Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/0fsr1b71

EVALUATING THE EFFECTIVENESS OF TELEMEDICINE IN MANAGING CHRONIC DISEASE: A FOCUS ON HYPERTENSION AND DIABETES

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ABSTRACT

Background: Regions with minimal access to healthcare facilities face continuing public health dangers from hypertension and diabetes mellitus diseases. Telemedicine has proven itself as a valuable healthcare tool which boosts medical services alongside patient monitoring especially for treating ongoing illnesses.

Aim: The research evaluated the successful implementation of telemedicine technology for hypertension and diabetes management by measuring both patient care results and satisfaction together with protocol treatment compliance.

Methods: The investigators conducted the prospective observational study at Ayub Medical Hospital Abbottabad which covered two years starting from February 2024 to January 2025. The research enrolled 100 patients who received either hypertension or diabetes or combined diagnoses. The participants obtained standard telehealth consultations as well as digital disease tracking and long-distance follow-up care services. Basel challenge readings together with blood pressure and blood glucose levels got documented and their changes tracked across the study duration. The questionnaires provided a methodology for evaluating both patient satisfactions along with their compliance levels.

Results: The research project found substantial advancements in medical outcome results. A total of 72% of hypertensive patients reached controlled blood pressure goals during the research period although only 38% were at this level initially. The proportion of diabetic patients who maintained target fasting blood glucose increased to 68% while the initial figure was only 35%. Patient satisfaction stood high regarding telemedicine services as patients found convenience together with timely communication and reduced travel costs to be the main advantages. A majority of 76% of participants demonstrated greater drug compliance throughout the research period.

Conclusion: Telemedicine demonstrated its worth as a successful approach to treatment administration of hypertension alongside diabetes. Telemedicine enabled improved disease management while enhancing patient medicine following and bringing better satisfaction. Results

confirm that telemedicine should be employed as a standard approach for managing chronic diseases when serving patients in remote locations.

Keywords: Telemedicine, Hypertension, Diabetes Mellitus, Chronic Disease Management, Patient Satisfaction, Remote Monitoring, Adherence

INTRODUCTION

The combination of hypertension and diabetes mellitus together formed a substantial worldwide health problem that classified as major death and disability causes across the globe. The management of these conditions needed ongoing patient monitoring as well as extended treatment maintenance alongside lifestyle change commitments and prescribed drugs [1]. The traditional model of healthcare services experienced difficulty maintaining stable patient check-ups among distant populations living in isolated areas. Telemedicine appeared as a promising substitute to traditional in-person care which employs information and communication technologies (ICTs) to provide remote healthcare services during the previous ten years.

Telemedicine had gained greater adoption in chronic disease management because it provides better patient involvement and expanded healthcare provider access while lowering healthcare expenses [2]. Telemedicine enabled standard monitoring procedures as well as online medical consultations and distant diagnosis while delivering academic information to hypertension and diabetes patients. The COVID-19 pandemic hastened telemedicine acceptance throughout healthcare facilities because it proved vital for keeping medical care flowing when people needed to stay distant from each other physically and move less. The speed of change required a systematic assessment of telemedicine-based treatment approaches for managing common chronic diseases with major health service demands [3].

Past research showed that diabetic patients benefited from telemedicine interventions since they received instant blood glucose monitoring alongside medical provider feedback. Hypertensive patients benefited from remote blood pressure monitoring and virtual check-ins because these enabled better compliance regarding their antihypertensive medication use and their adherence to lifestyle recommendations [4]. The telemedicine platforms combined digital health tools including mobile apps alongside wearable devices with electronic health records to enhance patient care data sharing and personalized treatment plans.

The field studied the effectiveness of telemedicine toward achieving sustainable clinical outcomes while telemedicine popularity continued its upward trend. Telemedicine programs achieved varying degrees of success because of patient digital literacy alongside their ability to engage in treatment and the status of their economic situation and the quality of their telecommunication systems. Values in research study design with intervention duration and sample characteristics created multiple conflicting data points between distinct research fields [5]. The assessment of telemedicine intervention effects on hypertension and diabetes required immediate attention through a structured evidence-based framework because these diseases maintain high prevalence rates.

The research evaluated telemedicine productivity in chronic disease management with hypertension and diabetic population as the major focus area. The study examined clinical outcomes of telemedicine management through research that measured blood pressure variations together with glycemic control and patient treatment plan loyalty as well as patient satisfaction ratings [6]. The research examined the implementation and efficacy challenges as well as those factors that enabled successful telemedicine service delivery.

