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Evaluating the Efficacy of Telemedicine in Chronic Disease Management: A Prospective Cohort Study

Dr. MK Tawde

Deparment of Patology, Government medical college, Kashmir

Corresponding Author

Dr. MK Tawde Deparment of Patology, Government medical college, Kashmir

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ABSTRACT

Background: The COVID-19 pandemic accelerated the adoption of telemedicine, offering a platform for managing chronic diseases remotely. This study evaluates the efficacy of telemedicine in improving clinical outcomes, patient satisfaction, and healthcare access for individuals with chronic conditions such as diabetes, hypertension, and heart disease.

Methods: A prospective cohort study was conducted across three healthcare centers involving 500 patients with chronic diseases. Participants were divided into telemedicine and in-person care groups and followed for 12 months. Key metrics included disease control (e.g., HbA1c for diabetes, blood pressure for hypertension), hospitalization rates, and patient-reported satisfaction.

Results: Patients in the telemedicine group showed significant improvement in disease management (mean HbA1c reduction of 1.2%, $p < 0.01$; blood pressure reduction of 12/8 mmHg, $p < 0.01$). Hospitalization rates were lower in the telemedicine group (7.4% vs. 12.3%, $p = 0.02$), and patient satisfaction scores were higher (mean score: 4.5/5 vs. 3.9/5, $p < 0.01$).

Conclusion: Telemedicine is an effective modality for chronic disease management, offering comparable or superior outcomes to traditional care in selected cases. Its integration into healthcare systems should be prioritized to improve access, outcomes, and patient satisfaction.

Keywords: Telemedicine, Chronic Disease, Diabetes, Hypertension, Remote Care.

INTRODUCTION

Chronic diseases account for a significant proportion of global morbidity and mortality, necessitating ongoing management and frequent healthcare interactions. Traditional in-person care, while effective, often faces challenges such as limited accessibility, time constraints, and patient inconvenience.

The advent of telemedicine has transformed healthcare delivery, providing a virtual alternative to in-person visits. While its utility during acute illnesses is well-documented, its efficacy in managing chronic diseases remains underexplored. This study aims to evaluate the effectiveness of telemedicine in chronic disease management by comparing it with traditional in-person care.

MATERIALS AND METHODS

Study Design:

A prospective cohort study conducted over 12 months (January 2022 to December 2023).

Study Population:
500 adult patients (aged 18–75 years) diagnosed with chronic conditions, including diabetes mellitus, hypertension, and heart disease, were enrolled. Participants were divided into two groups:

- **Telemedicine Group (n=250):** Received care via video consultations, remote monitoring, and online health platforms.
- **In-person Group (n=250):** Received conventional face-to-face consultations.

Inclusion Criteria:

- Diagnosed with one or more chronic conditions for at least one year.
- Access to internet-enabled devices for telemedicine.

Exclusion Criteria:

- Acute exacerbations requiring immediate in-person care.
- Inability to use telemedicine platforms due to cognitive or technological barriers.

Intervention and Data Collection:

- **Telemedicine Group:** Provided with home monitoring devices (e.g., glucometers, BP monitors), scheduled video consultations, and access to 24/7 online support.
- **In-person Group:** Followed standard care protocols with regular clinic visits. Clinical data (e.g., HbA1c, blood pressure, hospitalization events) and patient-reported outcomes were collected at baseline, 6 months, and 12 months.

Outcome Measures:

- **Primary outcomes:** Disease control metrics (HbA1c for diabetes, BP for hypertension) and hospitalization rates.
- **Secondary outcomes:** Patient satisfaction (measured on a 5-point Likert scale) and healthcare accessibility (measured by visit adherence).

Statistical Analysis:
Between-group comparisons were made using t-tests for continuous variables and chi-square tests for categorical variables. A p-value < 0.05 was considered statistically significant.

RESULTS

Participant Demographics:

- Mean age: 52.8 years (range: 18–75).
- Male-to-female ratio: 1.2:1.

Clinical Outcomes:

- **Diabetes Management:** Telemedicine group HbA1c reduced from 8.2% to 7.0% ($p < 0.01$); in-person group reduced from 8.1% to 7.5% ($p = 0.04$).
- **Hypertension Management:** Telemedicine group BP reduced from 145/92 mmHg to 133/84 mmHg ($p < 0.01$); in-person group reduced from 146/94 mmHg to 138/88 mmHg ($p = 0.03$).

Hospitalization Rates:

- Telemedicine: 7.4% (19/250).
- In-person: 12.3% (31/250).

Patient Satisfaction:

- Telemedicine: Mean score 4.5/5.
- In-person: Mean score 3.9/5.

Healthcare Accessibility:
Telemedicine group showed 98% adherence to scheduled visits, compared to 86% in the in-person group ($p < 0.01$).

Table 1: Clinical Outcomes in Telemedicine vs. In-person Groups

Metric	Telemedicine Group (n=250)	In-person Group (n=250)	p-value
HbA1c (Diabetes)	7.0% (from 8.2%)	7.5% (from 8.1%)	<0.01
Blood Pressure (Hypertension)	133/84 mmHg (from 145/92 mmHg)	138/88 mmHg (from 146/94 mmHg)	<0.01
Hospitalization Rates (%)	7.4%	12.3%	0.02

Table 2: Patient Satisfaction and Healthcare Accessibility

Metric	Telemedicine Group	In-person Group	p-value
Patient Satisfaction (5-point Likert scale)	4.5/5	3.9/5	<0.01
Healthcare Visit Adherence (%)	98%	86%	<0.01

DISCUSSION

This study highlights telemedicine as an effective tool for chronic disease management, with outcomes comparable to or better than traditional care.

Efficacy in Disease Management:

Patients in the telemedicine group achieved superior control of chronic conditions, likely due to enhanced patient engagement, timely feedback, and continuous monitoring. Remote devices allowed patients to monitor their health more frequently, leading to better adherence to treatment regimens.

Reduced Hospitalizations:

The lower hospitalization rates in the telemedicine group suggest that early interventions and improved disease control can prevent acute exacerbations, reducing the need for inpatient care.

Patient Satisfaction and Accessibility:

Higher satisfaction scores in the telemedicine group indicate the convenience and perceived quality of care delivered remotely. Additionally, telemedicine eliminated barriers such as travel time, making healthcare more accessible.

Limitations:

- The study relied on self-reported data for some metrics, which could introduce bias.
- Technological literacy and internet access were prerequisites, potentially excluding certain populations.
- The study did not evaluate the cost-effectiveness of telemedicine.

Future Directions:

Further research should explore long-term outcomes, cost-effectiveness, and integration of telemedicine into standard care pathways. Expanding telemedicine to underserved populations through affordable technologies should also be prioritized.

CONCLUSION

Telemedicine demonstrates significant potential in chronic disease management, offering improved clinical outcomes, reduced hospitalizations, and high patient satisfaction. Its integration into healthcare systems can enhance accessibility and quality of care, particularly for individuals with chronic conditions.

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