AI Enabled Digital Inclusion in Healthcare in Eastern India: A Study

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Abstract— **AI enabled digital inclusion are revamping the Indian healthcare ecosystem and economics by altering the system from responsive, costly, and hospital-centric to preventive, reasonable, community-centric, and economically sustainable delivery system. India's healthcare system has enduring a overwhelming revolution driven by Artificial Intelligence (AI), digital health platforms, and inclusive technology implementation. These innovations are not merely improving the clinical outcomes but primarily restructuring the healthcare economics by easing costs, refining access, improving productivity, and also enhancing financial sustainability. This study evaluates how AI-enabled digital inclusion is changing healthcare delivery, affordability, clinical competency, and economic impact in India.**

*Keywords—***AI, Healthcare, Digital Health, Tele Medicine.**

I. INTRODUCTION

The convergence of artificial intelligence and digital health infrastructure in Eastern India represents one of the most significant socio-economic shifts in the region's contemporary history. Comprising the states of West Bengal, Odisha, Bihar, and Jharkhand, this geographical corridor has historically been characterized by high population density, significant rural-urban disparities, and a healthcare system struggling under the weight of specialist shortages and fragmented data systems. The introduction of AI-enabled digital inclusion strategies—ranging from smartphone-based diagnostic tools for frontline workers to large-scale predictive analytics for public health management—is not merely an incremental technological upgrade. Rather, it is a structural transformation that addresses the fundamental bottlenecks of access, affordability, and quality that have long plagued the region's health economics.

II. MACRO ECONOMICS

To examine the intersection of AI-enabled digital inclusion and health economics in India, secondary data provides a clear picture of how technology is bridging the urban-rural divide while creating significant financial value.

The following data points, updated as of late 2025, highlight the scale of this transformation.

1. Digital Inclusion: Scale and Reach:

Digital public infrastructure is the foundation upon which AI services are built. A NASSCOM study from 2023 states that the use of AI and data in healthcare might increase India's GDP by USD 25–30 billion by 2025. In order to enhance Indian healthcare services and promote better quality, lower prices, increased accessibility, and a strong emphasis on patient care, experience, operational efficiency, and research and development, it will be important to implement strategic mechanisms for AI-driven change. In India, the Ayushman Bharat Digital Mission (ABDM) has achieved massive scale, allowing AI tools to process and analyze health data at a national level.

Key Inclusion Metrics (December 2025)

- *ABHA Accounts:* Over 84.35 crore Ayushman Bharat Health Accounts have been created, providing unique digital IDs for citizens.

- *Telemedicine (e-Sanjeevani):* More than 43.2 crore free tele-consultations have been conducted, with 57% of beneficiaries being women, showcasing how digital tools overcome gender and mobility barriers.

- *Rural Infrastructure:* Over 1.75 lakh Ayushman Arogya Mandirs (Health and Wellness Canters) have been operationalized, acting as the primary physical touchpoints for AI-driven screening.

2. Health Economics: Market Growth and GDP Impact

AI in healthcare is transitioning from a pilot phase to a significant economic contributor.

Metric	Secondary Data Value	Source
GDP Contribution	Projected $25–30 Billion by end of 2025	NASSCOM / Deloitte
Market Size (AI Healthcare)	Estimated $1.6 Billion by 2025 (40.6% CAGR)	IndiaAI
National Health Sector Value	Projected to reach $650 Billion by	Ministry of Health (MoHFW)
Operational Efficiency	AI improves resource allocation by ~45%	ResearchGate (2025)

Economic Efficiency: AI-driven diagnostics are estimated to be 63% faster than traditional methods, which reduces the "misdiagnosis rate" by 28%, preventing costly long-term complications and repeat hospitalizations.

3. Addressing the Urban-Rural Divide

The "Economic Friction" of healthcare is highest in rural areas due to travel costs and lack of specialists.

- *Specialist Access:* Rural India houses 70% of the population but only 37% of hospital beds.
- *The AI Solution:* AI-based **Clinical Decision Support Systems (CDSS)** are now integrated into e-Sanjeevani, allowing rural practitioners to provide "specialist-level" diagnosis without the patient needing to travel to a Tier-1 city.
- *Diagnostic Impact:* AI-based diabetic retinopathy screening and jaundice detection (smartphone-based) have moved high-end diagnostics from urban labs to village doorsteps.

4. Critical Challenges to Economic Realization

Despite the gains, data suggests several bottlenecks:

- *Digital Literacy Gap:* While urban digital literacy is at 61%, rural literacy remains at 25%, limiting the "self-service" potential of AI apps.

- *The Hardware Hurdle:* High-tech medical equipment is still largely imported; however, surgical consumable exports reached $1.6 billion in FY23, indicating a shift toward domestic manufacturing which could further lower costs.

