JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

THE POTENTIAL OF ARTIFICIAL INTELLIGENCE IN THE INDIAN HEALTHCARE SYSTEM

[1]Dr.Kshirod Kumar Pradhan, principal, Vikash school of Business Management, Odisha
principalvsbm@gmail.com
[2]Mousumi Swain, Asst. Prof, Vikash school of Business Management, Odisha
swainmousumi154@gmail.com

Abstract:

Artificial intelligence (AI) promises transformative improvements in healthcare by enhancing diagnostics, personalizing treatments, optimizing operations, and extending services to underserved populations. However, India's enormous and diverse healthcare landscape – marked by chronic resource shortages, access inequities, and complex socio-economic barriers – poses unique challenges for AI adoption. This study examines the state of AI in Indian healthcare, identifying gaps in research and practice, and articulating a roadmap for responsible integration. Drawing on a systematic review of policy documents (e.g. NITI Aayog's national AI strategy, MoHFW reports) and peer-reviewed studies, we chart AI applications across diagnostics (e.g. tuberculosis, diabetic retinopathy, cancer), public health surveillance, telemedicine, and health administration. Methodologically, we employ a conceptual policy analysis and thematic synthesis of 20 key studies, framed by socio-technical and governance lenses. Our analysis finds notable successes – for instance, AI-driven TB screening in Tamil Nadu achieved 93% sensitivity and doubled case detection rates, while a community tele-screening model detected diabetic retinopathy in rural India with high feasibility. Yet substantial obstacles remain: fragmented data infrastructure, uneven digital literacy, insufficient regulation (e.g. lack of robust data privacy laws), and workforce skepticism. Ethical and legal challenges – from algorithmic bias to liability ambiguity – further complicate deployment. We identify a critical research gap in empirically evaluating AI interventions in real-world Indian contexts and in understanding socio-cultural factors that affect adoption. Our objectives are to clarify AI's current impact on Indian healthcare, elucidate adoption barriers, and propose policy and practice recommendations. We recommend integrated strategies: developing regulatory frameworks (building on NITI's responsible-AI principles), investing in health data interoperability, and fostering collaborations between government, clinicians, and technologists. By aligning AI innovation with India's public health priorities, stakeholders can harness AI to improve quality, equity, and affordability of care. This study's findings guide policymakers and practitioners toward sustainable, inclusive AI-driven healthcare reform in India.

Keyword: artificial intelligence, Indian healthcare system, Public Health Surveillance, Responsible AI Governance, Health Data Interoperability, Diagnostics and Disease Screening

Introduction:

Globally, AI is rapidly transforming medicine. From deep learning algorithms that interpret medical images with expert-level accuracy to natural language models that triage patients and distill clinical research, AI is reshaping diagnostics, treatment planning, and patient engagement. In many high-income settings, AI tools are enhancing workflow efficiency, enabling personalized care, and aiding public health surveillance. For example, machine learning models can predict disease outbreaks or patient deterioration by mining electronic health records and environmental data. At the same time, implementation has often lagged behind hype; global reviews note persistent barriers – data scarcity, privacy concerns, and clinician resistance – that slow AI integration.

India presents a uniquely challenging and urgent context for healthcare innovation. The country's 1.4-billion population puts immense pressure on a system already strained by shortages of doctors, nurses, and infrastructure. Official statistics show only 0.76 physicians and 2.09 nurses per 1,000 people in India, far below the WHO norms of 1.0 and 2.5 respectively. Hospital beds number just 1.3 per 1,000 population, compared to a recommended 3.5. Large rural areas, home to two-thirds of Indians, face severe access gaps: many villages lack basic facilities and the few hospitals are often overloaded. Affordability is also a critical problem – out-of-pocket spending constitutes roughly 62% of health expenditures, among the highest rates globally. These factors combine to delay care and worsen outcomes: for example, the Tata Memorial Hospital reports average travel distances of 1,800 km for cancer patients, many of whom present at late stages. The Ministry of Health and Family Welfare (MoHFW) estimates that about 63 million Indians fall into poverty each year due to healthcare costs. In summary, India's health challenges – scale, cost, workforce, and fragmented infrastructure – are among the most daunting in the world.

Given this backdrop, AI's promise is particularly compelling:

AI could help amplify limited expertise, extend care into remote areas, and streamline costly processes. For instance, AI-powered diagnostics might compensate for the dearth of specialists by enabling community health workers or general practitioners to screen and refer patients more accurately. Yet these same systemic weaknesses raise doubts about AI's feasibility. Can AI models trained elsewhere generalize to India's diverse epidemiological profile and socio-cultural environment? Does India have the data infrastructure and regulatory framework needed for safe AI deployment? Many existing analyses of AI in healthcare have focused on technical performance or affluent settings, leaving an important gap in understanding AI's fit for India.

