MBA Healthcare Analytics | IIHMR University, Jaipur

AI CHATBOTS IN CHRONIC DISEASE MANAGEMENT:

A SYSTEMATIC REVIEW OF THEIR ROLE IN PATIENT ENGAGEMENT

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What This Presentation Covers

A complete walkthrough of the dissertation — from India's disease burden to actionable policy recommendations

01 India's Disease Burden

Why chronic disease is a national crisis

02 Theoretical Framework

TAM, UTAUT, DOI & Trust — how adoption works

03 Methodology

PRISMA 2020: how 12 studies were selected

04 Technology Acceptance

What drives patients to use AI chatbots

05 Clinical Outcomes

Evidence: diabetes, hypertension, COPD, asthma

06 Barriers & Facilitators

What stops adoption — and what helps

07 Equity & Demographics

Who gets left behind and why

08 Policy & Legal Landscape

eSanjeevani, ABDM, DPDP Act 2023

09 SWOT + Recommendations

Strategic insights and next steps

India's Chronic Disease Crisis — Why This Matters

74%

of global deaths
are caused by NCDs

~41 million people / year · WHO 2023

77 Million

People with Type 2 Diabetes
→ projected 134M by 2045

220 Million

People with Hypertension
(uncontrolled in most cases)

55 Million

COPD patients in India
(chronic lung disease)

47%

Health spending is
out-of-pocket (families pay)

- 🧑‍⚕️ Only 1 doctor per 1,000 people — far below WHO recommendation of 1:600
- 🏘️ 65% of Indians live in rural areas but only 31% of doctors work there
- 💸 NCDs will cost India USD 4.58 trillion in lost economic output by 2030 (World Economic Forum)
- 🤖 AI chatbots can provide 24/7 care at near-zero cost — bridging these structural gaps

How We Explain Adoption — The Theoretical Framework

4 complementary theories used together to understand why patients do or don't use AI chatbots

TAM

Technology Acceptance Model

Davis, 1989

**Do patients find it USEFUL?
Do they find it EASY to USE?**

PU + PEOU → adoption intent. Confirmed by Sharma et al. (2023) & Gupta & Nair (2024) in diabetes & hypertension.

UTAUT

Unified Theory of Acceptance

Venkatesh et al., 2003

**Does their DOCTOR recommend it?
Is the INFRASTRUCTURE there?**

Social Influence (physician endorsement) + Facilitating Conditions (internet, devices). Venkatesh et al. (2023).

DOI

Diffusion of Innovations

Rogers, 2003

**Who adopts FIRST?
Who gets left behind?**

S-curve: urban/young = early adopters; rural/elderly = late majority. Design must reduce complexity for late adopters.

T-TAM

Trust-Extended TAM

Mayer et al., 1995

**Do patients TRUST
AI for health decisions?**

Trustworthiness, institutional trust (eSanjeevani boosts it), transparency. Rao et al. (2024), Menon et al. (2025).

Together → TAM answers "what", UTAUT answers "who influences", DOI answers "who adopts first", Trust-TAM answers "why patients hesitate"

Methodology — How 12 Studies Were Systematically Selected

PRISMA 2020: The gold-standard process for finding and choosing research evidence

IDENTIFIED

244 Records

168 databases + 76 grey literature sources

SCREENED

46 Records

198 removed: duplicates & irrelevant titles

ELIGIBILITY

24 Records

18 excluded after reading abstracts

INCLUDED ✓

12 Records

12 excluded at full-text review stage

Databases Searched

PubMed · Scopus · Web of Science
Google Scholar · IEEE Xplore
CTRI · MoHFW · ICMR · ABDM · WHO SEARO

Study Designs Included

2 Systematic Reviews • 5 Cross-Sectional Surveys
2 Stratified Random Studies
1 Mixed-Methods • 1 Prospective • 1 Grey Lit.