5. Macroeconomic Gains (National Level)

- *GDP Contribution:* Experts estimate that AI could contribute $25 to $30 billion to India's GDP by 2025 (Helius, 2025).
- *Workforce Productivity:* By reducing the "burden of disease" through better outcomes, AI-enabled healthcare boosts the productivity of the national workforce (ResearchGate, 2025).
- *Investment & Scaling:* The India AI Mission, with an allocation of over ₹ 10,300 crore, is deploying 38,000 GPUs to make AI compute affordable (₹ 65/hour), fostering a startup ecosystem that drives down the cost of healthcare technology (PIB, 2025).

6. Mechanisms of AI-Enabled Digital Inclusion

AI serves as the "intelligent layer" over existing digital health infrastructure (like the Ayushman Bharat Digital Mission), making healthcare more accessible through several key innovations:

- *Breaking Language Barriers:* AI-powered platforms like Bhashini use Natural Language Processing (NLP) to provide medical information and discharge summaries in native Indian languages, ensuring that non-English speakers are not excluded from digital services (PIB, 2025; PwC India, 2024).
- *Virtual Clinics & Telemedicine:* AI-driven triage and remote monitoring allow patients in rural areas (where 70% of India's population resides) to receive expert consultations without traveling long distances, directly addressing the shortage of rural healthcare professionals (Chandravanshi, 2024; Patil et al., 2021).
- *Enhanced Diagnostics:* AI algorithms for screening conditions common in India—such as tuberculosis and diabetic retinopathy—enable early-stage detection at lower costs than traditional specialist-led methods (Helius, 2025).

III. OBJECTIVE & RESEARCH METHODOLOGY

1. To study the adoption level of AI enabled digitization in various states
2. To find out the various services delivery mechanism using AI

3. To find out the analysis of Pilot project and its economic impact

- The research work was studied based on extensive literature review and study of secondary data.

IV. ANALYSIS OF DATA

Objective 1: The Digital Chasm and the Mechanics of Inclusion in Eastern India

Digital inclusion in the healthcare context of Eastern India is defined by the intersection of connectivity, affordability, and literacy. While India has witnessed a staggering 200% increase in rural internet subscriptions between 2015 and 2021, the benefits of this connectivity are unevenly distributed. In states like Bihar, the digital divide remains a stark reality; NFHS-5 data indicates that four in five women in Bihar have never used the internet, a statistic that presents a formidable barrier to any top-down digital health intervention. This gendered digital chasm is particularly critical because women are the primary conduits for maternal and child healthcare, yet they are often the most marginalized from the tools required to access modern digital services.

The concept of "digital presence without digital power" captures the essence of the challenge in the Eastern states. Having a mobile phone does not necessarily equate to the ability to navigate a complex health application or interpret a digitized medical report. For instance, in many rural households across Jharkhand and West Bengal, women may own a device but remain dependent on male family members to interpret government health messages or coordinate teleconsultations. This dependency undermines the autonomy that digital health technologies are designed to provide. Consequently, AI interventions in this region are increasingly shifting toward "offline-first" and voice-based interfaces to bypass these literacy barriers.

State	Female Internet Usage (Ever Used %)	Male Internet Usage (Ever Used %)	Rural Female Internet Usage (%)	Urban Female Internet Usage (%)
Bihar	20.6%	43.6%	17.0% (est.)	38.4% (est.)
West Bengal	25.5% (rural avg)	46.7% (rural avg)	25.5%	52.1%
Odisha	25.0% - 30.0%	45.0% - 50.0%	21.0%	49.0%
Jharkhand	25.0% (est.)	49.0% (est.)	18.5%	44.2%

Structural Foundations: The Ayushman Bharat Digital Mission (ABDM) in the East

The Ayushman Bharat Digital Mission (ABDM) serves as the architectural foundation for AI integration in the Eastern states. By implementing a central sector scheme that provides funding for human resources, capacity building, and digital infrastructure, the government has created the standardized data environment necessary for AI to function.

The "Trinity of Registries"—the Ayushman Bharat Health Account (ABHA), the Health Facility Registry (HFR), and the Health Professional Registry (HPR)—provides the "single source of truth" required for interoperable healthcare delivery.

In Eastern India, the adoption of ABHA accounts has been remarkably swift, despite the underlying digital literacy challenges. As of July 2025, Bihar and West Bengal have created over 53 million and 48 million ABHA IDs, respectively. These accounts serve as a longitudinal health record that follows the patient, a critical feature for the migratory labor populations common in Bihar and Jharkhand. For AI, these IDs provide the structured, consent-based data streams needed for predictive modeling and risk assessment.