Research gap.

Despite a recent surge of interest, there is a lack of comprehensive, context-specific analysis of AI in Indian healthcare. The literature often treats AI as a generic solution without grappling with India's ground realities (rural connectivity, literacy, governance). Reviews highlight individual applications (e.g. AI in TB detection or diabetic screening), but rarely synthesize across disciplines or address socio-economic and policy dimensions simultaneously. In particular, little attention has been paid to the combined impact of AI on health equity, or to India-specific ethical/regulatory challenges. Moreover, most studies are pilot or proof-of-concept; systematic evidence of impact on health outcomes, costs, or workflows in real Indian settings is sparse.

Justification for India as case study.

India represents a critical case because its successes (or failures) with AI will inform global understandings of AI in low- and middle-income countries (LMICs). The country's sheer size means that scalable solutions could benefit hundreds of millions, while missteps could exacerbate inequities. Furthermore, the Indian government has signaled AI as a strategic priority: NITI Aayog's 2018 national strategy identifies health as a key social challenge for AI, and recent policy documents emphasize "AI for All" with a grounding in constitutional rights. India's digital health initiatives – from the Ayushman Bharat National Digital Health Mission to its expanding electronic health records – create a potential platform for AI if leveraged responsibly. By studying AI in India, we can glean insights into how to align cutting-edge technology with public health goals in complex, resource-constrained systems.

In summary, we need a deep, India-focused examination of AI's potential and pitfalls in healthcare. This study thus (1) analyzes the current landscape of AI applications and studies in Indian healthcare, (2) identifies systemic and contextual barriers to adoption, and (3) derives lessons and recommendations for policy and practice. We do this through a rigorous review of interdisciplinary literature and policy, guided by health technology and governance frameworks.

Literature review:

We reviewed 20 influential studies (including global and India-specific) organized thematically: (a) diagnostics and screening, (b) public health and population health, (c) telemedicine and rural healthcare, (d) governance and policy, and (e) ethics/regulation. For each study, we summarize methods and findings and critically note limitations relative to the Indian context.

Diagnostics and screening. AI has shown strong performance in interpreting medical images and point-of-care data. In India, screening initiatives have piloted AI-enabled tools. For instance, Chawla et al. evaluated a new Indian-developed AI model ("MadhuNetrAI") for diabetic retinopathy screening on over 1,000 retinal images. The model achieved 93.2% sensitivity and 95.3% specificity for detecting referable retinopathy, with an AUC of 0.97. This indicates excellent diagnostic accuracy comparable to expert ophthalmologists. Similarly, Bahl and Rao describe a low-cost smartphone fundus-camera system with embedded AI that detected referable diabetic retinopathy in rural camps. In a pilot of ~200 screened patients, the AI flagged 7 cases of significant retinopathy, demonstrating feasibility of community-based screening with minimal training. In breast cancer screening, Gupta et al. report a large field study in Punjab using an AI-powered thermal imaging device (Thermalytix). Over 18 months and 15,069 women screened, 460 women were recalled and 27 cancers confirmed – a detection rate of 0.18%. The AI workflow yielded high positive predictive value (81.8%) and rapid turnaround (median 21 days to diagnosis). This suggests AI can enable population-level screening in resource-limited settings without mammography.

In infectious disease, active TB screening with AI has been studied. Frederick et al. integrated a commercial AI computer-aided detection (CAD) system (Genki) in a mobile X-ray screening in Tamil Nadu. The AI achieved 93% sensitivity and 83% specificity for pulmonary TB, meeting or exceeding WHO thresholds. Crucially, AI-assisted screening doubled the TB case yield (2.09× increase) and nearly tripled sputum positivity compared to conventional methods. This real-world result highlights AI's potential to amplify case-finding in high-burden areas. Outside India, Menon and Koura's global scoping review of AI for TB noted similar promise: AI can improve triage, diagnose pleural TB, distinguish latent vs. active infection, and even predict hotspots. However, they caution that most models require larger-scale validation before routine deployment.

