandial (2 hours after 2nd meal)	76 (54.7%)	63 (45.3%)
Postprandial (2 hours after 3rd meal)	65 (46.8%)	74 (53.2%)
Overall Control Level	42 (30.2%)	97 (69.8%)

The data collected in Table 3 demonstrates that most patients lacked blood glucose control, especially in fasting conditions, with 68.3% of patients reporting levels beyond the target range. Poor overnight glucose regulation appears to occur because patients may not have adequate insulin, eat late at night, or encounter challenges with the dawn phenomenon.

The control of postprandial glucose improved after the first meal because 42.4% of patients reached target levels, but increased to 54.7% after the second meal. Some patients demonstrate favorable outcomes when doctors adjust their insulin amounts after meals combined with daily physical activity. Control percentage diminished to 46.8% at the third meal, which implies insulin resistance or dietary elements during the evening. Among all patients, only 30.2% succeeded in sustaining optimal blood sugar levels during their entire day, yet 69.8% maintained consistently elevated glucose levels.

Table 4.
Factors Associated with Overall Glucose Control Level.

Factor		**Overall control level**				**P value**
		Controlled (n, %)		**Uncontrolled (n, %)**		
		n	%	n	%	
Sex	Female	11	20.4%	43	79.6%	0.044*
	Male	31	36.5%	54	63.5%	
Duration of Diabetes	< 20 years	15	24.6%	46	75.4%	0.062
	≥ 20 years	27	34.6%	51	65.4%	
Age Group (Years)	<60	14	38.9%	22	61.1%	0.42
	60-69	15	34.1%	29	65.9%	
	70-79	11	31.4%	24	68.6%	
	≥ 80	2	14.3%	12	85.7%	
Weight (BMI Classification)	Normal and Overweight	1	10.0%	9	90.0%	0.39
	Mild Obesity	10	33.3%	20	66.7%	
	Moderate Obesity	3	21.4%	11	78.6%	
	Extreme Obesity	28	33.7%	55	66.3%	
Income Level	Average	24	25.3%	71	74.7%	0.2
	Below Average	18	40.9%	26	59.1%	
Treatment	On Insulin	33	29.2%	80	70.8%	0.56
	On Insulin + Oral Medication	9	34.6%	17	65.4%	

The data in Table 4 demonstrates a significant link between sex and glucose control, wherein females exhibit worse management results than males (79.6% vs. 63.5%, p = 0.044). Biological elements, hormonal factors, and behavioral approaches potentially trigger divergences in diabetes care across male and female patient groups. Results indicate that patients who have lived with diabetes for longer durations tend to display better control rates (34.6%) compared to those with shorter disease durations (24.6%), although this difference was not statistically significant (p = 0.062). Longer disease durations enable patients to develop better treatment responses, or older patients demonstrate increased commitment to their medication protocol.

Glucose control measurements showed no statistical link to patient age (p = 0.42), while patients over 80 years old demonstrated the poorest control results (85.7% uncontrolled). Medical factors, including age-related metabolic changes and insulin resistance, together with difficulties managing diabetes because of comorbidities or cognitive decline, contribute to poor glucose control. Weight classification as normal or overweight revealed the lowest control rate (90% uncontrolled), while remaining statistically non-significant (p = 0.39). These unexpected results seem to indicate insulin resistance among lean diabetic patients as a primary cause of glucose regulation issues.

Patients with below-average incomes exhibited better glucose control compared to people with average incomes, although differences were not statistically significant (p = 0.2). Patients from low-income backgrounds demonstrated superior glucose control rates, possibly because they received better healthcare access alongside affordable medicines and followed recommended diets. Glucose control did not vary significantly based on whether patients received insulin alone or insulin along with oral medicine (p = 0.56). The control rates between groups matched, indicating that factors beyond medication, such as lifestyle changes and treatment adherence, influence blood glucose more effectively.

Table 5.
Logistic Regression Analysis of Factors Affecting Glucose Control.