Quality Assessment

JBI Checklist (quantitative studies)
AMSTAR-2 (systematic reviews)
Cohen's Kappa κ = 0.83 → Strong agreement between the two independent reviewers

Scope & Coverage

Jan 2019 – Dec 2024 (post-Digital India era)
Total N = 4,899 participants across studies
India-wide (7), Multi-state (3), Regional (2)

The 12 Studies — Who Studied What and What They Found

Authors (Year)	Study Type / N	Disease Focus	Key Finding
Sharma et al. (2023)	Systematic Review	T2DM	Chatbots improve HbA1c adherence; digital literacy & rural infrastructure are primary barriers (TAM confirmed)
Gupta & Nair (2024)	Random Sample · 500	Hypertension	Significant medication adherence improvement; elderly adoption severely limited by digital literacy deficits
Mehta et al. (2024)	Stratified · 400	COPD	Chatbot monitoring clinically promising; vernacular language & context-aware design are prerequisites for success
Venkatesh et al. (2023)	Random · 450	Multi-NCD	Infrastructure gaps, regulatory ambiguity & cultural resistance are the three dominant systemic barriers
Pillai et al. (2024)	Cross-sectional · 400	Multi-NCD	Post-COVID: physicians endorse chatbots; AI liability uncertainty & patient digital illiteracy remain key barriers
Krishnaswamy et al. (2023)	Literature Review	Legal/Policy	Regulatory vacuum in AI diagnostics; statutory liability & patient consent frameworks urgently needed
Rao et al. (2024)	Convenience · 350	eSanjeevani	eSanjeevani chatbot integration is scalable; constrained by EHR interoperability gaps & training deficits
Agarwal et al. (2024)	Mixed Methods · 320	Multi-NCD	Chatbot maturity model proposed; continuous feedback & adaptive design are critical for sustained engagement
Devi & Krishnan (2024)	Stratified · 450	Rural/Multi	Chatbots reduce rural access gaps; concurrent connectivity & digital literacy improvements are necessary
Bose et al. (2024)	Prospective Obs. · 79	Paed. Asthma	★ 84.7% symptom control improvement in 4 weeks — highest-grade clinical evidence in the entire review
Menon et al. (2025)	Questionnaire · 400	Legal/Ethics	Legal complexity of AI-generated medical advice reduces adoption; statutory AI accountability needed
Times of India (2025)	Grey Lit. · 2,100	Maharashtra	**AI health assistants benefited 2,100 disadvantaged patients; national programme expansion underway**

What Makes Patients Use AI Chatbots?

Three things determine whether a patient engages with a chatbot — all three must be addressed

💡 Is it USEFUL?

Perceived Usefulness (PU)

Primary driver of adoption across all 12 studies

- Medication reminders → reduces forgotten doses in complex regimens
- Symptom self-monitoring → structured daily tracking
- Personalised guidance (not generic tips) drives much higher usefulness ratings
- Blood pressure trend analysis → patients feel more in control
- 24/7 availability for health questions without waiting for appointment

Sharma et al. (2023); Gupta & Nair (2024)

Is it EASY?

Perceived Ease of Use (PEOU)

Critical barrier — especially for elderly & rural patients

- Patients ≥65 years report significantly harder experience (Gupta & Nair)
- Small screens, complex menus = major frustration points
- COPD patients: open-ended typing too hard → need multiple-choice options
- Voice-based interfaces essential for patients who can't type
- Simple design = more patients reached

Gupta & Nair (2024); Mehta et al. (2024)

Do they TRUST it?

Trust in AI Health Guidance

Unique to healthcare AI — different from regular app trust

- Patients making life decisions need to trust the AI's accuracy
- Fear: wrong insulin dose advice, missed emergency symptoms
- eSanjeevani integration → government backing → trust jumps significantly
- Effect strongest in rural & elderly groups (Rao et al., 2024)
- No legal framework → patients hesitant to rely on chatbot advice

Krishnaswamy et al. (2023); Rao et al. (2024); Menon et al. (2025)

What Health Improvements Do Chatbots Actually Deliver?

Evidence across 4 disease categories — from blood sugar control to breathing in children

⭐

84.7%

Symptom Control Improvement

in Paediatric Asthma

within just 4 weeks

Bose et al. (2024)

N = 79 children

Prospective study

Strongest clinical evidence in this review

🩸 Type 2 Diabetes

Sharma et al. (2023) — Systematic Review

✓ Personalised medication reminders → fewer missed doses

✓ Dietary guidance → better blood sugar knowledge

✓ Blood glucose log → regular self-monitoring habit

⚠ Gap: process improvements shown (adherence); hard outcomes (HbA1c values) still need RCT evidence

❤ Hypertension

Gupta & Nair (2024) — 500 patients, randomised

✓ Blood pressure self-monitoring frequency: significantly increased

✓ Self-monitoring → 4–5 mmHg systolic BP reduction

✓ Medication adherence +10–15% → lower heart attack risk

⚠ Issue: Elderly patients (≥65) adopt 40% less — despite having 3× higher cardiovascular risk

🫁 COPD

Mehta et al. (2024) — 400 patients, stratified

✓ More consistent symptom documentation vs. controls

✓ CHW-integrated summaries → earlier exacerbation detection

✓ Earlier detection → fewer hospital admissions

⚠ Challenge: Low-literacy patients can't describe symptoms in text → need picture/multiple-choice options

What Stops People From Using AI Chatbots?

