

A comprehensive exploration of clinicians' perspectives on the challenges & barriers in implementing Artificial Intelligence in healthcare – A questionnaire based study from a tertiary care hospital in Central India

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Summary

Introduction: Artificial Intelligence (AI) has the potential to transform healthcare in various ways. It can turn large amounts of patient data into actionable information, improve public health surveillance, accelerate health responses & produce faster & more targeted research & development. In context of developing countries, the potential of AI in public health needs to be assessed. This study enables a comprehensive exploration of clinicians' views, aiming to identify actionable insights for addressing barriers to AI implementation in healthcare systems.

Methodology: It is a cross-sectional study in which a pre-validated questionnaire developed. A purposive sample of 94 clinicians from various specialities taken in the study. Data is collected using a structured questionnaire designed after an extensive literature review & expert consultation. Data were analyzed using the appropriate statistical test.

Results: The study identified key challenges hindering AI adoption in healthcare, based on responses from 94 clinicians. The primary barriers include insufficient infrastructure (68.5%), lack of AI-specific training (44.7%) & limited collaboration between healthcare sectors (63.8%). Clinicians' skepticism (58%) about AI's decision-making accuracy and ethical concerns regarding patient data security (74.5%) were significant obstacles. Fragmented healthcare data systems (70%) further hindered the effective AI integration.

Conclusion: While AI has substantial potential to enhance healthcare delivery, particularly in optimizing operations and personalizing treatment, addressing these challenges through comprehensive strategies involving ethical frameworks, robust data management & stakeholder engagement is crucial for successful implementation & acceptance of AI technologies in clinical practice.

Key words: Clinical decision support, digital health, ethics & governance, health technology adoption, medical informatics, physician attitude



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Introduction

Artificial Intelligence (AI) is rapidly transforming the healthcare landscape worldwide by offering significant potential to improve diagnostic accuracy, reduce human error, and streamline both clinical and administrative operations (Mu et al. 2021). AI systems assist healthcare professionals by automating routine tasks, facilitating personalized treatment planning, and enabling real-time patient monitoring through the analysis of large volumes of data (Gandhi et al. 2023).

A 2020 report by Global Market Insights estimated that the AI healthcare market exceeded USD 4 billion in 2020 and projected it to grow at a compound annual growth rate of 33.7%, reaching USD 34.5 billion by 2027. Increased investments largely drive this surge in adoption, the global push toward digital health modernization, and the rising availability of large-scale health data (Global Market Insights 2024).

Numerous AI platforms and tools are already actively deployed in healthcare environments, such as IBM Watson Health, Aidoc, and PathAI, to support diagnostic processes, including the rapid interpretation of medical images in radiology and pathology. Similarly, AI has demonstrated benefits in streamlining administrative functions such as claims processing, patient triage, and workforce scheduling, thereby reducing human error and improving operational efficiency (Davenport and Kalakota 2019).

Despite these advancements, the integration of AI into routine healthcare practice remains in its infancy in developing countries such as India. Developed countries benefit from well-established digital infrastructure and the widespread use of electronic medical records (Hassan et al. 2024). In contrast, developing countries face significant barriers, including fragmented data systems, inadequate computing infrastructure, high implementation costs, and limited internet connectivity. These limitations restrict access to AI systems, slow their development, and contribute to inequities in digital health transformation (Gore and Olawade 2024).

Although many governments, including India's, have begun introducing AI-friendly health policies, a substantial gap in regulatory clarity persists. This gap is primarily due to the lack of harmonized legal and ethical frameworks, along with concerns regarding data privacy, patient consent, algorithmic transparency, and accountability, which collectively create hesitation in adoption (Pham 2025). Healthcare professionals play a pivotal role in facilitating or resisting AI adoption, as their level of awareness, trust in AI tools, ethical concerns, and preparedness for technological change greatly influence successful integration.

Therefore, this study was planned to assess the perspectives of clinicians in a tertiary healthcare setting in Central India, with a focus on the challenges and barriers associated with the implementation of AI systems. Understanding these frontline insights may help inform future planning and support a responsible adoption of AI in healthcare settings.

Materials and methods

Study design

A quantitative questionnaire-based cross-sectional survey was conducted.

Study duration

The study was carried out over a period of two months (November 2024 to December 2024).

Study population and sampling

Participants were recruited using a purposive sampling technique. The target population included clinicians working in the hospital, specifically general physicians, surgeons, and medical specialists.