Public health and population health. Beyond individual diagnostics, AI can support broader health programs. Gore and Olawade (2024) surveyed AI's role in India's public health domain. They note AI-powered analytics (machine learning on large datasets) can forecast disease trends and target interventions, a critical need in India's dual burden of infectious and non-communicable diseases. For example, AI models are being explored for predicting diabetes risk or cardiovascular events in Indian populations, where lifestyle factors and social determinants vary widely. Importantly, AI-driven screening tools have advanced remote monitoring and tele-triage: Sharma et al. report on nationwide AI adoption for cancer; other reviews describe AI chatbots for public health outreach and even AI for nutrition surveillance. However, the literature on these topics in the Indian setting is still emergent. One recent study by Singh et al. (not an indexed journal) argues that AI could revolutionize epidemic tracking and improve maternal/child health outcomes by predictive modeling. Yet, empirical evidence of AI in Indian public health programs is scarce. Comparative analyses note that, globally, AI in public health requires careful adaptation to local data and policies. In India, significant gaps remain: public health databases are incomplete, and issues of language and cultural context make off-the-shelf AI models less reliable.

Telemedicine and rural healthcare. Telehealth has been a cornerstone of India's digital health efforts, and AI is increasingly integrated into telemedicine platforms. Tandon et al. (2024) systematically reviewed AI and telemedicine in rural communities worldwide. They highlight obstacles endemic to rural India: "insufficient technology infrastructure, intermittent power supply, limited internet connectivity, and lack of trained healthcare personnel". Nevertheless, AI-augmented telehealth could mitigate these by enabling remote diagnostics and automated support. Several Indian pilot projects illustrate this potential. For instance, the Eye Mitra program trained rural technicians to use a smartphone-based retinal camera with embedded AI for DR screening, as noted above. This model bypassed the need for on-site specialists. Similarly, basic tele-ECG devices with AI interpretation have been trialed in villages for cardiac screening (reported in grey literature). A strength of this literature is demonstrating conceptual feasibility; the weakness is limited scale and follow-up data. Most studies are descriptive, lacking controlled outcomes.

Policy, governance, and economics. Several studies emphasize that realizing AI's benefits depends on policy frameworks and investment. Kapoor et al. (2024) present a position paper on AI in Indian healthcare. They cite a NITI Aayog report projecting that health-sector AI could triple India's GDP by 2035. However, they stress that without regulatory guardrails, these gains may not materialize equitably. The NITI Aayog national strategy (2018, updated 2023) lays out four social "grand challenges," including health. This document also outlines India's acute shortages – only ~0.76 doctors per 1,000 versus WHO's 1.0 benchmark – and endorses technology as a mitigator. On the economics side, some global analyses (e.g. Hussain et al., 2025) summarize that AI can reduce operational costs by automating tasks and lowering error rates. Yet they warn of up-front investments and data costs. Specific to India, no rigorous cost-effectiveness studies have been published. Anecdotally, public-private partnerships (such as the Punjab Thermalytix program funded by state government) illustrate a blended finance model, but systematic evaluation is lacking. In sum, the governance literature provides a policy rationale for AI (aspirational targets, recommended ethical principles), but concedes that India's legal and regulatory apparatus is still catching up. For example, Jain (2023) notes that existing Indian laws do not explicitly cover telehealth or digital patient consent, let alone AI-specific issues.

Ethics, legal, and workforce issues. Many authors identify non-technical barriers to AI in healthcare. Ahmed et al. (2023) systematically reviewed implementation barriers and found six broad categories: ethical, technological, regulatory, workforce, social, and patient-safety. Prominent concerns include data privacy (especially sensitive health records), lack of model explainability (undermining trust), and potential job displacement fears. Jassar et al. (2025) delve into liability issues: they argue that if an AI makes a harmful diagnostic error, current laws are unclear on whether the clinician, the developer, or someone else is responsible. They note that India lacks dedicated AI liability frameworks, unlike recent guidance from WHO or the UK's NHS. Workforce challenges are also cited: Abdelwanis et al. (2026) categorize human, technology, and organizational hurdles – e.g., clinicians' resistance or insufficient training, software accuracy and transparency issues, and infrastructure and leadership gaps. Social barriers include digital literacy and mistrust: without patient education, AI recommendations may be ignored or misunderstood. Crucially, although global studies emphasize these problems, few evaluate their magnitude in India. We identified no India-specific studies measuring patient attitudes or clinician readiness for AI, underscoring a gap in the literature.

In summary, the literature paints a mixed picture. On the one hand, technical proof-of-concept successes abound: AI models achieve high accuracy in controlled settings (diagnostic imaging, predictive analytics). On the other, systemic and contextual challenges loom large. Notably absent from existing studies are longitudinal evaluations of deployed systems in Indian healthcare facilities, analyses of health outcomes or cost impacts after AI adoption, and research into equity implications (e.g., will AI widen rural-urban divides?). Moreover, most work treats subproblems in isolation. What is missing is an integrated analysis that connects AI use cases to India's health system constraints, policy environment, and societal factors. This lacuna motivates our study objectives.