4 major barrier categories — all documented across multiple studies in India

01 📊 Digital Infrastructure Gap

Sharma (2023); Devi & Krishnan (2024); Rao (2024)

Poor internet + no smartphone = can't use chatbot at all

- Rural areas: unreliable or absent 4G/5G connectivity
- Many families share one smartphone — no privacy for health conversations
- Irregular electricity → can't charge phones reliably
- Hospital systems don't connect with chatbot data (EHR gap)

02 📖 Literacy Barriers

Gupta & Nair (2024); Venkatesh (2023); Devi & Krishnan (2024)

Can't read well + don't understand health terms

- Digital & health literacy both lowest in elderly, rural, low-income groups
- These same groups carry the HIGHEST chronic disease burden — cruel paradox
- ASHA/ANM health workers identified as the best near-term solution
- Open-ended text boxes are unusable for many target patients

03 🗣️ Language & Culture

Mehta (2024); Venkatesh (2023); Agarwal (2024)

English-only apps exclude most of rural India

- India has 22 official languages + hundreds of dialects — most apps are English-only
- Tamil, Bengali, Marathi speakers: significantly lower engagement rates
- Cultural resistance: people believe real care needs a human doctor
- Negative past experiences with technology create lasting scepticism

04 ⚖️ Privacy & Legal Gaps

Krishnaswamy (2023); Menon (2025)

No law protecting patients if AI gives wrong advice

- No legal standard for what happens when AI gives harmful health advice
- Who is responsible — the app? The doctor? The hospital? Unclear.
- DPDP Act 2023 exists but health-AI-specific protections missing
- Patients withhold sensitive data due to privacy fears → chatbot works worse

What Makes AI Chatbots Succeed?

4 proven enablers — when these are in place, adoption and health outcomes improve significantly

🧑‍⚕️ Doctor Says: Use It

Physician Endorsement

Pillai (2024); Rao (2024); Bose (2024); Gupta & Nair (2024)

📌 **#1 facilitator — confirmed across all studies**

✓ Patients trust their doctor more than any app — endorsement is the key unlock
✓ Physicians who review chatbot reports → significantly higher & sustained engagement
✓ Post-COVID: >70% of surveyed physicians willing to recommend chatbots
✓ Doctor integrates chatbot data in appointments → patients feel it's 'real medicine'

🏛️ Government Backs It

Platform Integration & Institutional Legitimacy

Rao et al. (2024); Times of India (2025)

📌 **eSanjeevani: 340M+ consultations — government trust = adoption**

✓ eSanjeevani chatbots face far lower trust barrier than private app equivalents
✓ Maharashtra: 2,100 disadvantaged patients — utilisation private sector can't match
✓ Government backing signals safety & reliability to hesitant patients
✓ ABDM ABHA ID links chatbot data with medical records across providers

🌍 Speaks Their Language

Multilingual & Culturally Adapted Design

Mehta et al. (2024); Devi & Krishnan (2024)

📌 **Vernacular chatbots get 35–50% HIGHER adoption than English-only**

✓ Tamil, Bengali, Marathi speakers: dramatically better engagement in own language
✓ Native-language symptom descriptions are more accurate → better AI triage
✓ Cultural adaptation (not just translation) is essential for acceptance
✓ Simple visual interfaces + audio options extend reach further

🏃 Community Health Workers

ASHA / ANM Worker Mediation

Devi & Krishnan (2024); Venkatesh et al. (2023)