Inclusion & exclusion criteria

- Inclusion Criteria:
 - Clinicians actively practising at the tertiary care hospital during the study period.
 - Willingness to participate and provide informed consent.
- Exclusion Criteria:
 - Interns, postgraduate students, or non-clinical staff (e.g., administrative personnel).
 - Clinicians not available during the study period.
 - Participants who declined or were unable to provide informed consent.

Sample size

As it was a purposive sampling technique, of the 100 clinicians invited, 94 participants completed the survey, with a response rate of 94%.

Data collection tools and process

Data were collected using a pre-validated semi-structured questionnaire, designed based on prior studies and expert input. The tool included both open and close-ended questions, covering knowledge and awareness of AI in health care, perceived barriers and concerns regarding AI implementation, and suggestions for facilitating AI adoption.

Questionnaires were distributed both in person and electronically via Google Forms.

Data analysis

Survey responses were entered and analysed using SPSS version 26. Descriptive statistics (frequencies, percentages) were used to summarise responses.

Ethical considerations

The study received approval from the Institutional Ethics Committee (IEC). Written informed consent was obtained from all participants prior to inclusion. Participant anonymity and confidentiality were strictly maintained throughout the study.

Results

Data from 94 participants were analysed for the study titled "A Comprehensive Exploration of Clinicians' Perspectives on the Challenges and Barriers in Implementing Artificial Intelligence in Healthcare."

Many respondents were familiar with AI tools used in the health sector. Forty-seven (50%) participants reported familiarity with ChatGPT, followed by 19 (20%) who were familiar with perplexity. Regarding awareness of AI applications across medical fields, 45 (48%) respondents cited radiodiagnosis, whereas only 9 (10%) mentioned its use in clinical research.

Among the 94 clinicians, 60 (64%) believed that the current healthcare infrastructure is not ready for AI implementation, while 34 (36%) felt it is adequately prepared. (Fig. 1)

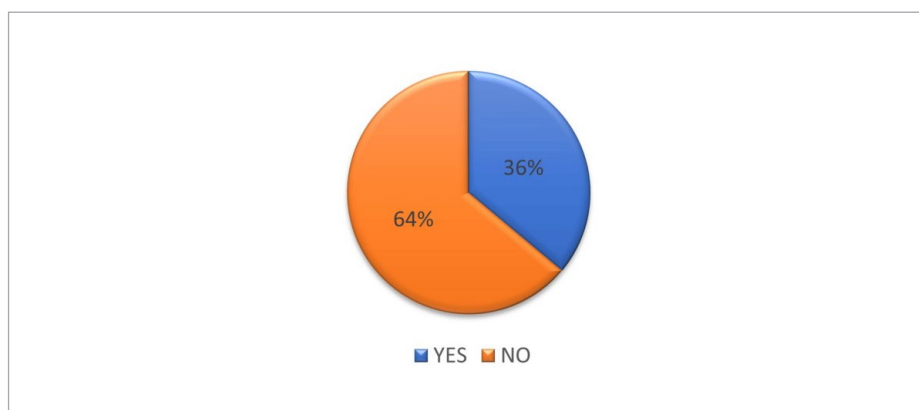


Figure 1. Preparedness of health care infrastructure for AI implementation.

Sixty-two (66%) participants reported that existing legal frameworks are inadequate to regulate the use of AI in healthcare effectively (Fig. 2).



Figure 2. Adequacy of legal frameworks for AI in healthcare.

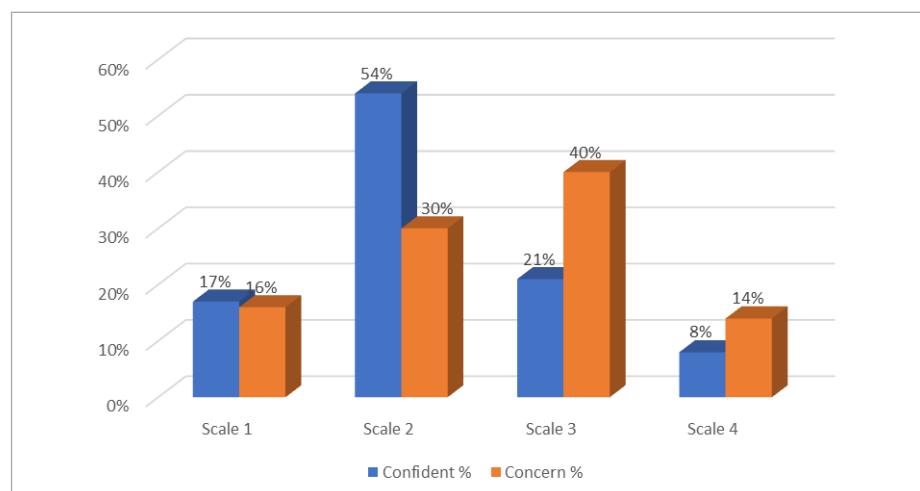
Clinicians expressed multiple concerns regarding the use of AI in healthcare. A total of 70 (74.5%) participants identified the risk of harm from incorrect AI recommendations as the major concern. Privacy and consent issues were reported by 64 (68.1%) participants, while 46 (48.9%) cited bias and fairness in AI systems as additional concerns. (Table 1)

Table 1. Main concerns regarding the Use of AI in healthcare.

