

ISSN- 0301-1216  
*Indian J. Prev. Soc. Med. Vol. 55, No.4, 2024*

## Using Artificial Intelligence in Healthcare Sector: Mapping the Issues and Challenges in India

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### ABSTRACT

**Background:** AI refers as intelligent machines working on the basis of human cognitive functions such as learning and problem solving. Scholars of this area have confidence that AI will shape the future of the public health. The fundamental question is how AI could shape the future of public health from personal level to system level. AI comes with huge opportunities and challenges. On one side it is going to transform the health care sector with disease prediction, prevention, personalized treatment plans and remote health care and many more, on the other hand AI introduces a huge challenge which includes privacy, data security and cyber-attack. In this backdrop the present paper tried to identify different challenges which are obstacles in facilitating the safe and effective use of AI in health Care and tried to identify key consideration for integrating AI in health sector. **Objective:** This paper attempts to highlight the general and peculiar challenges which India faces in the effective implementation of AI in the health sector. **Methodology:** The Paper is primarily prepared on the basis of doctrinal research which includes primary sources such as the report of NITI Ayog and other Government documents.

**Keywords:** AI, Health Care, Cyber Security, Computing Resources, Ethical Concern

### Introduction

Prof. Daniel Rueckert in an interview observed that ‘an experienced doctor may not have seen all types of cancer but the algorithms can pool the data from thousands of rare cases’ he was referring to the potential that Artificial Intelligence (AI) can play in the health care systems across the globe.<sup>1</sup> The observation made by the Professor is not far-fetched as AI is already making great changes in many sectors including health and its impact is being felt globally. It is possible because Artificial Intelligence (AI) constitutes a type of “intelligent computing” that mimics human cognition via computer programs capable of perception, reasoning, learning, action, and adaptation. It is designated as “intelligent” due to its emulation of human cognitive processes, and “artificial” since it depends on computational rather than biological information processing.<sup>2</sup> AI which is designed to act and respond like humans are in certain cases have the potential to surpass human deficiencies. In the medical examinations and images, the health professionals may miss critical things for many reasons such as insufficient training, cognitive abilities, work pressures etc. but AI with a lot of data can predict, assess and assist the observer in being able to diagnose the disease correctly.<sup>2</sup> AI has successfully analyzed skin cancer images more accurately than dermatologists and helped to diagnose diabetic retinopathy.<sup>3</sup> An insight report from the World Economic Forum’s Digital Healthcare Transformation Initiative has identified the potential for digital data and AI to tackle three of the most pressing healthcare challenges: the increasing burden of chronic illnesses, inequitable patient outcomes and healthcare access worldwide, and resource constraints<sup>4</sup>. Number of studies have highlighted the potential of AI in disease prediction and prevention<sup>5</sup>, personalized treatment plans<sup>6</sup> remote health care<sup>7</sup>, drug discovery and development<sup>8</sup>, health provider operations and resource management.<sup>9</sup>

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Submission	25.11.2024	Revision	11.12.2024	Accepted	20.12.2024	Printing	31.12.2024
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*Prior Publication: Nil; Source of Funding: Nil; Conflicts of Interest: None, Article #623/ 862*

However, these potentials of AI come with huge challenges. The WHO chief has admitted that when using health data, however, AI systems could potentially access sensitive personal information, necessitating robust legal and regulatory frameworks for safeguarding privacy, security, and integrity.<sup>10</sup> AI systems are dependent on the data on which they are trained upon. Consent which forms the basis of the majority of medical data is now covered by the General Data Protection Regulation (GDPR) of Europe. The extensive detailing of data in Europe impacts the maintenance, use, handling and processing of medical data for AI training and development. Such regulations can help manage the risks of AI biases in training data. Bringing objectivity in the training data itself is very challenging as it is difficult for AI models to accurately represent the diversity of populations, leading to biases, inaccuracies, or even failure. Significant risks associated with the use of AI in healthcare include privacy and data security concerns, as sensitive health information may be vulnerable to breaches and cyber-attacks. There is also the potential for bias and discrimination in AI algorithms, which can lead to inequitable healthcare outcomes. Additionally, the implementation of AI may disrupt job functions, causing workforce displacement and burnout among healthcare professionals. Unclear accountability for harms caused by AI solutions further complicates the landscape, while the risk of over reliance on AI could undermine clinical judgment.<sup>11</sup>

