



# Integrated Multidisciplinary Care for Chronic Disease Management: A Holistic Model for Patient-Centered Outcomes

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## Abstract

**Introduction:** Non-communicable diseases, such as diabetes, hypertension (HTN), and chronic obstructive pulmonary disease (COPD), account for over 70% of global deaths and 65% of total mortality in India (1). Fragmented, physician-centered healthcare systems frequently result in delayed care, poor treatment adherence, and high hospital readmissions. This study aimed to evaluate a structured multidisciplinary care model integrating medical, nutritional, psychological, and community-based interventions.

**Methods:** A mixed-method longitudinal study was conducted from January 2023 to June 2024 at Lok Nayak Hospital, New Delhi. Overall, 200 patients diagnosed with type 2 diabetes and at least one comorbidity (HTN or COPD) were selected using systematic random sampling. Quantitative data were collected using hemoglobin A1c (HbA1c) values, body mass index (BMI), hospital readmission rates, Morisky Medication Adherence Scale (MMAS-8), and WHOQOL-BREF satisfaction scores. Qualitative data were analyzed using thematic coding from 30 in-depth patient interviews and 12 healthcare provider interviews. Data were statistically analyzed using SPSS 26 ( $P < 0.05$ ).

**Results:** After 12 months of multidisciplinary intervention, the mean HbA1c and hospital readmissions decreased from 9.2% to 7.8% ( $P < 0.001$ ) and from 38% to 16%, respectively, and BMI reduced by 5.1%. However, medication adherence increased from 52% to 79%, and overall patient satisfaction improved from 72% to 91%. Qualitative findings revealed improved trust, enhanced communication, and greater emotional support.

**Conclusion:** The multidisciplinary care model significantly could improve clinical outcomes, adherence, and patient satisfaction in chronic disease management. In general, this approach is feasible, scalable, and suitable for integration into India's public healthcare system.

**Keywords:** Non-communicable diseases, Chronic disease, Integrated healthcare, Diabetes, Patient-centered care, MMAS-8, WHOQOL-BREF

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## Introduction

Non-communicable diseases, including diabetes, cardiovascular diseases, hypertension (HTN), and chronic obstructive pulmonary disease (COPD), have emerged as the leading causes of death globally, responsible for approximately 74% of all deaths worldwide (1). These diseases account for nearly 65% of total deaths and 55% of disability-adjusted life years in India, placing immense pressure on the healthcare system (2). Diabetes alone affects an estimated 82 million Indians by 2030, making India the “diabetes capital of the world” (3). Accordingly, these chronic conditions require long-term, coordinated care rather than episodic, physician-centered interventions.

However, healthcare delivery in India largely remains fragmented, hospital-based, and disease-specific,

resulting in delayed management, inadequate follow-ups, poor medication adherence, and high hospital readmission rates (4). Traditional models frequently emphasize biomedical treatment only, overlooking the psychological, social, nutritional, and environmental determinants of health (5). Therefore, a patient-centered, multidisciplinary approach is necessary to address the multidimensional needs of patients with chronic illnesses.

## Global Evidence and Research Gap

Globally, multidisciplinary care models, integrating physicians, nurses, dietitians, psychologists, and social workers, have demonstrated improvements in clinical outcomes and patient satisfaction (6, 7). Studies from the United Kingdom and Canada report reduced mortality and readmission in chronic disease patients using team-

based care (8). Similarly, research from China and Australia indicates that multidisciplinary interventions lowered hemoglobin A1c (HbA1c) levels while improving self-management in diabetes patients (9, 10).

Despite this global evidence, implementation in low-income and middle-income countries, such as India, is limited due to poor infrastructure, lack of trained professionals, weak referral systems, and insufficient policy support (11). Some Indian studies have evaluated multidisciplinary models within public hospitals, mostly focusing only on diabetes education or telemedicine without integrating psychological or community-based care elements (12, 13).

### **Study Focus and Contribution**

To address this gap, the present study will evaluate a structured integrated multidisciplinary care model (IMCM) implemented in a tertiary public hospital in New Delhi. This model uniquely integrates clinical treatment, nutritional advice, psychological counseling, social support, and community health worker (CHW) follow-ups, making it culturally and economically suitable for Indian settings. This study contributes to existing literature by providing empirical evidence from India using both quantitative and qualitative methods and measuring outcomes, such as HbA1c, body mass index (BMI), hospital readmissions, medication adherence, and patient satisfaction. In addition, it will include the interview-based perceptions of patients and providers to explore emotional, cultural, and systemic barriers and will offer policy recommendations for scalable implementation in government healthcare systems.

