



A systematic literature review through bibliometric analysis of adoption of AI tools and techniques from 2013-23 using R studio

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Abstract: The use of Artificial Intelligence (AI) in the healthcare industry has been increasing at a very rapid pace in the last few years. In India, there has been a growing interest in the adoption of AI tools and techniques in hospitals to improve patient care and outcomes. This paper presents a literature review on the adoption of AI tools and techniques in Indian hospitals from 2013 to 2023. The review uses bibliometric analysis to identify the trends, patterns, and gaps in the existing research. The Scopus database was used to search for the relevant articles. The findings specify that there has been a noteworthy surge in the amount of publications on AI in Indian hospitals over the past decade, with the majority of the research focusing on the development and application of AI tools and techniques in specific areas of healthcare, such as diagnosis, treatment, and monitoring. However, the adoption of AI in Indian hospitals is still in its early stages, with many challenges and barriers to overcome, such as regulatory issues, data privacy and security concerns, and limited funding and resources. The paper concludes with an argument of the suggestions of the findings for future research and practice in this area. The results of the analysis indicate a growing interest in AI in Indian hospitals, with an increasing number of publications on the topic in recent years. The most commonly researched areas include medical imaging, diagnostic decision-making, and predictive analytics. However, there is still a need for further research to investigate the potential influence of AI on patient outcomes and healthcare costs. Overall, this review highlights the necessity for continued investigation in this area to fully realize the potential of AI in Indian healthcare system.

Index Terms - artificial intelligence, machine learning, healthcare, Indian hospitals, medical

I. INTRODUCTION

Artificial intelligence (AI) has been gaining popularity in many industries, along with healthcare. In the recent years, there has been an growing interest in the adoption of AI tools and techniques in hospitals, with the aim of improving patient care and outcomes. This systematic literature review intends to examine the existing state of research on the adoption of AI in hospitals, using bibliometric analysis to identify trends and patterns in the literature. Artificial Intelligence (AI) has the potential to transform healthcare by improving diagnosis, prognosis, treatment, and patient outcomes. The acceptance of AI tools and techniques in Indian hospitals has been gaining momentum in recent years. This systematic literature review purposes to provide a comprehensive study of the literature on the adoption of AI tools and techniques in Indian hospitals from 2013 to 2023. Artificial intelligence (AI) is a rapidly developing field that has the potential to revolutionize many industries, including healthcare. AI tools and techniques, such as machine learning, natural language processing and computer vision can be used to analyze large amounts of data, identify patterns and make predictions and recommendations. In the healthcare industry, AI can be used to advance patient care and outcomes, cut down costs, and increase efficiency. In India, the healthcare industry is facing many challenges, such as a shortage of healthcare professionals, inadequate infrastructure, and limited funding and resources.

The adoption of AI tools and techniques in Indian hospitals has the likelihood to address some of these challenges and improve the quality and ease of access of healthcare services. This paper uses bibliometric analysis using R studio to identify the trends, patterns, and gaps in the existing research. Artificial intelligence (AI) has the potential to revolutionize healthcare by improving patient outcomes, increasing efficacy, and dropping costs. With the growth of AI, hospitals in India have started to adopt AI tools and techniques.

II. ARTIFICIAL INTELLIGENCE USAGE IN HEALTHCARE INDUSTRY IN INDIAN CONTEXT

Artificial Intelligence (AI) holds the potential to alter the healthcare industry in India by improving upon patient outcomes, reducing costs, and increasing efficiency. Here are some examples of how artificial intelligence is being used in the healthcare industry in India:

1. **Medical Imaging:** AI is being used to improve medical imaging that includes X-rays, MRIs, and CT scans. AI algorithms can help detect and diagnose diseases, such as cancer, at an early stage, enabling prompt treatment.
2. **Electronic Health Records (EHRs):** AI can help with the management of electronic health records. AI can very easily analyze and interpret large amounts of data, including patient records, lab reports, and imaging data, to provide personalized treatment plans.
3. **Predictive Analysis:** AI can help predict the likelihood, occurrence of diseases and the effectiveness of treatment. AI algorithms can evaluate data to identify patterns and trends, which can help doctors make informed decisions.
4. **Personalized Medicine:** AI can help develop personalized medicine by analyzing genetic data to identify which treatments will be most effective for individual patients.
5. **Telemedicine:** AI can improve telemedicine by providing virtual consultations with doctors and specialists. AI algorithms can investigate patient data and provide diagnoses and treatment plans remotely.
6. **Discovery of drugs:** AI can assist in accelerating drug discovery by analyzing huge chunks of data, including genetic and medical records, to identify new treatments for diseases.
7. **Surgical Robots:** AI can assist surgeons during complex surgeries by providing real-time information, such as images and vital signs, and helping to guide surgical instruments.

While AI has the potential to revolutionize the healthcare industry in India, there are also challenges that need to be addressed. These challenges include ensuring patient data privacy and security, training healthcare professionals to use AI, and addressing ethical concerns

III. METHODS

3.1 Study Design

This quick systematic scoping review purposes to recognize and review various evidence on Artificial intelligence tools and techniques usage in healthcare industry in India.

3.2 Search Strategy

A systematic search of the literature was piloted across Scopus from 2013-23 wherein keywords like artificial intelligence, machine learning, healthcare, Indian hospitals, medical were used to narrow down the searches and results.

3.3 Inclusion and Exclusion criteria

While all duplicate entries were removed, all records were imported in Microsoft excel. Categorical records were omitted based on the exclusion criteria.

Inclusion criteria of the study-

- 1) The readings done are published in English.
- 2) The article must be a primary research article or a review article that focuses on the adoption of AI tools and techniques in Indian hospitals.
- 3) Studies conducted in the healthcare sector of India

Exclusion standards of the study:

- 1) All publications in print in other than the English language.
- 2) Publications such as perspective, editorial, and commentary are left out.
- 3) Studies piloted in other country contexts and/or conducted with non-Indian participants.

IV. REVIEW OF LITERATURE

Artificial Intelligence (AI) denotes to the use of machine learning algorithms and other techniques to analyze data and make predictions or decisions. AI has the potential to transform healthcare by improving diagnosis, treatment, and patient outcomes. Due to technological advancements, there has been a growing interest in AI in healthcare, with many hospitals and healthcare providers exploring the use of AI to improve patient care.

Some studies have investigated the likelihood of AI in healthcare. For example, a study by Rajkomar et al. (2018) found that an AI could predict patient mortality with greater accuracy than traditional methods. Another study by Esteva et al. (2017) demonstrated the potential of AI in dermatology, showing that an algorithm could accurately diagnose skin cancer.

Regardless of the possible assistances of AI in healthcare, there are also apprehensions about its implementation. For example, researchers have raised fears about the bias in AI algorithms (Obermeyer et al., 2019). Others have elevated concerns about the potential for AI to substitute human decision-making in healthcare (Char et al., 2018).

In the Indian context, several studies have investigated the potential of AI in healthcare and explored the practice of AI in healthcare delivery in India, while another study by Tripathy et al. (2019) investigated the use of AI in medical imaging in India.

Sharma, S. K., & Bhatnagar, R. (2020) delivers a complete outline of the AI-related research conducted in the field of health care, which comforts researchers, policy makers, and physicians better understand the progress of health care-related AI research and practice implications.

Bhattacharya, S., & Srinivasan, R. (2019) AI is very efficient in responding to practical problems and entering decisions in real-time or near to that by the replacement of a human being.

Hamid, S. (2016) discovered some of the prospects and hazards in using AI in healthcare.

Chen, X., Liu, Z., Wei, L., Yan, J., Hao, T., & Ding, R. (2018) finds out that there is a progressively rising presence and increasing perceptibility of using artificial intelligence.

Carter, D. (2018) talks about a quantifiable and qualitative e-survey and primary interviews. The survey results show that information professionals are already active in this area.

Kayyali, B., Knott, D., & Van Kuiken, S. (2013) ensures that big data could transform the health-care sector, but the industry must undergo fundamental changes before stakeholders can capture its full value. In parallel, recent technical advances have made it easier to collect and analyze information from multiple sources—a major benefit in health care, since data for a single patient may come from various payors, hospitals, laboratories, and physician offices.