Despite the roadblocks, AI can help address some of health's largest challenges including a depleted workforce, future threats to public health, ageing populations, and increasing complexity of health due to multiple chronic conditions.<sup>12</sup> This paper attempts to highlight the general and peculiar challenges which India faces in the effective implementation of AI in the health sector based on the use cases.

#### **Development of AI led Digital Healthcare in India**

The healthcare sector is witnessing strong growth led by government and corporate investments in coverage and quality. However, despite the sector's scale, growth and investments by both public and private players to bolster the quality and coverage of medical products and services, India still ranks low on the Healthcare Access and Quality (HAQ) index, and the sector faces several challenges.<sup>13</sup> The Indian healthcare sector is growing rapidly and is projected to reach \$638 billion by 2025. The health sector has experienced a massive surge in private healthcare spending during and post-COVID-19, with the hospital market size growing from \$62 billion in 2020 to \$132 billion in 2022-23. In pharmaceuticals, India emerged as a global vaccine hub, led by organizations like the Serum Institute and Bharat Biotech. In diagnostics, a core shift occurred towards digital diagnostics, while demand for home testing kits accelerated post pandemic. Additionally, the functional foods and personalized nutrition market is growing at a 16% CAGR and is expected to reach \$12 billion by 2027. Meanwhile, the fitness and wellness industry are projected to grow at a 27% CAGR, reaching \$12 billion by 2025.<sup>14</sup> In March 2023, the Indian Council of Medical Research (ICMR) released "The Ethical Guidelines for Application of AI in Biomedical Research and Healthcare," and outlined ten patient-centric ethical principles for AI use in healthcare.<sup>15</sup> The All India Institute of Medical Sciences (AIIMS), New Delhi signed a Memorandum of Understanding (MoU) with Wipro GE Healthcare Pvt. Ltd., to establish an AI Health Innovations Hub at the Centre. The new hub will focus on the development of products and solutions that enhance healthcare delivery and outcomes through more precise diagnosis, innovative treatment protocols, and real-time patient data tracking.<sup>16</sup> The National Health Authority (NHA) and IIT Kanpur signed a Memorandum of Understanding (MoU) wherein a federated learning platform across a variety of machine learning model pipelines, a quality-preserving database, an open benchmarking platform for comparing & validating AI models, and a consent management system for research under *Ayushman Bharat* Digital Mission (ABDM) would be developed by IIT Kanpur. The platform will subsequently be operated and governed by NHA, thereby unlocking the immense potential of AI for improving health outcomes.<sup>17</sup>

The draft national strategy for artificial intelligence released by NitiAyog provides an opportunity to undertake some of the biggest challenges of providing affordable health care to all. The government is trying to create a national digital health infrastructure and national digital health blueprint. The prioritization of AI for healthcare has created an impetus for greater collaboration between government, technology companies and traditional healthcare providers. NITI Aayog is working with Microsoft and Forus Health to roll out a technology for the early detection of diabetic retinopathy as a pilot project. 3Nethra, developed by Forus Health, is a portable device that can screen for a common eye problem.

Integrating AI capabilities to this device using Microsoft's retinal imaging APIs enables operators of the 3Nethra device to get AI-powered insights even when they are working at eye checkup camps in remote areas with nil or intermittent connectivity to the cloud.<sup>18</sup> The Maharashtra state government has also signed a memorandum of understanding with NITI Aayog and the Wadhvani AI group to launch the International Centre for Transformational Artificial Intelligence (ICTAI), focusing on rural healthcare.<sup>19</sup> Similarly, the Telangana state government has adopted the Microsoft Intelligent Network for Eyecare, which was developed in partnership with Hyderabad-based LV Prasad Eye Institute.

