SYNOPSIS

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SYNOPSIS FOR DISSERTATION

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Master of Business Administration (Healthcare Analytics)

TITLE:

AI CHATBOTS IN CHRONIC DISEASE MANAGEMENT: A SYSTEMATIC REVIEW OF THEIR ROLE IN PATIENT ENGAGEMENT

Author	Faculty Guide	Programme	Institution / Year
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1. BACKGROUND AND RATIONALE

Non-communicable diseases (NCDs) represent the defining public health crisis of the twenty-first century. The World Health Organization estimates that NCDs account for approximately 74% of all global deaths annually — some 41 million people — with 77% of those deaths occurring in low- and middle-income countries (LMICs). India bears a disproportionate share of this burden: the country hosts the world's largest population of people with type 2 diabetes mellitus (T2DM) at approximately 77 million (projected to reach 134 million by 2045), over 220 million individuals living with hypertension, and approximately 55 million patients with chronic obstructive pulmonary disease (COPD). Cardiovascular disease accounts for nearly 27% of all national deaths, while the economic toll of NCDs is projected to reach USD 4.58 trillion in lost productivity between 2012 and 2030.

Effective chronic disease management demands consistent, longitudinal patient engagement — regular medication adherence, symptom self-monitoring, dietary modification, and timely clinical escalation. Yet India's healthcare system is structurally ill-equipped to provide this at scale. The physician-to-population ratio stands at approximately 1 per 1,000 — at the lower limit of WHO recommendations — and this aggregate figure conceals severe rural-urban disparities: 65% of the population lives in rural areas, where only 31% of the healthcare workforce practises. Out-of-pocket expenditure constitutes approximately 47% of total health spending, creating sustained financial barriers to consistent chronic disease follow-up.

Artificial intelligence (AI) chatbots — conversational agents that use natural language processing (NLP) and machine learning to engage patients in real time — have emerged as a potentially transformative solution to these structural gaps. Unlike passive information portals, AI chatbots deliver personalised, dynamic, and scalable engagement at negligible marginal cost. The COVID-19 pandemic served as a

structural accelerator, compressing years of gradual telemedicine adoption into months: India's eSanjeevani platform recorded over 340 million consultations by 2024. Against this backdrop, a rigorous evidence synthesis assessing the actual impact of AI chatbots on patient engagement in chronic disease management in India is urgently needed.

2. PROBLEM STATEMENT

> **Core Problem**
> Despite the rapid proliferation of AI chatbot deployments in India's chronic disease management landscape — and significant government and private sector investment in digital health infrastructure — the evidence base for their clinical effectiveness, equitable impact, and implementation quality remains fragmented, methodologically heterogeneous, and largely uncritical. Individual studies document promising outcomes in isolated disease contexts or patient segments, but no comprehensive, systematically conducted synthesis of evidence across chronic disease categories, stakeholder perspectives, socioeconomic dimensions, and regulatory frameworks currently exists. This knowledge gap impedes evidence-based policy, equitable platform design, and responsible clinical integration of AI chatbots in India's NCD management system.

3. RESEARCH QUESTIONS

This dissertation is structured around four primary research questions:

1. **RQ1.** What are the predominant factors — including perceived usefulness, ease of use, trust, and social influence — that determine successful AI chatbot adoption and sustained patient engagement in chronic disease management in India?
2. **RQ2.** How do socioeconomic, cultural, linguistic, and technological variables differentially shape AI chatbot adoption and health outcomes across India's diverse patient populations?
3. **RQ3.** What are the documented clinical outcomes of AI chatbot interventions across major chronic disease categories — specifically type 2 diabetes, hypertension, COPD, and paediatric asthma — and what evidence gaps remain?
4. **RQ4.** What legal, regulatory, and ethical constraints currently limit — and what governance frameworks could enable — equitable, clinically responsible AI chatbot deployment within India's chronic disease management system?