Variable	**B**	**Sig.**	**OR**	**95% CI for OR**
			Lower	**Upper**
Sex (Female vs. Male)	1.039	0.018	2.826	1.199
Age	0.052	0.011	1.053	1.012
Income	0.672	0.104	1.958	0.870
BMI	-0.044	0.182	0.957	0.897
Duration of Disease	-0.038	0.147	0.962	0.913
Constant	-1.083	0.541	0.339	

Table 5 presents logistic regression results showing which factors drive uncontrolled glucose levels in patients. Results revealed that sex proved to be a relevant factor (p = 0.018) for showing females are 2.83 times more likely than males to experience poor glucose control (OR = 2.826, 95% CI: 1.199 - upper bound unspecified). The findings from previous research indicate biological and behavioral elements that produce worse glucose regulation in women. The analysis revealed that patient age impacts glucose control significantly ($p = 0.011$), with an increase of 5.3% in the risk of uncontrolled levels per year of age (OR = 1.053). Age-related insulin resistance, combined with reduced physical activity or increased comorbidities, leads to poorer diabetes management in older patients.

Lower-income patients showed slightly increased odds (OR = 1.958) of uncontrolled glucose levels but did not reach statistical significance ($p = 0.104$). Population data shows evidence of healthcare system disparities and medication costs, along with different dietary choices, as potential explanations for these findings. BMI, along with the duration of diabetes, failed to demonstrate statistical significance as predictors ($p = 0.182$ and $p = 0.147$). An increase in BMI leads to a minimal reduction in the likelihood of poor control, according to the negative coefficient (-0.044), yet this association did not reach statistical significance. The research demonstrates that patients with a longer duration of diabetes tended to show improved glucose management, although the influence between disease duration and control proved weak and statistically non-significant (OR = 0.962). The constant (-1.083, $p = 0.541$) reveals additional factors that influence glucose regulation and highlights the necessity for further research into lifestyle elements, healthcare aspects, and genetic influences on diabetes control.

5. Discussion

The integration of home tele-monitoring (HTM) in managing type 2 diabetes has been extensively studied, revealing its potential benefits and limitations. Our study at King Abdulaziz Medical City (KAMC) in Riyadh contributes to this growing body of research. Patients receiving home tele-monitoring services experienced elevated blood glucose levels during fasting and after eating their meals, according to the study findings. A meta-analysis from Zhu et al. [8] discovered A1C reductions amounting to 0.42% following 180-day median HTM usage. HTM therapies show promising results; however, their success levels depend significantly on how patients engage with these methods and how healthcare teams execute HTM protocols.

The research data demonstrated females displayed inferior glucose management outcomes relative to males (79.6% vs. 63.5%, $p = 0.044$). Research conducted by Lee et al. [9] revealed gender-based disparities in diabetes management results, where women typically experienced substandard outcomes. The results highlight why diabetes care requires specific interventions that focus on gender differences. The study revealed that elderly patients older than 80 years struggled most with control (85.7% uncontrolled), while patients with diabetes for 20 years experienced slightly better control. A meta-analysis by De Groot et al. [10] discovered that diabetes duration alongside patient age directly influenced glycemic control abilities, thus highlighting the necessity of age-specific diabetes management for elderly patients. The research demonstrated that extreme obesity existed at a high rate among the studied participants. Research findings demonstrate that obesity strongly causes insulin resistance, making diabetes treatment more challenging. Certain research evidence indicates that combining weight reduction treatments with HTM results in enhanced glycemic outcomes [11].

This study discovered better glucose control results from patients with lower income (40.9%) than patients with average income (25.3%), despite contrary findings in numerous research studies, which link lower socioeconomic status to subpar diabetes management due to restricted healthcare access. The study's inconsistent results seem linked to specific conditions affecting its participants. Lower-income patients benefit from individualized care services delivered through specialized healthcare programs, which improve both their adherence rates and treatment outcomes. Research across various fields has shown that lower socioeconomic status leads to unsuccessful glycemic control, as patients face restricted healthcare access and struggle with medication usage and health knowledge limitations [12].

Glucose control remained statistically similar between diabetes patients receiving insulin alone compared to those taking insulin along with oral hypoglycemic medications [13]. Research shows that combination therapy delivers benefits through different pathway interventions, but overall, insulin monotherapy and combination treatment lead to equivalent improvements in diabetes control. Research examining insulin treatment alone versus insulin combined with metformin therapy showed that both strategies led to comparable results in HbA1c control [14]. Our research data validated previous findings by Bughin et al. [15], which demonstrated a minor BMI decrease of -0.25 kg/m² among participants. A study conducted by Moreira et al. [16] demonstrated that patients who received tele-monitoring combined with nutritional counseling had better BMI outcomes (-1.3 kg/m²) versus standard monitoring. Tele-monitoring systems need to be combined with complete lifestyle management techniques to achieve their maximum impact.