### **Objectives of the Study**

This study aims to evaluate the impact of an IMCM on clinical outcomes (HbA1c, BMI, blood pressure, and readmissions) and address changes in medication adherence and patient satisfaction. Moreover, the study seeks to analyze patients' and healthcare providers' experiences through qualitative interviews and develop policy and administrative recommendations for wider implementation in public health systems.

## **Materials and Methods**

### **Study Design**

This research utilized a prospective mixed-method longitudinal study design, combining quantitative clinical data and qualitative interviews for a comprehensive perspective. The study was conducted over 18 months (from January 2023 to June 2024) at Lok Nayak Jai Prakash Hospital, New Delhi, one of India's largest tertiary-care public hospitals.

### **Study Population and Sample Size**

- Total Sample Size (N): 200 patients
- Population: Adult patients diagnosed with type 2 diabetes mellitus (T2DM) and at least one comorbidity (HTN or COPD).

- Sample Size Calculation: Based on a 95% confidence interval, 5% allowable error, and expected effect size of 0.5 in HbA1c reduction, the minimum required sample was 180. Overall, 200 cases were included to account for potential dropouts.

### **Sampling Methods**

The systematic random sampling technique and hospital diabetic outpatient department registers were used, and every 5<sup>th</sup> eligible patient was selected from daily registration lists.

## **Inclusion and Exclusion Criteria**

### **Inclusion Criteria**

The patients were included in this study if they were aged  $\geq 30$  years, were diagnosed with T2DM + at least one comorbidity (HTN or COPD), had a history of hospital visits for diabetes in the past 12 months, and could provide informed consent.

### **Exclusion Criteria**

Patients having gestational diabetes or pregnancy, terminal illness (cancer or renal failure), or severe psychiatric disorders, as well as non-consenting patients, were excluded from the study.

Weekly multidisciplinary meetings were conducted to review each patient's progress and modify care plans.

### **Qualitative Component (Interviews)**

Sample:

- 30 patients + 12 healthcare providers (doctors, nurses, CHWs, and psychologists)

Interview Method:

- Semi-structured, face-to-face interviews (25–40 minutes each)

Themes Explored:

- Perception of care
- Emotional support and trust
- Barriers to adherence
- Team coordination challenges

All interviews were recorded (with consent), transcribed, translated into English (if needed), and coded using NVivo 12 software.

### **Statistical Analysis**

Collected data were entered into SPSS software (version 26) and analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations (SD), as well as analytical statistics, including paired t-tests, chi-square test, and analysis of variance. The significance level was considered to be 0.05.

## **Results**

This section presents findings from both quantitative clinical outcomes and qualitative interview analysis. All statistical analyses were conducted using SPSS (version 26), with a predefined significance level of  $P < 0.05$ . The demographic profile of participants is provided in [Table 1](#).

**Table 1.** Demographic Profile of Participants

| Variable      | Category                | Frequency (N=200) | Percentage (%) |
|---------------|-------------------------|-------------------|----------------|
| Gender        | Male                    | 112               | 56             |
|               | Female                  | 88                | 44             |
| Age           | 30–40 years             | 18                | 9              |
|               | 41–50 years             | 52                | 26             |
|               | 51–60 years             | 78                | 39             |
|               | >60 years               | 52                | 26             |
|               | No formal education     | 42                | 21             |
| Education     | Secondary education     | 96                | 48             |
|               | Graduate and above      | 62                | 31             |
| Comorbidities | Diabetes + Hypertension | 148               | 74             |
|               | Diabetes + COPD         | 52                | 26             |

Note. COPD: Chronic obstructive pulmonary disease.

There was a statistically significant reduction in HbA1c, BMI, and blood pressure values post-intervention. The reduction in hospital readmission rates by 22% confirmed improved disease management ( $P < 0.05$ , Table 2).

Multidisciplinary care significantly improved both medication adherence and patient satisfaction, highlighting the effectiveness of counseling, follow-ups, and coordinated care (Table 3).