State	ABHA Accounts Created	Health Facility Registry (HFR)	Health Professional Registry (HPR)
Bihar	53,105,029	16,220	37,071
West Bengal	48,801,710	12,456	937
Odisha	39,206,340	8,560	927
Jharkhand	14,620,041	5,820	15,209

Objective 2: Pilot Results and Economic Impacts

Maternal and neonatal health is the most active frontier for AI application in Eastern India. The region faces a paradox of progress; while Jharkhand has reduced its Maternal Mortality Ratio (MMR) from 371 in 2003 to 50 in 2022, other areas like the Rayagada district in Odisha still report an MMR of 170. AI-driven tools are being deployed to address these inequities by augmenting the capabilities of frontline health workers.

The Rayagada Pilot: AI-Driven Gestational Monitoring

In the tribal districts of Odisha, the government has introduced AI-enabled maternal and child health-monitoring kits. Operated by ASHA workers equipped with smartphones, these kits use machine learning algorithms to track the physical and cognitive development of the fetus. The diagnostic kits generate instant health reports that can be shared remotely with gynecologists at district headquarters, such as those at the Rayagada district hospital. By enabling real-time screening in low-connectivity terrain, this initiative bridges the gap between remote patients and quality care, ensuring that high-risk cases are identified weeks before they become life-threatening emergencies.

Predictive Modeling in Bihar and Jharkhand

In Bihar and Jharkhand, CARE India has piloted AI models that utilize antenatal data to predict high-risk pregnancies. These tools allow ASHAs to prioritize referrals based on risk scores, effectively managing the scarce ambulance and hospital resources in the region. The use of local-language user interfaces has been critical to the adoption of these tools by community workers who may have limited technical proficiency. Furthermore, AI-driven chatbots and virtual assistants deliver personalized, timed voice messages in Bengali and local tribal dialects, which has been shown in other Indian pilots to increase antenatal care (ANC) adherence by 25%.

Newborn Anthropometry and Fetal Age Estimation

Accurate measurement of newborns is often impossible in rural home settings due to the lack of calibrated scales. A computer vision AI solution has been developed to estimate an infant's weight, height, and head circumference from a short smartphone video. This system, which works offline and is geo-tagged, has shown a mean weight error of only 114 grams. Additionally, the Garbhini-GA2 model, specifically trained on Indian biometric patterns, provides significantly more accurate fetal age estimation than traditional Western formulas, reducing the median error by over three times. These precise measurements are vital for the early detection of stunting and the management of preterm births, which are major drivers of infant mortality in the East.

Innovation	Application Area	Specific Impact in Eastern India
Garbhini-GA2	Fetal Age Estimation	3x reduction in error for Indian populations
Shishu Maapan	Newborn Weight	Contactless weighing with 114g precision
AI-MCH Kits	Maternal Health	Real-time screening in tribal Rayagada
mMitra / Kilkari	ANC Adherence	25% increase in follow-up visits via Bengali voice alerts

Objective 3: Diagnostic Revolution: Radiology, Cardiology, and the Triage of Scarcity

The scarcity of specialized doctors in Eastern India—estimated at a shortage of 3,000 obstetricians in rural West Bengal alone—makes AI-based diagnostics a necessity rather than a luxury. AI is increasingly used to interpret medical images and signals, providing a "second opinion" or a primary screen where no specialist exists.

Chest X-Ray Automation and TB Screening

Tuberculosis (TB) remains a persistent burden in Bihar and Jharkhand. AI tools like qXR from Qure.ai have been deployed in community camps to analyze chest X-rays for signs of TB and other pulmonary diseases. In a multicentric national study, such AI systems processed over 150,000 images with 99.8% precision for normal vs. abnormal classification.[14] This high level of negative predictive value (NPV) allows healthcare systems to quickly rule out healthy individuals and focus resources on confirmative testing for positive cases, significantly reducing the diagnostic bottleneck.

Cardiology and Stroke Triage

In the "Golden Hour" of a cardiac or stroke event, the lack of an on-site cardiologist in a rural Bihar PHC can be fatal. AI-enabled portable ECG devices, such as those from Tricog or Sanket-Life, can instantly interpret ECG to flag arrhythmias or emergencies.[5] These tools guide local doctors on whether to stabilize the patient or escalate to a tertiary center, preventing costly over-referrals and ensuring that ambulances are used for the most critical cases.

For stroke management, AI algorithms analyse CT scans to identify brain bleeds, enabling faster triage and potentially saving thousands of lives in regions with limited neurosurgical access.