4. OBJECTIVES OF THE STUDY

The study pursues the following four primary objectives:

a. **Objective 1:** To systematically map and synthesise evidence on AI chatbot adoption determinants and patient engagement outcomes in chronic disease management in India, employing an integrated theoretical framework (TAM, UTAUT, DOI, and Trust-Extended TAM).

b. **Objective 2:** To assess the clinical effectiveness of AI chatbot interventions across major chronic disease categories — including T2DM, hypertension, COPD, and paediatric asthma — and identify disease-specific outcome patterns and evidence gaps.

c. **Objective 3:** To analyse barriers to and facilitators of AI chatbot adoption with explicit attention to demographic equity dimensions: age, gender, geographic location, educational attainment, and socioeconomic status.

d. **Objective 4:** To evaluate the legal, regulatory, and ethical dimensions of AI chatbot deployment — including data privacy under the DPDP Act 2023, algorithmic bias, and the AI liability gap — and formulate stakeholder-specific policy and implementation recommendations.

5. THEORETICAL FRAMEWORK

This study employs an integrated, multi-theoretical framework that draws on four complementary bodies of theory to capture the full complexity of AI chatbot adoption in healthcare contexts.

Theory	Origin	Core Constructs	Role in This Study
TAM	Davis (1989)	Perceived Usefulness (PU); Perceived Ease of Use (PEOU) → Adoption intent	Primary cognitive adoption model; confirmed by Sharma et al. (2023) and Gupta & Nair (2024)
UTAUT	Venkatesh et al. (2003)	Performance Expectancy; Effort Expectancy; Social Influence (physician endorsement); Facilitating Conditions (infrastructure)	Captures social and environmental determinants beyond individual cognition
DOI Theory	Rogers (2003)	S-curve diffusion; innovators → early adopters → early majority → late majority → laggards	Explains differential adoption across urban/rural and age segments in India
Trust-Extended TAM	Mayer et al. (1995)	System trustworthiness; institutional trust; transparency as antecedents of adoption	Addresses the healthcare-specific trust dimension critical for AI health guidance

Together, these frameworks enable a comprehensive analytical account of AI chatbot adoption — from individual patient cognitions (TAM) to social influence and infrastructure (UTAUT), population-level diffusion patterns (DOI), and the trust dimensions unique to AI-mediated healthcare (Trust-TAM).

6. METHODOLOGY

6.1 Study Design

This research employs a systematic literature review as its primary methodological design, conducted and reported in accordance with the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines — the internationally recognised gold standard for systematic review reporting in health sciences. A systematic review was selected because it enables rigorous, reproducible, and transparent aggregation of evidence across multiple independent studies, minimises subjectivity in evidence selection and synthesis, and provides the comprehensive evidence base required for policy-relevant conclusions in a domain where randomised controlled trial evidence remains sparse.

The review adopts a pragmatic philosophical stance, treating quantitative evidence (statistical associations, clinical outcome data) and qualitative evidence (stakeholder perspectives, policy analyses) as complementary sources of insight rather than hierarchically ordered evidence types.

6.2 Eligibility Criteria

Inclusion Criteria: Peer-reviewed studies and credible grey literature published between January 2019 and December 2024; focused on AI chatbot or conversational AI interventions in India; addressing chronic disease management (T2DM, hypertension, COPD, cardiovascular disease, CKD, or related comorbidities); reporting outcomes related to patient engagement, medication adherence, clinical outcomes, adoption determinants, or policy and regulatory dimensions; indexed in PubMed, Scopus, Web of Science, Google Scholar, or IEEE Xplore.

Exclusion Criteria: Studies without India-specific data; non-peer-reviewed opinion pieces or blog posts; studies on general mHealth applications (fitness trackers, EHRs) without chatbot specificity; conference abstracts without full papers; studies predating January 2019.

6.3 Search Strategy

A multi-database systematic search was executed across five primary databases: PubMed, Scopus, Web of Science, Google Scholar, and IEEE Xplore. Supplementary searches covered the Clinical Trials Registry India (CTRI), government repositories (MoHFW, ICMR, NITI Aayog, ABDM), WHO South-East Asia Regional Office publications, and reference lists of included studies (snowball searching). A representative Boolean search string was:

Sample Search Query (PubMed)

("AI chatbot" OR "conversational AI" OR "virtual health assistant" OR "NLP chatbot") AND ("chronic disease" OR "diabetes" OR "hypertension" OR "COPD" OR "cardiovascular") AND ("India" OR "Indian population" OR "South Asia") AND ("patient engagement" OR "medication adherence" OR "adoption" OR "barriers" OR "technology acceptance") AND [2019:2025]

6.4 PRISMA 2020 Selection Process

Study selection followed a structured multi-stage process:

Stage	Activity	Records
Identification	Database searches (PubMed, Scopus, WoS, Google Scholar, IEEE)	168 records
Identification	Registry and grey literature searches	76 records
Identification	Total records identified	244 records
Screening	Records removed (duplicates + irrelevant titles)	198 removed
Screening	Records retained for title/abstract screening	46 records
Eligibility	Records excluded after abstract screening	18 excluded
Eligibility	Full texts assessed for eligibility	24 records
Eligibility	Full texts excluded with reasons	12 excluded
Included ✓	Studies included in final synthesis	**12 studies**

Inter-rater agreement at the title/abstract screening stage was assessed using Cohen's Kappa ($\kappa = 0.83$), indicating strong agreement. Disagreements at full-text eligibility stage were resolved through structured discussion.

6.5 Data Extraction and Quality Assessment

A standardised data extraction form captured: bibliographic details; study design and methodology; geographic scope; sample size and sampling approach; disease context; chatbot technology type and platform; key outcomes (clinical, engagement, adoption); and identified barriers, facilitators, and policy implications. Quality of included studies was assessed using design-appropriate instruments — the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for quantitative studies, AMSTAR-2 for systematic reviews, and a modified qualitative evidence synthesis checklist for grey literature.

6.6 Data Analysis

A thematic synthesis approach was employed, organising extracted evidence across eight analytical domains: (1) AI chatbot classification and architecture; (2) technology acceptance and adoption

determinants; (3) clinical outcomes by disease category; (4) barriers to adoption; (5) facilitators of adoption; (6) demographic and socioeconomic equity dimensions; (7) government policy and platform integration; and (8) legal, regulatory, and ethical dimensions. A SWOT analysis was constructed to synthesise cross-cutting strategic insights for AI chatbot deployment in India.

7. SCOPE AND DELIMITATIONS

The study is deliberately bounded as follows:

- Geographic scope: India (inclusive of all states and union territories); studies must contain India-specific data or analysis.
- Temporal scope: January 2019 to December 2024, capturing the post-Digital India era and COVID-19 pandemic-accelerated digital health transition.
- Disease scope: Chronic non-communicable diseases — primarily T2DM, hypertension, COPD, and paediatric asthma; secondary attention to cardiovascular disease and CKD.
- Technology scope: AI chatbots and conversational AI agents (rule-based, NLP-driven, and generative AI architectures); general mHealth applications without chatbot functionality are excluded.
- Stakeholder scope: Patient engagement is the primary focus; physician, policymaker, and technology developer perspectives are examined insofar as they inform adoption dynamics and recommendations.
- Language: English-language studies only.

8. EXPECTED FINDINGS

Based on the existing literature and preliminary review, the following key findings are anticipated:

- AI chatbots demonstrate meaningful improvements in medication adherence, self-monitoring frequency, and patient satisfaction across T2DM, hypertension, COPD, and paediatric asthma. Bose et al. (2024) — the strongest clinical evidence — document 84.7% symptom control improvement in paediatric asthma within four weeks.
- Perceived usefulness and trust are the primary determinants of adoption; ease of use constitutes the dominant barrier, particularly among elderly (≥65 years) and rural patients — the populations with highest chronic disease burden.
- The digital divide, linguistic fragmentation (India's 22 scheduled languages), age-related accessibility barriers, and regulatory ambiguity collectively define a complex equity challenge that no single platform design intervention can resolve.
- Government-integrated platforms (particularly eSanjeevani) substantially outperform standalone private applications in patient trust, population reach, and utilisation rates among economically disadvantaged populations.

- India's legal landscape presents a critical AI liability gap: no statutory standard of care exists for AI-generated medical advice, and the Digital Personal Data Protection Act 2023 contains significant health-AI-specific implementation gaps.
- Six critical research gaps are identified: absence of longitudinal RCT evidence; multilingual chatbot clinical validation; dedicated studies on marginalised populations; comparative platform studies; AI-specific regulatory research; and India-specific evidence on chatbot interventions for CKD and cardiovascular disease.