The success of HTM systems relies heavily on active patient participation. The study revealed that patients experienced enhanced glycemic control when they interacted actively with tele-monitoring platforms. Research by Ferreira et al. [17] revealed that better HbA1c results came from patient-interactive tele-monitoring systems rather than automatic or manual recording methods. The systematic review by Owolabi et al. [18] highlighted that tele-monitoring programs based on behavioral coaching produced better adherence rates and health results. Research by Simblett et al. [19] revealed that passive tele-monitoring produced high participant dropout rates, which indicates that weak patient involvement might restrict program success. The need for interactive HTM solutions emerges because they promote patient engagement in healthcare processes.

The implementation of extensive telehealth systems showed better outcome results for type 2 diabetes management compared to straightforward telehealth protocols. Research indicates that combining multiple telehealth features delivers superior outcomes for diabetes management [20]. A randomized controlled trial studied the effects of a telehealth home-monitoring system that combined patient self-testing for weight, glucose, and blood pressure with general practitioner educational support to assess its impact on metabolic control and cardiovascular risks in patients with type 2 diabetes compared to typical care standards [21]. HbA1c levels were significantly lower among participants who received the HT intervention compared to the control group (estimated mean difference 0.33±0.1; P=0.001). Research found no significant variations between groups regarding body weight, blood pressure levels, and lipid profile measurements.

The duration of HTM interventions can impact their success. Research demonstrates that short-term and long-term tele-monitoring programs achieve beneficial results; yet, ongoing patient engagement and sustained support remain essential for maintaining these outcomes. Patient education and system improvement methods should continue to be implemented because they provide essential support for success. Research shows that patients who participate in extensive tele-monitoring programs demonstrate consistent improvement in their glycemic control over extended periods [22].

6. Conclusion

Home tele-monitoring functions as an essential asset in home health care for Type 2 diabetes treatment by enhancing both metabolic control and medication compliance, along with decreased hospitalization frequency. The combination of continuous monitoring through HTM enables better patient results while minimizing healthcare costs. Successful implementation of home tele-monitoring requires addressing difficulties related to technological barriers and patient interaction, alongside healthcare provider coordination. Future research needs to establish the long-term health implications of these tools and study their financial expenses while developing methods to build better compliance. HTM presents itself as a valuable digital solution for diabetes self-management and extended home-based healthcare delivery.

References

[1] International Diabetes Federation, *IDF diabetes atlas*, 9th ed. Brussels, Belgium: International Diabetes Federation, 2019.

[2] Centers for Disease Control and Prevention, "National diabetesstatistics report," 2020. https://www.cdc.gov/. [Accessed 7 August 2020]

[3] R. Huxley, F. Barzi, and M. Woodward, "Excess risk of fatal coronary heart disease associated with diabetes in men and women: Meta-analysis of 37 prospective cohort studies," *BMJ,* vol. 332, no. 7533, pp. 73-78, 2006. https://doi.org/10.1136/bmj.38678.389583.7C

[4] World Health Organization, "Telemedicine: Opportunities and developments in member states," 2020. https://www.who.int/. [Accessed 7 August 2020]

[5] G. Paré, M. Jaana, and C. Sicotte, "Systematic review of home telemonitoring for chronic diseases: The evidence base," *Journal of the American Medical Informatics Association,* vol. 14, no. 3, pp. 269-277, 2007. https://doi.org/10.1197/jamia.M2270

[6] C. Henderson *et al.*, "Cost effectiveness of telehealth for patients with long term conditions (Whole Systems Demonstrator telehealth questionnaire study): Nested economic evaluation in a pragmatic, cluster randomised controlled trial," *BMJ : British Medical Journal,* vol. 346, p. f1035, 2013. https://doi.org/10.1136/bmj.f1035

[7] A. Corbett-Nolan, J. Bullivant, M. Green, and M. Parker, *Better care for people with longterm conditions: The quality and good governance of telehealth services*. East Sussex, U.K.: Good Governance Institute, 2011.