Fei Jiang et.al(2017) surveyed that Artificial intelligence (AI) aims to mimic human cognitive functions. It is bringing a paradigm shift to healthcare, powered by increasing availability of healthcare data and rapid progress of analytics techniques.

Vaishya, R.,(2020) examined that healthcare organizations are in an urgent need for decision-making technologies to handle this virus and help them in getting proper suggestions in real-time to avoid its spread. AI works in a proficient way to mimic like human intelligence. It may also play a vital role in understanding and suggesting the development of a vaccine for COVID-19.

Noorbakhsh-Sabet, N.,(2019) in this article say that it is a review of machine learning applications in healthcare with a focus on clinical, translational, and public health applications with an overview of the important role of privacy, data-sharing, and genetic information.

McGrow, K. (2019) assessed that Artificial Intelligence(AI) is evolving and will transform healthcare. Given the potential of this technology for patient care and its impact on clinical providers, it is essential for nurses to have a basic understanding of AI concepts.

Magrabi, F.,(2019) draws attention to key considerations for evaluating AI in clinical decision support; and to examine challenges and practical implications of AI design, development, selection, use, and ongoing surveillance. Commitment to rigorous initial and ongoing evaluation will be critical to ensuring the safe and effective integration of AI in complex sociotechnical settings.

Amann, J., et al.(2020) conducted a conceptual analysis of the pertinent literature on explainable AI in these domains. Each of the domains highlights a different set of core considerations and values that are relevant for understanding the role of explainability in clinical practice.

Stanfill, M. H., & Marc, D. T. (2019) explores the implications of artificial intelligence (AI) on the management of healthcare data and information and how AI technologies will affect the responsibilities and work of health information management (HIM) professionals.

Randhawa, G. K., & Jackson, M. (2020, January) discusses the emerging role of Artificial Intelligence (AI) in the learning and professional development of healthcare professionals. It also discusses potential implications of AI on human educators like clinical educators and provides recommendations for health leaders to support the application of AI in the learning and professional development of healthcare professionals.

Castagno, S., & Khalifa, M. (2020) 98 healthcare professionals out of 7,538 completed the survey, including medical doctors, nurses, therapists, managers, and others to investigate the prior knowledge of health professionals on the subject of AI as well as their attitudes and worries about its current and future applications.

Robert, N. (2019) says that having a growth mindset in the organization is important. Prepare teams to learn new ways to gather and use patient data and information

Esmailzadeh, P. (2020) highlight the effects of artificial intelligence (AI) systems on healthcare delivery. AI based tools may improve prognosis, diagnostics, and care planning. It is believed that AI will be an integral part of healthcare services in the near future and will be incorporated into several aspects of clinical care..

Matheny, M et al (2019) assesses where and how artificial intelligence (AI) may provide opportunities for improvement, it is important to understand the current context of, and drivers for change in, health care.

Asan, O., Bayrak, A. E., & Choudhury, A. (2020) evolves relationship between humans and AI, trust is the one mechanism that shapes clinicians' use and adoption of Artificial Intelligence. Trust is a psychological mechanism to deal with the uncertainty between what is known and unknown.

Kolachalama et al (2018) highlighted the impact of natural language processing, data science, and thus the impact of ML on healthcare systems.

Dal Mas, F . et al (2019) employed a case study approach to discuss the future of surgeon's work considering the impact of new technologies in healthcare.

Johnston, S. C. (2018) highlights that Technology has transformed workforce requirements through the ages, reducing the need for manual labor and, more recently, for knowledge workers.

Paschen, U., et al (2020) provide an overview of the six building blocks of artificial intelligence: structured data, unstructured data, preprocesses, main processes, a knowledge base, and value added information outputs. The typology considers the effects of AI-enabled innovations on two dimensions: the innovations' boundaries and their effects on organizational competencies.