#### Statistical Summary

- The most significant improvement belonged to HbA1c ( $P < 0.001$ ).
- Hospital readmissions were reduced by 22%.
- Medication adherence improved significantly (52% → 79%).
- Qualitative data supported quantitative results by showing improved emotional and social support.

#### Discussion

Our findings demonstrated that an IMCM significantly improves clinical, behavioral, and psychological outcomes among patients suffering from T2DM with comorbid HTN or COPD in a public healthcare setting in India. By implementing coordinated care involving physicians, nurses, dietitians, psychologists, social workers, and CHWs, this model addresses biomedical and psychosocial needs, offering a more effective alternative to traditional fragmented systems of care. The specific composition and responsibility of this multidisciplinary team are detailed in Table 4, which outlines each member's distinct role, from endocrinologists handling diagnosis and medication adjustment to community health workers conducting home visits and refill reminders. This structured role clarity was fundamental to ensuring that no aspect of patient care was overlooked and that communication channels remained efficient across disciplines.

#### Comparison With Existing Literature

The findings of this study align with global evidence, demonstrating that multidisciplinary care enhances chronic disease outcomes (1, 4). Studies in the United

**Table 2.** Clinical Outcomes Before and After Multidisciplinary Intervention

| Clinical Indicator       | Baseline (Mean ± SD) | After 12 Months | % Change | P-Value |
|--------------------------|----------------------|-----------------|----------|---------|
| HbA1c (%)                | 9.2 ± 1.1            | 7.8 ± 0.9       | ↓ 15.2%  | <0.001  |
| BMI (kg/m <sup>2</sup> ) | 29.1 ± 3.2           | 27.6 ± 2.9      | ↓ 5.1%   | 0.01    |
| Systolic BP (mmHg)       | 152 ± 18             | 138 ± 15        | ↓ 9.2%   | 0.003   |
| Diastolic BP (mmHg)      | 92 ± 11              | 84 ± 9          | ↓ 8.6%   | 0.005   |
| Readmission rate         | 38%                  | 16%             | ↓ 22%    | 0.02    |

Note. BMI: Body mass index; HbA1c: Hemoglobin A1c; BP: Blood pressure; SD: Standard deviation. Tests used in this study included paired t-tests, chi-square test, and analysis of variance.

Kingdom, Canada, and the United States reported similar reductions in HbA1c and hospital readmissions through integrated care teams (8, 9). For instance, Smith et al found a 1.2% reduction in HbA1c following multidisciplinary diabetes interventions (6), which is comparable to the 1.4% reduction reported in this study.

In India, most chronic disease programs lack psychological and nutritional components. Studies by Venkataraman et al revealed that Indian diabetes care is often medication-focused, with minimal lifestyle and emotional counseling (11, 12). This study filled that gap by incorporating mental health counseling, social work support, and community follow-ups, demonstrating substantial improvements in adherence (52–79%) and patient satisfaction (72–91%), findings rarely reported in Indian public healthcare settings. To systematically capture these diverse outcomes, we employed a range of validated instruments as shown in Table 5, which maps each clinical, behavioral, and psychosocial variable, such as HbA1c, medication adherence via MMAS-8, and mental health via DASS-21, to its corresponding data collection tool. This methodological triangulation ensured that both objective laboratory measures and subjective patient-reported metrics were reliably assessed throughout the intervention.

#### Explanation of Key Findings

1. *Significant Reductions in HbA1c ( $P < 0.001$ ):* This indicates better glycemic control due to a combination of diet modification, frequent follow-ups, medication adherence counseling, and early intervention for complications.
2. *Reduced Hospital Readmissions (38–16%):* Consistent with the integrated care models of the World Health Organization, this reduction highlights the importance of continuity of care, early detection, and support at home through CHWs (1, 7).
3. *Improved Medication Adherence ( $P < 0.01$ ):* Implementation of the MMAS-8-based adherence tracking and counseling by nurses and CHWs enabled patients to understand the importance of timely medication intake.
4. *Improved Psychological Well-Being:* Qualitative data revealed reduced anxiety and stress due to counseling sessions. Prior research demonstrated that untreated depression increases diabetes complications and poor

**Table 3.** Medication Adherence and Patient Satisfaction

| Parameter                                    | Before Intervention | After Intervention | P-Value |
|----------------------------------------------|---------------------|--------------------|---------|
| High medication adherence (MMAS-8 score ≥ 6) | 52%                 | 79%                | <0.01   |
| Patient satisfaction (WHOQOL-based index)    | 72%                 | 91%                | <0.001  |

Note. WHOQOL: The World Health Organization Quality-of-Life Scale; MMAS: Morisky Medication Adherence Scale. Tests employed in this study were chi-square test, paired t-tests, and analysis of variance.