The challenge of delivering quality healthcare at scale presents a strong case for developing AI-based solutions for healthcare in India. However, this process is unlikely to be straightforward or simple, and several questions arise as to the likely challenges and risks for developing AI-based solutions for healthcare in India?

### **Challenges in the execution of AI in India**

The challenge of delivering quality healthcare at scale presents a strong case for developing AI-based solutions for healthcare in India. However, a complex health landscape involving numerous stakeholders, competing priorities, entrenched incentive systems and institutional cultures give rise to a range of challenges and risks across the stages of development, adoption and deployment. The quality of digital infrastructure, affordability, and variable capacity among states and medical professionals are likely to result in adoption of AI applications primarily by India's well-established private hospitals. This in turn could result in new inequities in access to quality healthcare.<sup>20</sup> Although the potential of AI in healthcare is manifold, in reality the application of AI faces significant challenges. Some of these challenges are as follows:

**Data quality and accessibility:** One of the primary challenges is the availability and quality of healthcare data. While AI algorithms thrive on vast datasets, Indian healthcare records often lack standardization, making it difficult to feed AI systems with consistent and reliable information. Moreover, data silos among various healthcare providers impede seamless information sharing. To address this, the government and private sector need to collaborate in creating a unified digital health infrastructure, ensuring data privacy and accessibility.<sup>21</sup> AI systems are complex, dependent not only on the constituent code but also on the training data, clinical setting and user interaction. They are often situated in a complex clinical pathway or are being introduced into new clinical pathways altogether (e.g. into new telemedical pathways or as part of new triage tools). Therefore, for AI systems, safety and performance can be highly context-dependent.

People often go to different doctors, even for the same diagnosis or treatment; even large hospitals do not have loyal patient followings. A large proportion of these healthcare providers are unaccredited and informal health practitioners, with non-standardized data collection, recording and analysis systems, and differing approaches to medical care more generally.

Digitization practices are poor, uneven and not standardized; and there is no centralized database for health records in India. Even in large hospitals, it is often the case that every time a patient visits, a new registration number or patient file is created for them, and doctors' prescriptions are handwritten. Frontline health workers in India record patient histories in notebooks, using their own systems of annotation. The data that are readily available for AI companies are thus likely to be unrepresentative of a significant part of the population.<sup>22</sup>

**Lack of AI-ready infrastructure:** The implementation of AI in healthcare requires robust technological infrastructure, including high-performance computing, data storage capabilities, and network connectivity. Unfortunately, many healthcare facilities in India, especially in rural areas, lack such advanced infrastructure. Investment in upgrading healthcare facilities with AI-ready technology is imperative to democratize access to AI-powered health-care across the country.<sup>23</sup>

**Regulatory and ethical challenges:** The introduction of AI in healthcare raises ethical questions concerning patient data privacy, algorithm transparency, and the potential for bias in AI decision-making. Establishing clear regulations and guidelines to govern AI's use in healthcare is crucial. Striking a balance between innovation and safeguarding patient rights will require active involvement from regulatory bodies, policymakers, and stakeholders to build a transparent and responsible AI framework.<sup>24</sup> Navigating the complex regulatory landscape to ensure AI systems meet all legal and ethical standards can be challenging. Developers should engage with regulatory authorities early in the development process to understand requirements and ensure compliance. This includes documenting the intended use, analytical and clinical validation, and post-market surveillance plans.

**Documentation and Transparency:** Documentation and transparency are fundamental principles vital for enabling scientific and regulatory evaluations of AI systems. These principles not only foster trust in the AI system itself but also build confidence among developers, manufacturers, and end-users. Detailed and precise documentation is crucial for ensuring a transparent assessment of AI systems in healthcare. This involves adopting a total product lifecycle approach, which includes pre-specifying and recording processes, methodologies, resources, and decisions during the stages of conception, development, training, deployment, validation (such as data curation or model fine-tuning), and post-deployment of health-related AI systems subject to regulatory oversight.

The documentation should facilitate the tracking, recording, and retention of key steps and decisions, along with justifications and reasoning for any deviations from initial plans. Moreover, effective documentation can demonstrate that developers and manufacturers have considered the full complexity of the context in which the AI system is designed to function.