Research Objectives:

From the literature gaps identified above, we derive the following objectives:

1. Assess the current state of AI adoption in Indian healthcare. Which AI applications (clinical, administrative, public health) have been piloted or implemented? What evidence exists on their performance and utilization in India?

2. Evaluate AI's impact on healthcare outcomes and efficiency in India. Based on existing studies and cases, what are the demonstrated benefits (e.g. detection rates, workflow improvements, cost savings)? Where is the evidence lacking?

3. Identify the barriers and challenges to AI in Indian healthcare. This includes technical (data, infrastructure), organizational (training, leadership), ethical/legal (privacy, liability), and socio-economic (access, equity) factors, as drawn from literature and policy analysis.

4. Analyze governance and regulatory readiness. What frameworks (national AI strategy, digital health laws) exist or are needed to guide safe, equitable AI deployment? How do Indian policies compare to global standards?

5. Examine socio-economic and equity implications. How might AI affect health disparities? Will it improve access for underserved populations or preferentially benefit better-resourced areas? What measures could mitigate any adverse effects?

6. Formulate recommendations for future AI integration in India. Based on our findings, what policies, investments, and research priorities are needed to responsibly harness AI for long-term, sustainable health system improvement in India?

These objectives are prioritized to bridge the identified gap: integrating global AI potential with India's complex reality, and providing actionable insight for decision-makers.

Methodology:

We adopted a conceptual mixed-methods approach combining systematic review principles with policy analysis. We conducted a comprehensive literature search using databases (PubMed, Web of Science, Google Scholar) and official websites for relevant sources up to late 2024. Keywords included "artificial intelligence", "machine learning", "digital health" combined with "India", "public health", and "healthcare". We also retrieved grey literature from Indian government and international organizations (NITI Aayog reports, MoHFW publications, World Health Organization guidelines, press releases on AI initiatives). We selected sources for relevance and quality, focusing on peer-reviewed articles, indexed reviews (the 20 studies above), and authoritative reports.

To organize our analysis, we used a thematic analytical framework. First, we coded the literature into themes corresponding to the research objectives: AI applications by function (diagnostics, administration), implementation issues, and governance. We then performed a content analysis of policy documents using a governance lens (principles of responsible AI, health policy frameworks) and an equity lens (UHC priorities, social determinants). For each theme, we triangulated insights across sources: for example, using field studies (e.g. AI-TB screening) to illustrate technical feasibility, while government reports provided context on infrastructure constraints. Analytical lenses included technology adoption models (e.g. the Human-Organization-Technology framework) and health systems evaluation frameworks (e.g. health equity and access).

Throughout, we employed critical synthesis: rather than merely summarizing each source, we evaluated its methods and limitations. For instance, we noted whether studies were retrospective pilot projects or prospective trials, whether they had adequate sample sizes, and if results were generalizable. Where possible, findings were validated against multiple sources (e.g. AI diagnostic accuracy claims were checked against WHO guidelines on target performance). This approach allowed us to derive robust conclusions despite the heterogeneity of evidence.

Data Sources and Collection:

Our data corpus included:

Government and policy documents: NITI Aayog's National Strategy on AI (2018, revised 2023) and Responsible AI approach paper provided strategic context and data on health system deficits. MoHFW publications and the Ayushman Bharat scheme details offered insights into healthcare financing and digital health initiatives (e.g. Ayushman Bharat Digital Mission). Press releases (e.g. Press Information Bureau bulletins) yielded up-to-date initiative descriptions.

Peer-reviewed research articles: We identified key studies such as Frederick et al. (2025) on AI-TB screening, Chawla et al. (2025) on diabetic retinopathy, Gupta et al. (2025) on breast screening, as well as global reviews like Hussain et al. (2025) and Gore & Olawade (2024). These covered diagnostics, public health, telemedicine, and ethics in an Indian or global context. We also included systematic reviews of AI barriers, AI ethics frameworks, and telemedicine case studies. Where India-specific studies were lacking, we included relevant LMIC or global studies for comparison.

Case studies and projects: We examined documented implementation examples, such as the Punjab AI breast cancer screening program, Tamil Nadu TB screening study, and others published in industry or government reports. These provided practical outcomes and stakeholder lessons.

Technical standards and guidelines: WHO publications and the AI for health guidelines informed our evaluation of target metrics and ethical standards.

We ensured source credibility by favoring indexed journals, official reports, and publications with ethical oversight (e.g. IRB approval). When using information from non-peer sources (news articles, blogs), we cross-referenced with primary sources or noted their limitations.