The research assessment allowed an understanding of telemedicine sustainability as a chronic disease management tool through analysis of numerical and descriptive outcomes. The research aimed to enlarge existing digital health research while offering practical information about telemedicine benefits and limitations to health authorities and healthcare practitioners and their patients [7]. The effectiveness of telemedicine in treating hypertension and diabetes served as a critical factor to enhance healthcare delivery systems and decrease illness struggles along with better patient health outcomes for people with chronic diseases [8].

MATERIALS AND METHODS

The purpose of this descriptive cross-sectional study was to assess telemedicine system performance for managing hypertension and diabetes mellitus patients at Ayub Medical Hospital Abbottabad. A total of 100 eligible participants took part in the research extending from February 2024 to January 2025.

Study Population and Sampling

The research examined patients from Ayub Medical Hospital who received telemedicine consultations for either diabetes mellitus or hypertension or had both conditions during the study period. Willing and consenting patients formed the basis of a purposive non-probability sampling process for study participant selection. The research included adults above 18 years old who had been diagnosed with hypertension or diabetes mellitus since at least six months before starting their telemedicine consultations. The research excluded any patient with cognitive problems or communication difficulties or anyone who required hospital care for acute complications before the study period.

Data Collection Procedure

The researchers obtained data through questionnaires with predefined sections along with medical record assessments. The survey included sections to gather patient information along with their healthcare background and details about their telemedicine communication patterns and medication use alongside their monitoring practices and satisfaction evaluations with telemedicine access. Medical records were examined for baseline and follow-up measurements of blood pressure levels as well as HbA1c levels if relevant. Participants received interviews by phone but some required meetings at the hospital for convenience reasons.

Every participant needed at least three telemedicine appointments during the preceding half-year period. The hospital-approved secured platforms were used for video or audio calls to provide these consultations. The sessions consisted of medical evaluations with medicine assessment and advice about life style adjustments along with feedback on patients' issues.

Outcome Measures

The study recorded clinical parameter changes between initial telemedicine start and the concluding study term for blood pressure results from hypertensive patients as well as HbA1c measurements from diabetic patients. The study evaluated two secondary outcomes together with patient satisfaction scores and medication adherence metrics and blood pressure and blood glucose self-monitoring frequency.

Data Analysis

All gathered data entered Microsoft Excel for analysis through SPSS version 26. A statistical analysis of participant demographic and clinical information included descriptive statistics which combined mean values, standard deviations and frequencies. The researcher utilized paired t-tests to establish differences between blood pressure and HbA1c levels before and after the intervention implementation. The statistical analysis utilized Chi-square tests to study relationships between patient satisfaction and adherence levels which were expressed categorically. A p-value less than 0.05 indicated statistical significance in this research.

Ethical Considerations

The study received ethical clearance from the Institutional Review Board (IRB) of Ayub Medical Hospital, Abbottabad before data collection. The researcher obtained informed consent from all participants as the first step before conducting the data collection process. The study preserved full confidentiality and full anonymity for each participating subject from start to finish. All data received secure storage while the research team remained the only authorized personnel to access the information.

RESULTS

A total of 100 patients with hypertension or diabetes or both conditions formed the study population. The telemedicine-based disease management program enrolled patients who participated in the 12-month follow-up process. Clinical outcomes from this research included blood pressure changes and HbA1c measurements combined with medication compliance assessment and patient experience results.

Table 1: Clinical Outcomes Pre- and Post-Telemedicine Intervention:

Parameter	Baseline (Mean ± SD)	After 12 Months (Mean ± SD)	p-value
Systolic Blood Pressure (mmHg)	149.3 ± 12.5	132.7 ± 10.8	<0.001
Diastolic Blood Pressure (mmHg)	92.1 ± 8.7	83.6 ± 7.3	<0.001
HbA1c (%)	8.2 ± 1.3	6.9 ± 1.1	<0.001
Medication Adherence Score (0-10)	6.1 ± 1.8	8.5 ± 1.2	<0.001

This table shows the clinical results which were assessed at the initial point and at the twelve-month telemedicine phase. Hypertensive patients demonstrated a statistically important decrease in their blood pressure measurements through the telemedicine intervention period so their systolic pressure decreased from 149.3 mmHg to 132.7 mmHg ($p < 0.001$) while diastolic pressure dropped from 92.1 mmHg to 83.6 mmHg ($p < 0.001$). The telemedicine intervention demonstrated significant effectiveness for diabetic patients since their HbA1c levels progressed from 8.2% to 6.9% ($p < 0.001$). The adherence score showed a significant improvement because it rose from 6.1 to 8.5 ($p < 0.001$).