Concern	n (%)
Risk of harm from incorrect AI recommendations	70 (74.5%)
Privacy and consent issues	64 (68.1%)
Bias and fairness issues in AI systems	46 (48.9%)
Limited patient trust in AI	19 (20.5%)

When asked about challenges in collecting high-quality data for AI systems, **68 (72.3%)** participants highlighted **insufficient data from diverse patient populations**. **Fragmented data systems** were cited by **66 (70%)**. In comparison, **64 (68%)** reported **inconsistent data collection methods across institutions** as key challenges in ensuring data availability.

Fig. 3 illustrates clinicians' confidence and concern regarding the use of artificial intelligence in healthcare for clinical decision making, assessed using a four-point ordinal scale. The highest proportion of participants (**54%**) reported being **less confident** in the use of AI systems for clinical decision-making. In contrast, a substantial proportion (**40%**) expressed more **concern** regarding the reliability of AI-based tools for decision making.

**Figure 3.** Distribution of clinicians' confidence and concern regarding the use of artificial intelligence in health care for clinical decision making.

Scale 1 – least confident/least concerned;
 Scale 2 – less confident/less concerned;
 Scale 3 – more confident/more concerned;
 Scale 4 – most confident/most concerned).

Clinicians identified several primary challenges in implementing artificial intelligence in healthcare, including inadequate infrastructure, high costs, large data requirements, privacy and consent issues, and the need for staff training.

Regarding organizational barriers to AI implementation, 60 (63.8%) participants identified a lack of collaboration between specialized and non-specialized departments, 50 (53.2%) reported resistance to change among staff, and 42 (44.7%) cited the lack of comprehensive training programs as major barriers.

Ethical considerations requiring attention during AI implementation included patient consent, reported by 74 (78.7%) participants; doctor–patient confidentiality, reported by 70 (74.5%); and transparency in AI algorithms and their outcomes, reported by 55 (59%) participants.

Suggestions to promote the seamless integration of AI-assisted decision-making software included promoting a culture of continuous improvement and adaptation based on feedback, identified by 46 (48.9%) participants, while 82 (87.2%) emphasized the importance of actively incorporating healthcare practitioners' suggestions.

A total of 84 (89.4%) clinicians reported hands-on training with AI tools as the most beneficial approach for healthcare providers. Workshops on basic AI concepts were favoured by 78 (83.0%), while 76 (80.9%) considered workshops on ethical and legal considerations essential.

Key areas where AI was perceived to have the greatest potential impact included optimizing hospital operations—such as managing schedules, predicting patient flow, and automating administrative tasks—reported by 74 (78.7%) clinicians. Additionally, 64 (68%) identified AI's role in analyzing genetic and clinical data to personalize treatment, while 62 (66%) emphasized its potential in real-time patient monitoring through wearable devices and mobile applications.

Discussion

This study involved 94 clinicians from a tertiary care hospital in Central India, comprising a diverse group of physicians, surgeons, and specialists. The participant pool included individuals from varying age groups and levels of professional experience, providing a balanced representation of perspectives across different tiers of clinical practice.

Participants demonstrated awareness of the use of AI in healthcare, with its application primarily recognized in radiodiagnosis. A majority reported greater familiarity with ChatGPT compared to perplexity, which may be attributed to its wider accessibility and user-friendly interface. Despite this awareness of commonly used AI tools, participants were less familiar with specialized healthcare applications such as machine learning algorithms, IBM Watson NLP, and BenevolentAI (Davenport and Kalakota 2019).

The primary concerns raised regarding AI implementation included the risk of harm from incorrect AI recommendations and issues related to privacy and informed consent. Secondary concerns included bias and fairness in AI systems, limited patient trust, and the lack of interpretability or explainability of AI outputs. These findings suggest that, although AI integration in healthcare is advancing, clinicians remain sceptical about the consistency, accuracy, and trustworthiness of AI-generated recommendations. Such an assumption aligns with previous literature emphasizing explainability, transparency, interpretability, usability, and education as key factors influencing healthcare professionals' trust in medical AI (Tucci et al. 2022).