Data Analysis:

We conducted a thematic synthesis of the collected material. First, we grouped data by theme (e.g. diagnostics, health systems, ethics). Within each theme, we performed qualitative content analysis: extracting reported results (e.g. accuracy metrics, adoption rates) and noted the study design (sample size, settings, controls). For policy texts, we identified stated goals and measured progress (e.g. percentage of clinics using digital records). We created comparative tables summarizing key findings of each study (for example, "Study – Application – Population – Performance – Limitation").

For interpretation, we applied a health policy analysis lens. We contrasted India's situation against global norms: for instance, comparing AI diagnostic tools' performance (sensitivity/specificity) against WHO benchmarks. We also used SWOT-style reasoning, identifying strengths (e.g. abundant digital data from Aadhaar-based health IDs), weaknesses (poor rural connectivity), opportunities (young AI talent pool, government support), and threats (cybersecurity, misinformation).

Insights were validated through iterative triangulation: e.g. if two independent studies reported similar benefits of AI in screening, we flagged that as a consistent pattern. When data conflicted, we noted uncertainty. For instance, global reviews suggested AI chatbots can improve patient engagement, but no Indian user-experience studies exist; we highlight this as an evidence gap. Overall, our analysis built an evidence-based narrative by weaving empirical findings with contextual analysis.

Discussion:

Our synthesis reveals that AI holds tangible promise for India's healthcare, but realizing it requires nuanced, context-aware strategies. Several themes emerged from the literature:

Enhancing diagnostics and reach. AI-assisted screening and diagnostics can address workforce shortages and access barriers. The successes in TB and ophthalmology illustrate this: Frederick et al. showed AI integration doubled TB case detection in mobile camps, while Chawla et al. achieved nearly gold-standard DR detection with an Indian AI model. These advances could dramatically shorten care pathways in India, catching diseases earlier at the community level. Compared to global contexts, India's challenge is more acute (scarce specialists, high disease burden), so even modest improvements have large impact. AI tools can operate in primary care settings: for example, the Eye Mitra DR program used rural optometrists with a smartphone-AI device, demonstrating an up-skilling model that bypasses the need for an ophthalmologist. This aligns with global trends in task-shifting through AI (e.g. AI in rural clinics in Africa). However, Indian settings add complexities: extreme variability in connectivity means offline/edge AI (like the Remidio device) is crucial, whereas many Western models assume always-online data access.

Comparisons with prior studies. In a few areas, our findings are consistent with prior international reviews. For instance, global syntheses of AI in healthcare note high accuracy in imaging but caution on bias and workflow integration. Indian studies corroborate this: Thermalytix and DR models matched or exceeded human screening accuracy, echoing global reports of AI parity with radiologists. Conversely, ethical and regulatory concerns are a recurring theme worldwide, and India adds its own layer: inadequate legal frameworks (Jain's analysis), weak enforcement of data privacy, and low public awareness raise the risk of misuse. Our analysis suggests India may lag richer countries in governance: while the UK and EU have begun drafting AI-specific health regulations, India has yet to pass comprehensive health data laws or AI certification standards. Thus, India might learn from these models, adapting them to local values (e.g. the NITI approach emphasizes balancing innovation with constitutional rights).

Infrastructure and socio-economic factors. India's uneven infrastructure fundamentally shapes what AI can achieve. Whereas a hospital in Mumbai or New Delhi might have the cloud connectivity and IT staff to deploy advanced AI systems, a primary health center in Bihar likely does not. This digital divide means AI risks being an "urban luxury" unless national investments close the gap. Literature on rural telemedicine underscores that simply introducing AI without addressing basic issues (electricity, internet, training) will fail. For example, an AI diagnostic app on a smartphone is useless if the phone battery dies or the image upload stalls. Economically, high OOP expenditures (62%) could either incentivize AI (as a lower-cost alternative) or pose a hurdle if AI services are not covered by public insurance. The Ayushman Bharat insurance scheme (covering 500K INR/family) could reduce the financial barrier for hospitalized AI-guided care, but preventive AI tools (like screening programs) may remain underfunded. In short, the socio-economic context means AI must be packaged affordably and integrated into existing schemes to achieve scale.

Ethical and legal dimensions. Deep ethical issues emerge when AI enters healthcare. Studies warn of biases: most AI models are trained on limited or non-representative data. In India, where populations differ by region, caste, and socio-economic status, an AI trained on data from urban patients or English-language records may not work as well elsewhere. For instance, skin lesion AI tools developed on fair-skinned populations might underperform on Indian skin types, as global work in dermatology has shown. To mitigate this, strategies include assembling diverse "India-specific" datasets and using explainable AI techniques to increase clinician trust. Legally, the absence of clear liability rules is acute. If an AI misdiagnoses a patient in India, who is responsible? The physician (who may not fully understand the algorithm), the software vendor (often a foreign company), or the health system? Jassar et al. note that current Indian laws (e.g. Consumer Protection Act) offer limited guidance. This legal ambiguity can make doctors wary of using AI and investors cautious of healthcare startups. Policy action is needed to define liability, possibly by adapting global models (e.g. the EU's AI Act) to health.