**Cyber security Threats and Vulnerabilities:** AI systems are susceptible to cyber security threats that can compromise the confidentiality, integrity, and availability of health data. Developers must employ a risk-based approach to ensure that AI systems include appropriate cyber security protections throughout their lifecycle. This includes assessing risks and implementing measures to mitigate them, such as encryption, access controls, and secure data storage.

**Algorithmic Bias:** AI systems can exhibit biases when their training data fail to represent the diverse populations they are designed to serve. This can result in disparities in health outcomes, as the system may perform effectively for certain groups while underperforming for others. To address this, developers must ensure that training datasets are diverse and representative, and they should implement mechanisms for continuous monitoring and mitigation of biases in AI systems.

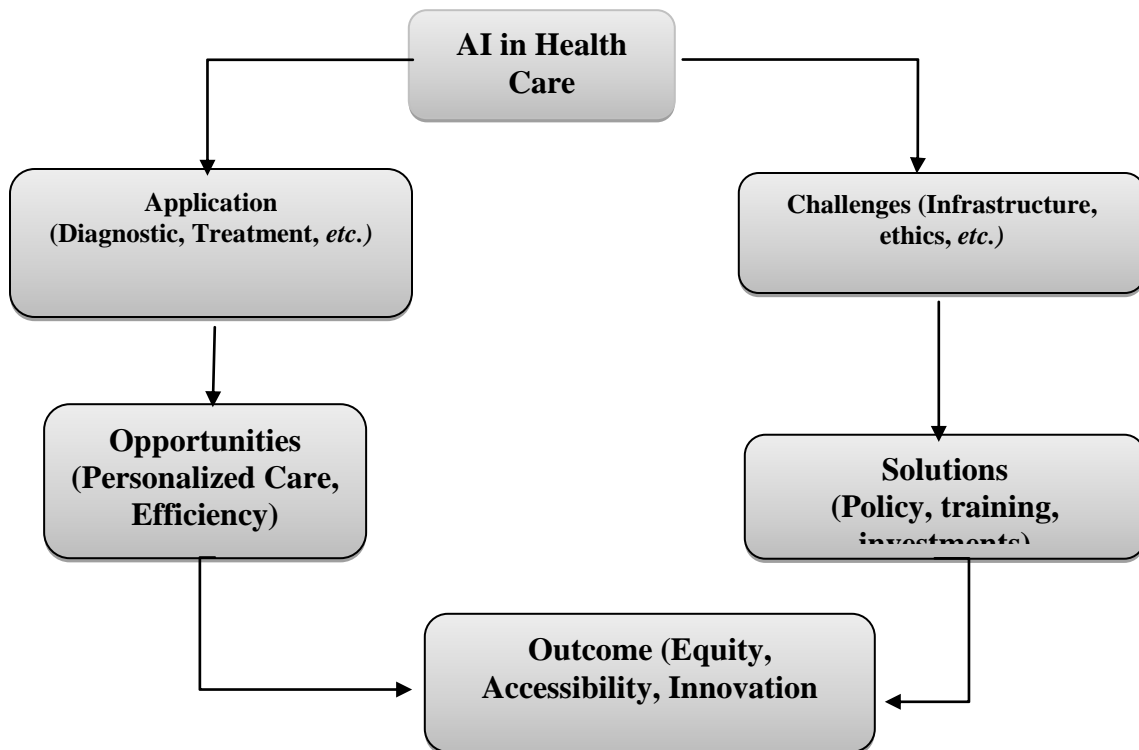
Facilitating the safe and effective use of AI in healthcare requires robust regulatory frameworks, ongoing monitoring, and active collaboration among stakeholders. However, the successful integration of AI into healthcare services is hindered by three key challenges: ethical dilemmas, social and regulatory issues, and technical barriers.