The participants' levels of confidence and concern regarding the reliability of AI systems for clinical decision-making, measured on a four-point scale, reflected considerable apprehension. A substantial proportion selected lower confidence scores, indicating limited confidence alongside moderate concern. These hesitations are consistent with previous studies in which physicians

expressed reluctance to adopt AI tools due to concerns related to transparency, reliability, and trust (Kowalewska 2025). Similarly, research has shown that clinicians often negotiate, rather than fully accept, AI-based recommendations in clinical practice (Tun et al. 2025).

Another major challenge we identified was the availability of high-quality data required for effective AI systems. Participants cited underrepresentation of diverse patient populations, fragmented data systems, and inconsistencies in data collection methods as significant barriers. Such limitations are known to exacerbate algorithmic bias and may lead to misdiagnosis or unequal predictive outcomes (Norori et al. 2021).

Organisational barriers were also prominent. The lack of collaboration between specialized and non-specialized departments, staff's resistance to change, and the absence of comprehensive training programs emerged as key obstacles to AI adoption. The importance of structured and targeted training has been well documented, with evidence indicating that such initiatives improve adoption intentions and reduce resistance to technological change (Li et al. 2024). Furthermore, national-level strategies have been recommended to address institutional gaps and promote interoperability across healthcare systems (NITI Aayog 2018).

From an ethical perspective, clinicians emphasized the importance of patient-informed consent, confidentiality, data security, and algorithmic transparency. Ethical frameworks guiding AI implementation must prioritize transparency, auditability, and patient-centred standards to ensure safe and responsible integration. Previous studies have highlighted the necessity of clear guidelines for data use, informed consent, and privacy protection (Reddy et al. 2019). More recent research has further underscored that, despite its promise, AI integration in healthcare raises substantial ethical, legal, and regulatory challenges (Mennella et al. 2024).

Suggestions offered by participants to facilitate AI integration included actively valuing clinician input and fostering a culture of continuous feedback and adaptation. These recommendations are supported by existing literature emphasizing the role of iterative, real-time feedback in refining AI tools and maintaining their clinical relevance (Obermeyer and Emanuel 2016).

Participants also perceived that the greatest potential of AI in healthcare lies in optimizing hospital operations, including scheduling, resource management, and automation of administrative tasks. Additionally, they acknowledged AI's role in analyzing genetic and clinical data to personalize treatment and in supporting remote patient monitoring. Previous research has similarly highlighted AI's immediate utility in administrative automation, real-time monitoring, and data-driven personalization of care (Topol 2019).

Despite the growing popularity and widespread use of AI in daily life, its application in healthcare remains limited due to a lack of trust, insufficient training, and resistance to change. Successful implementation of AI in healthcare depends not only on technological advancements but also on the readiness of the broader ecosystem, including clinician trust, data quality, organizational preparedness, ethical safeguards, and supportive national policies. A multi-pronged strategy encompassing legal, ethical, technical, and organizational reforms is therefore required. Future efforts should focus on developing inclusive, collaborative, and ethically sound AI systems that empower clinicians and enable AI to become a trusted partner in patient care.

Limitations

The study is a single-centred, small sample size, which restricts the generalisability and inferential statistics. The cross-sectional and exploratory nature reflects perceptions rather than causal relationships. Subgroup analyses were not conducted due to the purposive sample size, which may have limited the detection of subtle differences.

Conclusion

Inadequate infrastructure, limited patient trust, fragmented data systems, and ethical concerns are commonly perceived barriers to the adoption of artificial intelligence in health care among clinicians in a tertiary-care setting. The results suggest that efforts aimed at improving transparency, auditability, data quality, and organisational preparedness may help address some of these perceived challenges. Broader policy frameworks may play a role in facilitating responsible AI adoption.

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statements

The authors declared that no clinical trials were used in the present study.

The authors declared that no experiments on humans or human tissues were performed for the present study.

Informed consent from the humans, donors or donors' representatives: Government Medical College, Nagpur. Ethical approval number (3633 EC).

The authors declared that no experiments on animals were performed for the present study.

The authors declared that no commercially available immortalised human and animal cell lines were used in the present study.

Use of AI

No use of AI was reported.

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Author contributions

Supriya Khade: contribution to concept or design, data collection, analysis or interpretation of data, drafting of the manuscript. Mohini Mahatme: contribution to analysis of data, critical revision of the manuscript. Neha Meshram: contribution to interpretation of data, manuscript revision. Vikram Bobade: contribution to manuscript revision.

Data availability

All of the data that support the findings of this study are available in the main text.

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