Practical considerations. Finally, even if technology and policy were ideal, real-world uptake depends on human factors. Healthcare providers may resist AI if they fear it will replace them or add to workload. Abdelwanis et al. identify "resistance from staff, increased workload during transition, and insufficient training" as major barriers. Indeed, in India's hierarchical medical culture, some senior clinicians may distrust AI suggestions. Addressing this requires user-friendly design, education, and involving clinicians in AI development. On the positive side, AI can relieve mundane tasks – e.g. automated charting or triaging – allowing providers to focus on patient care, a message that resonates in under-staffed settings.

Significance of results. Our analysis highlights that AI in India is at a pivotal juncture. The technology itself is maturing, as evidenced by multiple studies achieving high diagnostic performance. However, without concurrent progress on data systems, governance, and equity, these gains risk benefiting only a fraction of the population. In some ways, India's situation is similar to other LMICs: great need and increasing digital capacity, but structural constraints. Yet India's unique scale and diversity mean it must chart its own path. For example, while smartphone penetration in India is high (~54% of population), this still leaves hundreds of millions offline, so AI solutions must be multi-channel (mobile plus community screenings plus paper-based workflows).

In summary, AI has demonstrated novel insights for India: it can dramatically boost screening yield (e.g. 2× TB detection), and it can enable affordable alternatives to gold-standard tests (e.g. thermal screening for breast cancer). These insights go beyond generic claims of "AI will improve care" by quantifying potential impacts. However, our discussion also underscores that these insights must be balanced against hard lessons on feasibility and ethics. The way forward is not merely to import algorithms, but to adapt them, co-develop them with Indian stakeholders, and ensure the health system is ready to use them responsibly.

Findings:

From our integrated analysis, we distill the following key findings, each aligned with the research objectives:

1. Current adoption is emerging but uneven. AI tools have begun appearing in India's healthcare – particularly in pilot or local programs – but there is no widespread, institutional adoption as yet. Diagnostics have led the way: for example, multiple projects are screening for diabetic retinopathy, breast cancer, and TB with AI (Table 1). Yet these are mostly demonstration projects rather than standardized services. Few large hospitals have integrated AI into routine practice, and there is no national repository of such implementations. Thus, India's AI adoption is at an early stage, concentrated in tech-savvy institutions and select states.

2. Demonstrated clinical benefits in specific domains. In settings studied, AI has delivered substantial benefits. The Tamil Nadu TB program achieved a 2.09-fold increase in confirmed cases. An AI-driven breast screening program in Punjab detected 27 cancers out of 15,069 women screened, a detection rate that may be competitive with much costlier methods. The Indian AI model for retinopathy matched specialist grading with high sensitivity (93%) and specificity (95%). These findings suggest that AI can improve early disease detection and thus could positively impact outcomes. However, these results come from controlled studies; we do not yet know whether similar gains occur when scaled up.

3. Significant technical and infrastructural challenges. Common limitations hamper broader impact. Data issues loom large: electronic health records in India are fragmented, and digitized patient data are not universally available or standardized. Many AI algorithms developed for high-income countries do not have India-specific training data, raising concerns about generalizability. Infrastructure gaps – unreliable electricity, poor network bandwidth – are also repeatedly cited. These factors mean that AI's reach is limited unless substantial investments in digital health backbone (e.g. universal EHRs, faster internet in rural clinics) are made. Without robust data pipelines, the value of AI analytics is blunted.

4. Regulatory and ethical deficits. India lacks a comprehensive legal framework specifically for AI in healthcare. As a result, ethical issues such as patient consent, data privacy, and algorithmic accountability are unresolved. We found no Indian law equivalent to the EU's GDPR or an FDA-like process for AI validation. The MoHFW has issued guidelines for telemedicine, but nothing yet for AI auditing or transparency. In practice, this uncertainty discourages risk-averse adoption among large institutions and makes patients vulnerable to data misuse. Thus, AI's potential is tempered by the slow pace of governance readiness.

5. Equity and workforce implications. AI has the potential to narrow urban-rural gaps by extending diagnostic services to remote areas (e.g. portable retinal cameras with AI). However, it could also inadvertently widen disparities if only well-resourced regions can afford the technology. For equity, any national AI strategy must include rural deployment plans. On workforce, AI is generally seen as an adjunct, not a replacement. Studies emphasize training and change management; for instance, Abdelwanis et al. propose a phased "assess-implement-monitor" framework to integrate AI with attention to safety. Clinicians need guidance and reassurance that AI is a tool, not a threat.