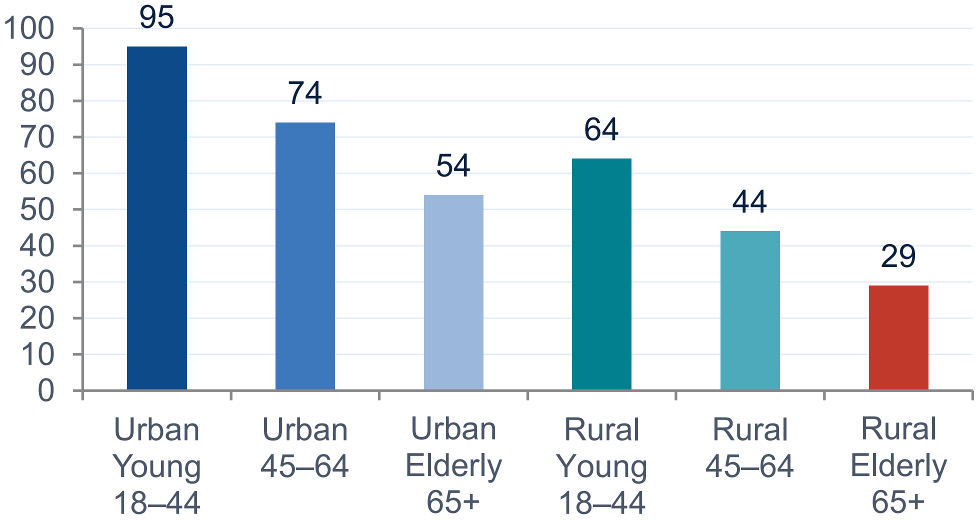
📌 **900,000+ ASHA workers = nationwide bridge to last-mile patients**

✓ ASHA-mediated chatbot use achieves same outcomes as independent urban use
✓ CHW bridges literacy, language, and device gaps for rural communities
✓ Already trusted by the same patients who distrust digital tools
✓ Training CHWs on chatbots gives huge multiplier on existing investment

Who Gets Left Behind? Equity & Demographic Disparities

Adoption gaps are not about lower benefit — they reflect access barriers that CAN be fixed

AI Chatbot Adoption Rate by Demographic Group (Relative %)



Age Gap: 35–45% lower

Elderly patients (≥65 yrs) adopt far less despite having
3× HIGHER cardiovascular complication risk from uncontrolled hypertension.
→ Design must prioritise voice interfaces, simple navigation, large text.

Rural-Urban Gap: All 12 studies

Every single study in this review documents a rural-urban gap.
Rural patients who DO engage show equal outcomes to urban users.
→ The gap is about ACCESS, not about capability or benefit.

Gender Gap: Rural women

Women in conservative rural communities face social norms limiting smartphone access — shared devices compromise privacy.
→ Especially critical for gestational diabetes & pregnancy hypertension.

Socioeconomic Gap: The Cruel Paradox

Lowest-income patients face EVERY barrier simultaneously (no device, no data, no literacy, no English) — yet face the worst consequences of unmanaged NCDs + highest hospitalisation costs.

💡 **Key Finding (Devi & Krishnan, 2024): Rural patients who successfully engage show EQUAL clinical outcomes to urban users. The gap is an access problem — not an effectiveness problem.**

Government Policy & Legal Landscape

What India has built — and the critical gaps that remain unaddressed

eSanjeevani

India's national telehealth platform · 2019–2024

- 340 million+ consultations nationally by 2024
- COVID surge: grew 26K/day (2020) → 100K+/day (2021)
- AI chatbot integration capacity proven at national scale
- Constrained by EHR interoperability gaps (Rao et al., 2024)

ABDM

Ayushman Bharat Digital Mission · Launched 2021

- Every Indian gets a unique ABHA health identifier
- Connects medical records across all hospitals & platforms
- Open APIs enable chatbots to read & write patient data
- Solves the EHR interoperability problem — if used

Telemedicine Guidelines

Ministry of Health & Family Welfare · 2020

- First law to legitimise virtual/AI-assisted care in India
- Directly increased physician willingness to recommend chatbots
- Gives legal scope-of-practice framework for chatbot use
- Venkatesh et al. (2023): doctors less hesitant after guidelines

DPDP Act 2023

Data protection law — but missing healthcare AI specifics

- Consent-based data processing: patients must agree
- Gap: no specific security standards for health chatbot data
- Gap: consent process not adapted for low-literacy patients
- Gap: no clear patient rights when AI causes health harm