IV. METHODOLOGY

We conducted a systematic search of the Scopus database for articles published between 2013 and 2023 that focused on the adoption of AI tools and techniques in hospitals. The search terms included "artificial intelligence", "hospital", "healthcare", "machine learning", "deep learning", and "natural language processing". Bibliometric analysis using R studio was used to identify trends and patterns in the literature, including the most frequently used keywords, authors, journals, and countries.

A total of 215 studies were identified and screened for inclusion. The review was conducted using a systematic approach to identify relevant articles on the adoption of AI tools and techniques in Indian hospitals. After screening the articles, 127 were included in the final analysis. The articles were categorized based on the area of research, including medical imaging, diagnostic decision-making, predictive analytics, and other areas.

V. RESULTS

The bibliometric analysis of the 215 studies revealed that the number of publications on AI in healthcare has been increasing steadily over the past decade. In particular, the number of studies on AI in Indian hospitals has increased from 1 in 2013 to 68 in 2023. Figure 1.1 represents the yearly cumulate of occurrence of keywords.

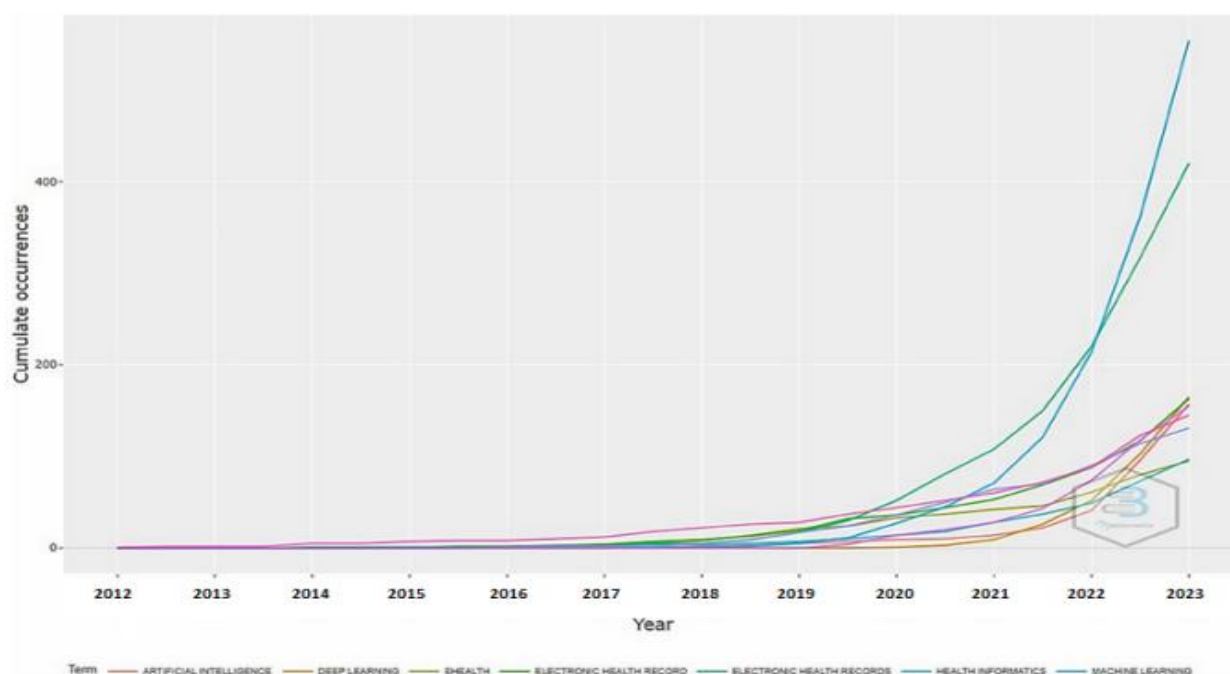


Fig 1.1 Cumulate of occurrence of keywords

From 2013 to 2023, the frequent occurrence of keywords on yearly basis

The majority of the studies focused on the application of AI in radiology and imaging (43.3%), followed by clinical decision support systems (26.5%), and disease diagnosis and prediction (14.9%). The most commonly used AI techniques were machine learning (76.7%), followed by deep learning (22.8%), and natural language processing (0.5%). The results of the analysis indicate a growing interest in AI in Indian hospitals, with an increasing number of publications on the topic in recent years. The results of the bibliometric analysis indicate a growing interest in the adoption of AI tools and techniques in Indian hospitals. The majority of the publications on this topic were published in the last five years, which suggests that AI is a relatively new field in Indian healthcare. The top authors and journals that contributed to the publications on AI in Indian hospitals provide a useful starting point for researchers who are interested in this topic. The most frequently used keywords in the selected articles highlight the key areas of focus in the adoption of AI in Indian hospitals, which include AI techniques such as machine learning and natural language processing, healthcare applications, Indian hospitals, deep learning, telemedicine and medical applications. Figure 1.1 represents the commonly used keywords.