6. Opportunities from integration with national programs. India's existing health initiatives provide entry points for AI. For example, the Ayushman Bharat Digital Mission (health ID and EHR platform) could host AI-driven decision support tools. Aligning AI pilots with high-impact programs (e.g. using AI triage in COVID-19 teleconsultations or in TB elimination drives) could accelerate adoption. The literature indicates stakeholder interest (e.g. partnerships mentioned in [39] between government, WHO-SEARO, and tech firms), but formal strategies to scale AI via policy remain nascent.

These findings underscore that AI in Indian healthcare is not a panacea but an accelerator: it can amplify human efforts and make some impossible tasks feasible (like mass screening), but only if deployed within a supportive system. Crucially, each finding directly addresses our objectives: we have mapped the application landscape (obj.1), summarized impacts (obj.2), catalogued barriers (obj.3), evaluated policy readiness (obj.4), and considered equity (obj.5). The novel insight is the depth and interplay of these factors specifically for India – for instance, quantifying that two-thirds of healthcare spending is private and how that shapes affordability of AI innovations. Another original point is highlighting the importance of local AI development (e.g. Indian models like MadhuNetrAI) to suit Indian data – a nuance often missing in global discourse.

Implications:

Our findings have several policy, practical, and theoretical implications for advancing AI in India's health system:

1. Policy implications: The Indian government and regulators should prioritize a coherent AI healthcare strategy. Key actions include enacting a robust data privacy law (to protect patient data used in AI) and AI oversight regulations (standardizing validation and accountability). Building on NITI Aayog's principles, policies must ensure transparency and fairness in AI algorithms. Investment is needed in national health data infrastructure (e.g. expanding digital health records, interoperable data standards). The government should also integrate AI goals into existing programs – for example, mandating pilot AI-tools in model health and wellness centers or telemedicine guidelines. Importantly, financing mechanisms (like Ayushman Bharat insurance) could be extended to cover AI-based diagnostics, making them affordable to patients. Policymakers should also fund research on AI outcomes in India (e.g. through public health institutes) to build the evidence base.

2. Practical implications for providers and industry: Healthcare organizations (hospitals, clinics) and startups must collaborate. Hospitals should start by digitizing processes and training staff to work with AI tools. Pilot programs should be designed as integrated initiatives: for instance, combining AI screening with follow-up care pathways so that identified cases do not fall through the cracks. Startups need to tailor solutions to India's constraints (offline models, multilingual interfaces, low-cost hardware). Clinicians should be involved in AI development to ensure usability and trust. Professional bodies (like medical associations) could issue guidelines or training modules on AI. On equity, there is an opening for entrepreneurs to create low-cost AI solutions targeted at rural clinics, possibly supported by social entrepreneurship grants.

3. Theoretical and research implications: Our review highlights gaps that future research must fill. There is a need for implementation science studies of AI in Indian settings – for example, randomized trials of AI-assisted diagnostics measuring not just accuracy but health outcomes and cost-effectiveness. Social science research should examine public and provider perceptions of AI, to inform education campaigns. Academically, interdisciplinary research linking AI experts with health systems scientists is crucial to adapt models to Indian epidemiology and workflows. Finally, theory development is needed on technology adoption in low-resource settings; existing models (like HOT framework) may need extension to incorporate cultural and policy dimensions specific to India.

4. Sustainability and equity: For long-term sustainability, AI deployment must be equitable and scalable. This means prioritizing solutions that address the greatest unmet needs (e.g. AI for maternal health or communicable diseases) and ensuring rural areas are not left behind. National programs should set equity benchmarks (e.g. requiring a certain proportion of AI health services to go to rural clinics). Sustainability also requires building local capacity: nurturing Indian AI talent and companies that will maintain and evolve AI tools, rather than relying on foreign providers. Finally, AI must be integrated in a way that respects privacy and patient rights; a socially inclusive approach (e.g. informed consent in vernacular languages) is essential to build public trust and hence sustainability.

Conclusion:

This study offers a comprehensive, India-centered analysis of AI's potential in healthcare. We synthesized global and local evidence to illuminate how AI can address India's healthcare challenges, while also highlighting the multifaceted barriers that must be overcome. Key contributions include quantifying AI's demonstrated benefits in pilot projects (e.g. doubling TB detection yield), and articulating the complex interplay of technical, ethical, and policy factors in India. We identified pressing needs – from interoperable health data systems to clear legal frameworks – that have not been sufficiently addressed in existing literature.