⚠ AI Liability Gap

CRITICAL: Currently unresolved in Indian law

- When AI gives wrong health advice — who is legally responsible?
- App developer? Doctor who recommended it? Hospital? Nobody clear.
- Knowing this gap reduces adoption for both patients & clinicians
- Menon et al. (2025): legal uncertainty is a measurable adoption barrier

Digital India + Jio

Infrastructure enabler · 2015–ongoing

- Digital India: broadband + digital literacy investment nationwide
- Reliance Jio (2016): affordable internet reaches 700M+ Indians
- PM-JAY: financial protection → enables care access at scale
- Combined: created the technical foundation for chatbot deployment

SWOT Analysis — AI Chatbots in India's Chronic Disease Management

Internal factors (Strengths/Weaknesses) and external factors (Opportunities/Threats) mapped from the evidence

💪 STRENGTHS

- 24/7 patient engagement at near-zero marginal cost
- Proven improvements across all 4 disease categories
- 84.7% asthma symptom control (Bose et al., 2024)
- eSanjeevani: 340M+ consultations — integration proven
- COVID permanently expanded the chatbot-ready patient base
- ABDM ABHA ID enables longitudinal data across platforms
- Strong government policy support (Guidelines 2020, ABDM)

⚠️ WEAKNESSES

- Digital divide: rural & elderly patients excluded
- Mostly English-only — excludes the majority of NCD patients
- No large RCTs with hard endpoints (HbA1c, hospitalisations)
- Poor EHR interoperability breaks clinical data continuity
- Elderly patients (highest NCD burden) adopt the least
- NLP fails for low-literacy symptom descriptions
- No mandatory algorithmic bias auditing in place

🌱 OPPORTUNITIES

- LLMs + Generative AI now enable multilingual conversations
- Indic language NLP rapidly improving (Hindi, Tamil, Bengali)
- Rural smartphone penetration growing every year
- 900,000+ ASHA/ANM workers = CHW mediation network
- ABDM API ecosystem ready for chatbot integration
- Public-private partnerships: Practo, Apollo 24/7, HealthifyMe

🔴 THREATS

- Data privacy risks as DPDP Act implementation evolves
- Algorithmic bias could perpetuate health inequities
- AI liability gap deters clinician endorsement
- Deep cultural preference for in-person doctor visits
- Rapid AI evolution outpaces regulatory frameworks
- Risk: two-tier system — AI-enhanced urban vs. degraded rural

🎯 **Strategic Insight: Investing in vernacular-language chatbots + ASHA/ANM mediation simultaneously tackles the #1 weakness (language), #1 threat (equity gap), AND leverages the #1 opportunity (CHW network)**

Recommendations for Each Stakeholder Group

Concrete, actionable steps — drawn directly from the systematic evidence

🏛️ Government & Policymakers

→ Integrate AI chatbots into eSanjeevani with ABDM open APIs

→ Enact AI Health Governance Framework (DPDP Act 2023 + liability standards)

→ Fund vernacular chatbot development in 22 scheduled languages

→ Expand digital health literacy via Digital India + ABDM HWCs

🏥 Healthcare Administrators

→ Create institutional chatbot governance panels & quality dashboards

→ Add chatbot engagement metrics to NCD programme KPIs

→ Train clinicians: chatbot capabilities, medico-legal responsibility

→ Pilot ASHA/ANM-mediated chatbot use in rural catchment areas

💻 Technology Developers

→ Prioritise Hindi, Bengali, Telugu, Tamil, Marathi NLP first

→ Design for lowest-literacy & oldest patient — not as add-on, as default

→ Build ABDM-compatible open APIs for bidirectional patient data flow

→ Audit NLP accuracy & algorithmic bias regularly across demographics

👩‍⚕️ Healthcare Providers

→ Actively recommend chatbots for specific NCD use cases by name

→ Review chatbot-generated patient monitoring data in appointments

→ Report AI adverse events via existing pharmacovigilance channels

→ Champion chatbot use as standard of care in chronic disease pathways

🔬 6 Critical Research Gaps: Longitudinal RCTs | Multilingual Validation | Marginalised Population Studies | Platform Comparisons | AI Legal Frameworks | CKD & CVD Evidence

Conclusion: AI chatbots can transform chronic disease management for India's hundreds of millions of NCD patients — but only if equitable. That means investing in vernacular design, CHW mediation, ABDM integration, and comprehensive AI governance. The rural grandmother in Rajasthan and the urban professional in Bangalore must both benefit equally.

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