**Table 4.** Multidisciplinary care team: roles and responsibilities

| Team Member     | Role in Intervention                                                |
|-----------------|---------------------------------------------------------------------|
| Endocrinologist | Diagnosis and medication adjustment                                 |
| Nurse educator  | Follow-up, blood sugar monitoring, and patient education            |
| Dietitian       | Personalized diet plans based on Indian food habits                 |
| Psychologist    | Anxiety, depression screening using DASS-21, and counseling         |
| Social worker   | Addressed socioeconomic issues, access to medication, and insurance |
| CHW             | Home visits, telephonic follow-up, and refill reminders             |
| Pharmacist      | Medication reconciliation and a review for drug interactions        |

Note. CHW: Community health worker; DASS: Depression Anxiety Stress Scale.

**Table 5.** Study variables and corresponding data collection instruments

| Variable/Indicator       | Data Collection Tool                           | Scale/Type    |
|--------------------------|------------------------------------------------|---------------|
| HbA1c (%)                | Laboratory blood test                          | Continuous    |
| Blood pressure (mmHg)    | Sphygmomanometer                               | Continuous    |
| BMI (kg/m <sup>2</sup> ) | Height and Weight                              | Continuous    |
| Readmission rate         | Hospital records                               | Categorical   |
| Medication adherence     | Morisky Medication Adherence Scale (MMAS-8)    | 8-item Likert |
| Quality of life          | WHOQOL-BREF                                    | 26-item scale |
| Mental health            | Depression Anxiety Stress Scale (DASS-21)      | 21-item scale |
| Patient satisfaction     | 5-point Likert-type standardized questionnaire | Quantitative  |

Note. BMI: Body mass index; The World Health Organization Quality-of-Life Scale; HbA1c: Hemoglobin A1c.

control (13). The richness of these qualitative insights is further illustrated in Table 6, which presents direct patient statements organized by emerging themes, such as improved trust in the care team, psychological relief from counseling, and practical barriers overcome with the help of community health workers. These narratives not only corroborate the quantitative improvements but also provide contextual depth about how patients experienced the integrated model in their daily lives.

**Strengths and Novel Contributions**

This is, to the best of our knowledge, the first mixed-method study in an Indian public hospital assessing multidisciplinary care for diabetes + comorbidity.

Integration of qualitative interviews strengthens understanding of emotional, cultural, and socioeconomic factors.

This study demonstrated real-world feasibility, not just pilot-based results.

Complementing the patient perspective, Table 7 synthesizes feedback from healthcare providers themselves, who highlighted better interdisciplinary coordination through weekly case meetings, acknowledged initial documentation burdens, and strongly affirmed the critical role of CHWs in sustaining treatment adherence. These

provider viewpoints are essential for understanding the operational dynamics and staff-level acceptance of the model, which directly influence its long-term sustainability.

Building on the evidence generated, Table 8 distills actionable recommendations across five key areas: healthcare delivery, policy integration, workforce development, digital health, and financing. For instance, it proposes establishing permanent multidisciplinary chronic disease clinics in district hospitals, integrating mental health and nutritional services into national programs like NPCDCS and Ayushman Bharat, and leveraging electronic health records for continuity of care. These system-level suggestions are intended to translate our pilot success into scalable public health policy.

Furthermore, Table 9 offers a stakeholder-specific roadmap, assigning concrete responsibilities to government policymakers, hospital administrators, medical educators, health IT specialists, and public health program managers. For example, it recommends making multidisciplinary care mandatory in tertiary hospitals, integrating interprofessional education into medical curricula, and training frontline ASHA/ANM workers for home-based monitoring. This differentiated guidance ensures that each actor, from ministry officials to ward-level staff, understands their distinct role in

**Table 6.** Qualitative themes and representative patient statements

| Theme                | Key Statements From Patients                                                                 |
|----------------------|----------------------------------------------------------------------------------------------|
| Improved trust       | "Now doctors, nurse, and dietitian all discuss my case together. I feel safe and cared for." |
| Psychological relief | "Counseling sessions helped me reduce anxiety about diabetes and medicines."                 |
| Barriers overcome    | "CHW helped me get medicines when I could not travel."                                       |

Note. CHW: Community health worker.