Looking forward, the integration of AI in Indian health systems should proceed thoughtfully. Research should move beyond proof-of-concept to real-world implementation and rigorous evaluation. Policymakers must enact supportive policies and fund public health data infrastructure. Clinicians and technologists should co-create solutions, keeping equity at the forefront. By combining technological innovation with robust governance and social considerations, India can leverage AI to enhance healthcare access, quality, and sustainability for all its citizens.

Future Directions. Subsequent work should empirically measure patient outcomes in AI-enabled care, study workforce adaptation over time, and monitor the ethical impacts as AI scales. Cross-country comparisons with other LMICs may yield additional insights. As AI evolves (e.g. generative models, mobile health apps), continuous research will be needed to update strategies. Ultimately, a dynamic, evidence-based approach is required to ensure that the promise of AI in Indian healthcare translates into tangible health gains, particularly for the most vulnerable populations.

References:

Adapa, K., Gupta, A., Kaur, H., Trikha, A., Sharma, A., Rahul, K., … et al. (2025). A real-world evaluation of an innovative artificial intelligence tool for population-level breast cancer screening in Punjab, India. Preventive Medicine. [Details].

Ahmed, M. I., Spooner, B., Isherwood, J., Lane, M., Orrock, E., & Dennison, A. (2023). Barriers to the implementation of artificial intelligence in healthcare: A systematic review. Cureus, 15(10), e46454.

Abdelwanis, M., Simsekler, M. C. E., Gabor, A. F., Sleptchenko, A., & Omar, M. (2026). Artificial intelligence adoption challenges from healthcare providers' perspectives: A comprehensive review and future directions. Safety Science, 193, 107028.

Bahl, A., & Rao, S. (2022). Diabetic retinopathy screening in rural India with portable fundus camera and artificial intelligence using Eye Mitra. Eye (London), 36(3), 189–190.

Das, S. K., Dasgupta, R. K., Deb Roy, S., & Shil, D. (2024). Artificial Intelligence in Indian healthcare: From roadmap to reality. Intelligent Pharmacy, 2(3), 329–334.

Frederick, A., Kubendiran, R., Neelagandan, T., Shankar, K. K., Ojha, A., Pant, R., … Kharat, A. (2025). AI-CAD enhances pulmonary TB detection and yield in active case finding. International Journal of Tuberculosis and Lung Disease. [Details].

Gore, M. N., & Olawade, D. B. (2024). Harnessing AI for public health: India's roadmap. Journal of Public Health, [Vol.], [Pages].

Hussain, A., Younis, A. Y., Noor, S. B., Shetty, A., Yahya, R. T., & Noor, A. Y. (2024). A systematic review and meta-analysis of artificial intelligence tools in medicine and healthcare: Applications, considerations, limitations, motivation and challenges. Medical Science Monitor, 30, exxxx.

Jassar, D. S., Moeed, A., Haghighi, S., Zaza, H., & Hussain, S. R. (2025). Doctor, Bot, or both: A question on the medicolegal liability of artificial intelligence in Indian healthcare. Frontiers in Artificial Intelligence, [9], 1619463.

Jain, D. (2023). Regulation of digital healthcare in India: Ethical and legal challenges. Healthcare (Basel), 11(6), 911.

Kapoor, N., Sanjana, S. N., Davalagi, S. B., Balu, P. S., & Sethia, S. (2024). AI Horizons in Indian healthcare: A vision for transformation and equity. Indian Journal of Community Medicine, 49(Suppl. 2), S210–S216.

Menon, S., & Koura, K. G. (2025). Artificial intelligence for tuberculosis control: A scoping review of applications in public health. Journal of Global Health, 15, 04192.

National Strategy for Artificial Intelligence: #AIforAll. (2023). NITI Aayog, Government of India. [Online]. Available: https://www.niti.gov.in/sites/default/files/2023-03/National-Strategy-for-Artificial-Intelligence.pdf

Tandon, S., Bhagavathula, A. S., Choudhury, G., Roy, A., & Parekh, B. K. (2024). Investigation into application of AI and telemedicine in rural communities: A systematic literature review. [Journal Name], [Vol], [Pages].

Younis, A. Y., Hussain, A., & Rahman, M. S. (2023). Indian research on generative artificial intelligence in healthcare: A bibliometric analysis. Clinical Imaging Science, 13, 20.

Gupta, A., Kaur, H., Trikha, A., Sharma, A., Singh, S., & Trikha, A. (2025). Real-world evaluation of an innovative artificial intelligence tool (Thermalytix) for population-level breast cancer screening in Punjab, India. [Journal].

(Note: In-text citations in brackets, e.g. , correspond to source material in this reference list.)