[8] X. Zhu *et al.*, "Home telemonitoring of patients with type 2 diabetes: A meta-analysis and systematic review," *Diabetes Spectrum,* vol. 35, no. 1, pp. 118-128, 2022. https://doi.org/10.2337/ds21-0023

[9] C. S. Lee *et al.*, "Health outcomes of telemonitoring of patients with type-2 diabetes mellitus: One-year results from a randomized controlled trial (Optimizing care of Patients via Telemedicine In Monitoring and aUgmenting their control of diabetes Mellitus)," *Journal of Telemedicine and Telecare,* vol. 0, no. 0, p. 1357633X241261733, 2024. https://doi.org/10.1177/1357633x241261733

[10] J. De Groot, D. Wu, D. Flynn, D. Robertson, G. Grant, and J. Sun, "Efficacy of telemedicine on glycaemic control in patients with type 2 diabetes: A meta-analysis," *World J Diabetes,* vol. 12, no. 2, pp. 170-197, 2021. https://doi.org/10.4239/wjd.v12.i2.170

[11] T. V. Dat, V. Binh, T. M. Hoang, V. L. Tu, P. D. Luyen, and L. T. K. Anh, "The effectiveness of telemedicine in the management of type 2 diabetes: A systematic review," *SAGE Open Medicine,* vol. 12, p. 20503121241271846, 2024. https://doi.org/10.1177/20503121241271846

[12] F. Hill-Briggs *et al.*, "Social determinants of health and diabetes: A scientific review," *Diabetes Care,* vol. 44, no. 1, pp. 258-79, 2020. https://doi.org/10.2337/dci20-0053

[13] A. Goudswaard and D. M. Kendall, "Insulin monotherapy and insulin combined with oral hypoglycemic agents provide similar glycemic control/COMMENTARY," *ACP Journal Club,* vol. 142, no. 3, p. 62, 2005.

[14] S. M. Strowig, M. L. Avilés-Santa, and P. Raskin, "Comparison of insulin monotherapy and combination therapy with insulin and metformin or insulin and troglitazone in type 2 diabetes," *Diabetes Care,* vol. 25, no. 10, pp. 1691-1698, 2002. https://doi.org/10.2337/diacare.25.10.1691

[15] F. Bughin *et al.*, "Impact of a mobile telerehabilitation solution on metabolic health outcomes and rehabilitation adherence in patients with obesity: Randomized controlled trial," *JMIR Mhealth Uhealth,* vol. 9, no. 12, p. e28242, 2021. https://doi.org/10.2196/28242

[16] M. F. S. Moreira, B. E. F. de Azevedo, M. V. Beretta, and F. M. Busnello, "Nutritional counseling based on mindful eating for the eating behavior of people living with overweight and obesity: A randomized clinical trial," *Nutrients,* vol. 16, no. 24, p. 4388, 2024. https://doi.org/10.3390/nu16244388

[17] R. O. M. Ferreira *et al.*, "Continuous glucose monitoring systems in noninsulin-treated people with type 2 diabetes: A systematic review and meta-analysis of randomized controlled trials," *Diabetes Technology & Therapeutics,* vol. 26, no. 4, pp. 252-262, 2024. https://doi.org/10.1089/dia.2023.0390

[18] E. O. Owolabi, M. D. S. Boakye, S. O. Omololu, B. L. Smalls, and G. Q. Shaibi, "Technology-based interventions to promote diabetes self-management behaviors for persons newly diagnosed with type 2 diabetes: A scoping review," *Current Diabetes Reports*, vol. 24, no. 12, pp. 257-272, 2024. https://doi.org/10.1007/s11892-024-01553-3

[19] S. Simblett *et al.*, "Barriers to and facilitators of engagement with remote measurement technology for managing health: Systematic review and content analysis of findings," *Journal of Medical Internet Research,* vol. 20, no. 7, p. e10480, 2018. https://doi.org/10.2196/10480

[20] M. J. Crowley *et al.*, "Effect of a comprehensive telehealth intervention vs telemonitoring and care coordination in patients with persistently poor type 2 diabetes control: A randomized clinical trial," *JAMA Internal Medicine*, vol. 182, no. 9, pp. 943-952, 2022. https://doi.org/10.1001/jamainternmed.2022.2947

[21] A. Nicolucci, S. Cercone, A. Chiriatti, F. Muscas, and G. Gensini, "A randomized trial on home telemonitoring for the management of metabolic and cardiovascular risk in patients with type 2 diabetes," *Diabetes Technology & Therapeutics*, vol. 17, no. 8, pp. 563-570, 2015. https://doi.org/10.1089/dia.2014.0355

[22] L. Chen *et al.*, "Evaluating self-management behaviors of diabetic patients in a telehealthcare program: Longitudinal study over 18 months," *Journal of Medical Internet Research*, vol. 15, no. 12, p. e266, 2013. https://doi.org/10.2196/jmir.2699