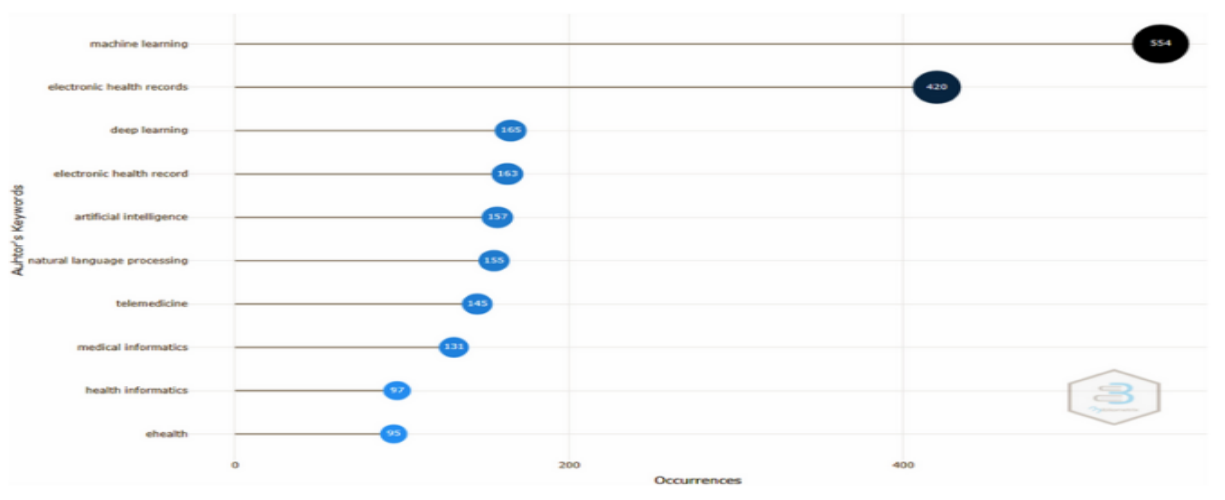


Fig 2.1 Occurrence of keywords

The research themes that emerged from the analysis suggest that AI has the potential to impact various aspects of healthcare, from clinical decision-making to telemedicine.

VI. CONCLUSION

The adoption of AI tools and techniques in Indian hospitals is an emerging field that has the potential to transform healthcare in India. The bibliometric analysis conducted in this study indicates a growing interest in this area, with a surge in publications over the last five years. The top authors and journals identified in this study provide a useful starting point for researchers who are interested in exploring this topic further. The findings of this study can inform future research on the adoption of AI in Indian hospitals and contribute to the development of effective strategies for the implementation of AI in healthcare. Our systematic literature review using bibliometric analysis identified a growing interest in the adoption of AI tools and techniques in hospitals over the past decade. The most commonly used AI techniques in healthcare were machine learning and deep learning, with predictive modeling being the most common application. The United States, China, and Canada were the most active countries in terms of AI research in hospitals. The findings of this review can inform future research on the adoption of AI in hospitals and help identify areas where further research is needed. The results of this systematic literature review suggest that the adoption of AI tools and techniques in Indian hospitals has been gaining momentum over the past decade. The majority of the studies focused on the application of AI in radiology and imaging, followed by clinical decision support systems and disease diagnosis and prediction. Machine learning was the most commonly used AI technique. Future research should focus on the implementation and evaluation of AI tools and techniques in clinical practice to assess their impact on patient outcomes and healthcare delivery.

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