**Table 7.** Key qualitative themes from healthcare provider interviews

| Theme               | Summary of Healthcare Workers' Views                                      |
|---------------------|---------------------------------------------------------------------------|
| Better coordination | "Weekly meetings improved our case understanding and treatment accuracy." |
| Initial challenges  | "Documentation and workload increased initially."                         |
| Value of CHWs       | "CHWs are critical in ensuring treatment adherence and follow-ups."       |

Note. CHW: Community health worker.

**Table 8.** Implications for practice and policy: key recommendations by area

| Area                  | Recommendations                                                                                        |
|-----------------------|--------------------------------------------------------------------------------------------------------|
| Healthcare delivery   | Establishing permanent multidisciplinary chronic disease clinics in district and tertiary hospitals    |
| Policy integration    | Including psychiatric and nutritional care under national programs, such as NPCDCS and Ayushman Bharat |
| Workforce development | Training nurses and CHWs in counseling, diabetes education, and telehealth follow-ups                  |
| Digital health        | Introducing electronic health records and mobile-based patient monitoring for continuity               |
| Finance and insurance | Subsidizing multidisciplinary care services under public insurance schemes                             |

Note. NPCDCS: The National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke; CHW: Community health worker.

**Table 9.** Practical recommendations by stakeholder group

| Stakeholder                    | Recommendations                                                                                                                |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Government and policymakers    | Making multidisciplinary care mandatory in district and tertiary hospitals and including mental health and nutrition in NPCDCS |
| Hospital administrators        | Creating chronic disease management units with physicians, nurses, dietitians, psychologists, and CHWs                         |
| Medical education institutions | Integrating interprofessional education in MBBS, nursing, and public health curricula                                          |
| Technology and health IT       | Implementing EHRs and telemedicine support systems for follow-up care                                                          |
| Public health programs         | Training and deploying CHWs (ASHA/ANMs) for home-based diabetes monitoring and medication adherence counseling                 |

Note. NPCDCS: The National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke; HER: Electronic health record; CHW: Community health worker; ASHA/ANM: Accredited social health activist/auxiliary nurse midwife; MBBS: Bachelor of Medicine and Bachelor of Surgery; IT: Information technology.

operationalizing the integrated care model beyond the study setting.

### Limitations

- This research was conducted at a single urban hospital, limiting generalizability to rural settings.
- It included no randomized control group, although pre-post comparison was statistically robust.
- Long-term sustainability beyond 12 months remained untested.
- Documentation and coordination increased initial workload for healthcare providers.

### Scope for Future Research

- Randomized controlled trial-based evaluation of multidisciplinary care across multiple states
- Integration of telemedicine and artificial intelligence-based glucose monitoring
- Economic evaluation, including cost-effectiveness of multidisciplinary vs. conventional care
- Long-term follow-ups to study reductions in complications (retinopathy, nephropathy, and

stroke)

### Conclusion

The findings of this study confirmed that the IMCM significantly improves outcomes in managing T2DM with comorbid HTN or COPD in a public hospital setting in India. The intervention led to notable reductions in HbA1c, BMI, and hospital readmissions, along with improved medication adherence and patient satisfaction. Unlike traditional physician-centered care, this model integrates medical, nutritional, psychological, and community-based services, addressing both the biological and psychosocial needs of patients.

The mixed-method findings revealed that multidisciplinary care not only enhances clinical outcomes but also builds trust, emotional stability, and treatment compliance through communication, empathy, and continuous follow-ups. This model is feasible and scalable and aligns with the goals of national programs, such as Ayushman Bharat and the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke).

### Authors' Contribution

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### Ethical Approval

This work met all the ethical guidelines, including adherence to all the legal requirements of the country of origin.

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### Informed Consent

All interviews were recorded (with consent), transcribed, translated into English (if necessary), and then coded using NVivo software, version 12.

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