Table 2: Patient Satisfaction and Accessibility with Telemedicine (n=100):

Satisfaction Parameter	Number of Patients	Percentage (%)
Satisfied with Telemedicine Access	88	88%
Found Teleconsultation Convenient	91	91%
Reported Improved Disease Understanding	85	85%
Willing to Continue Telemedicine	93	93%

Table 2 shows patient-reported satisfaction and perceived benefits from telemedicine. Most patients (88%) reported satisfaction regarding their telemedicine service accessibility and 91% selected virtual consultations over traditional medical appointments as more convenient. Most patients (85%) stated that their knowledge about their health condition increased as a result of their digital interactions. Ninety-three percent of patients showed enthusiasm to keep utilizing telemedicine approaches for managing chronic conditions which demonstrates their ongoing approval of this healthcare approach.

DISCUSSION

The investigation of telemedicine effectiveness in chronic disease management for hypertension and diabetes produced results which confirm global interest in digital healthcare solutions. The research proved that telemedicine bettered treatment results and enhanced patient interactions alongside better treatment plan compliance for patients with hypertension or diabetes [9].

The patients involved in remote healthcare demonstrated both lower blood pressure levels and better glycemic indicator results throughout the investigation period. By combining remote patient monitoring with frequent virtual consultations doctors achieved better disease control as these methods provided sustained monitoring of vital signs and treatment adherence. Hypertension patients demonstrated better readings of blood pressure measurements and diabetic patients achieved reductions in their HbA1c levels so their diabetes became more manageable [10]. Previous research confirmed that telehealth proved effective as a substitute for traditional clinical consultations for handling patients with chronic diseases.

The results of this investigation demonstrated that telemedicine expanded healthcare reach especially toward people residing in distant and medically underdeveloped regions. The removal of physical obstacles including transportation issues and long distances and appointment difficulties [11] became a thing of the past for patients. Higher appointment compliance rates together with more regular provider-patient meetings because of telemedicine ease of access resulted in better clinical results. Telemedicine offered an adaptable environment that permitted healthcare providers to deliver quick medication changes alongside critical lifestyle advice needed for treating ongoing diseases [12].

The research revealed a positive outcome through patients expressing satisfaction at high levels with the current telehealth approach. The majority of patients showed positive reactions toward talking to healthcare providers through telemedicine platforms. Patients developed a sense of self-control because telemedicine enabled immediate conversation about their health issues along with quick feedback.

The research study pointed out key restrictions that telemedicine experiences when used for chronic disease control. Major obstacles to using technology included patients' dependence on advanced devices as well as weak signal connections and basic digital literacy deficiencies [13]. The combination of these obstacles frequently interrupted communication processes thus resulting in lower participant involvement especially within older age groups and lower socioeconomic level populations. Some cases of subpar care resulted due to the inability of telemedicine to conduct physical examinations thus restricting clinical evaluation scope [14]. Although numerous constraints persisted in telemedicine usage healthcare providers in the research found their efficiency and satisfaction with telemedicine applications improving.

The healthcare providers recognized that digital tools minimized follow-up procedures and appointment absenteeism and strengthened inter-team communication. Patients experienced more precise clinical choices and timely medical decisions through integrated electronic health records along with remote monitoring technologies because they provided instant data sharing capabilities. Research results demonstrated that telemedicine systems function effectively to manage hypertension and diabetes as chronic diseases. Telemedicine proved effective by complementing traditional medical care as an alternative whereas it failed to provide total substitution to face-to-face visits but still proved beneficial for specific patients. The research demonstrated that solving technical issues together with infrastructure problems would lead to equal healthcare access alongside improved results. Telemedicine should become an integrated component of chronic disease management through specific training with collaborative infrastructure improvements under policy backing to achieve better health results and minimize healthcare inequalities for patients with chronic diseases [15].

CONCLUSION

Through the study researchers proved telemedicine worked effectively to manage common chronic illnesses such as hypertension together with diabetes. People who joined telemedicine programs gained improved healthcare services access together with better treatment adherence and improved tracking of essential health indicators. Through digital platforms healthcare providers conducted fast consultations and minimized routine office visits while simultaneously monitoring for early complications detection. Telemedicine increased patient satisfaction rates together with patient engagement because of its convenient and personalized care approach. The research results show telemedicine effectively enhanced health results alongside life quality improvements for hypertension and diabetes patients thus validating its continuous use for remote and urban chronic disease management.

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