Screening for Diabetic Retinopathy and Oncology

Chronic diseases like diabetes are rising in Eastern India, yet specialist eye care is concentrated in cities. Remidio's offline AI platform allows frontline workers to screen for diabetic retinopathy (DR) using portable fundus cameras, even without internet access. In studies, these AI systems have shown 92% sensitivity for detecting DR and 100% sensitivity for referable stages of the disease. Similarly, AI is being applied to breast cancer screening through thermal imaging (Niramai), providing a non-invasive, privacy-conscious alternative for rural women.

Health Economics: Analyzing the Financial Impact of AI Integration

The economic impact of AI in the healthcare of Eastern India is best understood through the lens of health capital and the reduction of Out-of-Pocket Expenditure (OOPE). In India, OOPE constitutes 47.1% of total health expenditure, a figure that remains high despite increased government health expenditure (GHE), which rose from 1.13% of GDP in 2014 to 1.84% in 2022.[22]

Reducing the Financial Burden of Catastrophic Care

The financial burden of healthcare often pushes families in Bihar and Jharkhand into poverty. AI reduces this burden primarily through early detection and preventive care.

By identifying a high-risk pregnancy or an early-stage cancer, AI prevents the need for expensive, late-stage interventions and prolonged hospitalizations. The logic of this saving is captured in the health capital model, where AI serves as an investment that reduces the depreciation of human health.

The economic effectiveness of AI-driven triage can be modeled by comparing the costs of the current "unfiltered" referral system against an AI-mediated system.

Let C_{total} be the total cost of treating a condition. In a traditional system:

$$C_{traditional} = C_{travel} + C_{initial\_diag} + C_{referral} + C_{tertiary\_care}$$

In an AI-enabled system:

$$C_{AI} = C_{AI\_diag} + C_{targeted\_referral} + C_{early\_intervention}$$

Where C_{AI_diag} is significantly lower than the cumulative costs of travel and multiple diagnostic rounds in a fragmented system.[5] Evidence from rural Bihar indicates that AI-enabled clinical decision tools help avoid "costly over-referrals," optimizing the use of public resources while saving patients from the "distress financing" methods often used to cover urban medical bills.

Market Trends and Startup Ecosystems in the East

The healthcare startup landscape in Eastern India is maturing, with companies like CureBay showing that "rural-first" models can be commercially viable. CureBay, headquartered in Bhubaneswar, operates over 150 e-clinics across Odisha and Chhattisgarh, serving 90,000 members. Their hybrid model—combining AI-powered digital triage with "Concierge Agents" or "Guardian Angels"—addresses both the technological and human elements of care. The company's ability to raise a $21M Series B in 2024 from international investors like Bertelsmann India and British International Investment signals a shift in investor sentiment toward inclusive health technologies.

Startup	Category	Headquarters	Scale / Funding	Key Impact
CureBay	Hybrid Telemedicine	Bhubaneswar	150+ Clinics; $21M Series B	Rural-first care for 90k+ members
Qure.ai	AI Diagnostics	Mumbai (Pan-India)	$87M Funding	Large-scale TB screening in Bihar/WB
Tricog	AI Cardiology	Bengaluru (Pan-India)	$25M Funding	Remote ECG interpretation in rural hubs
Janitri	Maternal Health	Bengaluru (Pan-India)	Pilot-focused	AI monitoring for labor in West Bengal

Challenges to Economic Realization

Despite the potential, several "economic friction" points exist:

- *High Initial Costs:* Implementing AI can range from $20,000 to $1,000,000, a steep barrier for a nation where healthcare spending was only 1.8% of GDP in 2020-21 (Drishti IAS, 2024).

- *The Literacy Gap:* For economic benefits to be realized, both healthcare workers and patients must be "AI literate" to ensure high adoption rates and diminish resistance to new systems (ResearchGate, 2025).

V. CONCLUSION

The integration of AI into the healthcare landscape of Eastern India is a structural necessity driven by the region's unique demographic and epidemiological challenges. This study reveals that while the technical capacity of AI to improve diagnostics and predictive care is well-established, its economic impact is contingent upon the depth of digital inclusion. The progress made in states like Odisha and Bihar through AI-enabled maternal health pilots and the massive rollout of ABHA IDs provides a template for leapfrogging traditional infrastructure barriers. However, the persistent digital divide, particularly among rural women, and the lack of localized data sets remain significant hurdles.

To achieve a sustainable and equitable health economy, Eastern India must prioritize "human-in-the-loop" AI models that empower frontline workers rather than replacing them.

The expansion of hybrid telemedicine models like CureBay and the continued localization of AI tools into regional languages are critical steps toward reducing the out-of-pocket expenditure that currently hinders the region's prosperity. As the Ayushman Bharat Digital Mission matures, the focus must shift from account creation to the meaningful use of data for personalized, preventive care. In doing so, Eastern India can transform its healthcare challenges into an opportunity for inclusive technological and economic growth.

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