Ethical concerns include managing potential biases in AI models, protecting patient privacy, and fostering trust among clinicians and the public in the use of AI in healthcare. Biases often stem from inadequate or unrepresentative training data, which can intensify health disparities. Safeguarding patient privacy is equally critical, as deep learning models used by AI systems may unintentionally collect and transmit sensitive information without patients' awareness, increasing the risk of privacy breaches. Addressing these challenges is essential for realizing the full potential of AI in improving healthcare outcomes.<sup>25</sup> The absence of standardized regulatory standards for assessing the safety and impact of AI algorithms further complicates the implementation of AI in healthcare.<sup>26</sup>

**Call to action and future directions**

The stakeholders must focus on actionable strategies that would help India realize the full transformative potential of AI in healthcare. Policymakers should focus on developing strong regulatory frameworks to ensure the ethical deployment of AI. Healthcare institutions and developers must collaborate to standardize and digitize health data for easier access.

The future of AI in Indian healthcare will depend on the adoption of emerging technologies like federated learning and block chain for secure data sharing, as well as AI-driven personalized medicine. Telemedicine services powered by AI can help bridge the gaps in access to healthcare in rural areas, and advancements in natural language processing can make it easier to develop multilingual healthcare support systems. Collaboration with global leaders will provide some insight into scaling models for integrating AI, while constant monitoring of algorithmic fairness will ensure its inclusivity. Aligned with technological innovation to a patient-centric approach, India shall be able to set a new benchmark for AI adoption in healthcare by sustainable means.



Visual Representation: AI in Health Care

**Conclusion**

AI has the potential to transform healthcare in India by improving efficiency and quality. However, its adoption faces significant challenges stemming from systemic issues such as inadequate funding, weak regulation, insufficient healthcare infrastructure, and socio-cultural constraints—problems that AI alone cannot resolve. Additionally, poor digital infrastructure, a fragmented and largely unregulated private healthcare sector, and varying capacities among states and medical professionals are likely to result in slow and uneven AI adoption. Private hospitals with advanced resources may become the primary users, limiting AI's ability to address equity and accessibility issues, particularly for underserved populations in rural and semi-urban areas.

For AI solutions to be effective, they must focus on real-world problems rather than being technology-driven. Designing interventions that account for local challenges, such as limited internet access in remote areas, is critical. Furthermore, the digital divide between developers and users often leads to solutions that are difficult for end-users to implement. Issues like privacy, misuse, and accountability are still evolving and require thorough deliberation before AI can provide safe and equitable healthcare outcomes.

When developing health-related AI systems, it is essential to clearly define the use case, including the geographical context, type of healthcare facility, target population characteristics (such as ethnicity, gender, age, and comorbidities), and the clinical scenarios for application. AI systems, being data-driven, are sensitive to biases in training data and may fail when applied to unfamiliar data or populations. Developers must ensure their tools are validated for specific contexts and provide transparent explanations of their intended performance.

Unlike human physicians, AI systems lack reasoning capabilities and rely on pattern recognition from datasets. Currently, AI is being used in healthcare to automate repetitive tasks and improve precision diagnostics. However, its success requires a human-centered approach aligned with local clinical workflows, patient needs, trust, and safety standards.

Key considerations for integrating AI in healthcare include:

1. **Ethical and Responsible Data Access:** Healthcare data is sensitive, inconsistent, and siloed, posing challenges for AI development and implementation.
2. **Domain Expertise:** Collaboration with healthcare experts is essential to interpret data and establish meaningful rules.
3. **Sufficient Computing Resources:** Real-time decision-making requires robust computational infrastructure, now increasingly enabled by cloud computing.
4. **Implementation Research:** Thorough exploration of real-world challenges is necessary to develop trusted AI systems embedded in appropriate workflows.

Regulatory approaches should adopt a risk-proportional framework for documentation and record-keeping. Developers should engage with regulatory bodies to clarify compliance requirements and foster ethical, effective AI deployment in healthcare.

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**Citation:** Maurya AK, Anoop Kumar A. Using Artificial Intelligence in Healthcare Sector: Mapping the Issues and Challenges in India. Indian J Prev Soc Med, 2024; 55 (4): **415- 421**.