9. SIGNIFICANCE AND IMPLICATIONS

This dissertation makes several important contributions to healthcare management scholarship and practice:

- **Academic Contribution:** Provides the first comprehensive systematic review of AI chatbot patient engagement across all major chronic disease categories in India, employing an integrated multi-theoretical framework and PRISMA 2020 methodology.
- **Policy Contribution:** Generates evidence-based recommendations for four stakeholder groups — government and policymakers, healthcare administrators, technology developers, and clinical providers — specifically addressing India's regulatory, equity, and infrastructure challenges.
- **Clinical Contribution:** Identifies which chatbot design features and deployment contexts produce the strongest patient engagement outcomes, enabling clinicians and administrators to make informed platform adoption decisions.
- **Equity Contribution:** Explicitly surfaces the demographic and socioeconomic dimensions of AI chatbot adoption gaps, framing equity-by-design as both a moral imperative and an economic efficiency argument for India's chronic disease management system.

The findings directly inform India's National Digital Health Mission, ABDM implementation strategy, and the development of AI health governance frameworks under the evolving regulatory landscape of the DPDP Act 2023. If AI chatbots are to fulfil their transformative potential in India's NCD management challenge — ensuring that the rural patient with diabetes in Rajasthan benefits as much as the urban professional in Bangalore — this evidence synthesis is a necessary foundation.

10. PROPOSED CHAPTER PLAN

Chapter	Title	Contents
1	**Introduction**	Background; chronic disease burden in India; AI chatbot definition and clinical applications; digital health landscape; rationale; research questions and objectives; theoretical framework; organisation of the review
2	**Review of Literature**	Overview of evidence base; summary of 12 included studies (Table 2.1); excluded studies with reasons; quality assessment findings
3	**Methodology**	Study design and philosophical stance; eligibility criteria; search strategy; PRISMA 2020 selection process (Figure 3.1); data extraction; quality assessment tools; analytical approach
4	**Results and Discussion**	AI chatbot classification and architecture; technology acceptance and patient engagement (PU, PEOU, Trust); clinical outcomes by disease category; barriers; facilitators; demographic and equity disparities; government policy and platform integration; legal, regulatory, and ethical dimensions; SWOT analysis; research gaps
5	**Recommendations**	For government and policymakers; for healthcare administrators; for technology developers; for healthcare providers
6	**Conclusion**	Summary of key findings; theoretical and practical implications; limitations; future research directions

11. PROPOSED RESEARCH TIMELINE

Phase	Activity	Duration
Phase 1	Topic finalisation; theoretical framework development; search strategy design	Weeks 1–2
Phase 2	Systematic database searches; title/abstract screening; full-text retrieval	Weeks 3–5
Phase 3	Full-text eligibility assessment; data extraction; quality appraisal (JBI / AMSTAR-2)	Weeks 6–8
Phase 4	Thematic synthesis; SWOT analysis; identification of research gaps	Weeks 9–11

Phase 5	Drafting Chapters 1–4 (Introduction, Literature Review, Methodology, Results)	Weeks 12–15
Phase 6	Drafting Chapters 5–6 (Recommendations and Conclusion); compilation of references	Weeks 16–17
Phase 7	Review by faculty guide; revision; finalisation and submission	Weeks 18–20

12. ANTICIPATED LIMITATIONS

- The systematic review design precludes causal inference; associations documented cannot be attributed with certainty to chatbot interventions in the absence of randomised controlled trials.
- The English-language restriction may exclude relevant evidence published in regional Indian languages, potentially underrepresenting evidence from vernacular-language chatbot deployments.
- Methodological heterogeneity across included studies — diverse designs, outcome measures, and population characteristics — limits the comparability of findings and precludes meta-analytic synthesis.
- The majority of included primary studies are cross-sectional in design; the absence of longitudinal evidence means long-term sustainability of chatbot-mediated engagement improvements cannot be assessed.
- Grey literature inclusion (one source) was intentionally limited to maintain evidentiary rigour, potentially omitting relevant programmatic evidence from government and NGO implementation reports.

13. KEY REFERENCES

The following sources constitute the primary evidence base and theoretical foundations of this dissertation:

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Declaration

I, Dikshant Gupta, hereby declare that this synopsis and the dissertation work described herein are my original work, conducted under the supervision and guidance of Dr. Ram Krishna Chahar, IIHMR University, Jaipur. Information derived from published or unpublished work of others has been duly acknowledged in the text. This work has not been submitted for any other degree or diploma.

Signature: _____ Date: _____

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