

Knowledge, attitude, and practice of artificial intelligence among doctors and medical students in medical institute of Northern India - A cross sectional study

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ABSTRACT

Background: Artificial intelligence (AI) is transforming healthcare through advanced diagnostic, predictive, and decision-support capabilities. However, effective adoption depends on the knowledge, attitude, and practice (KAP) of medical professionals. Aim & Objective: "To assess the knowledge, attitudes, and practices regarding artificial intelligence among doctors and medical students in a tertiary care medical institute in Northern India."

Settings: The study was conducted at a tertiary care medical institute in Northern India, involving doctors and medical students affiliated with the institution during the study period. **Study design:** An institution-based cross-sectional study was carried out using the census method. **Material & Method:** The study was conducted among doctors and medical students of a tertiary care medical institute in Northern India given informed consent. Data were collected using a pre-tested, structured questionnaire assessing knowledge, attitudes, and practices regarding artificial intelligence. **Results:** Of the participants, 88.5% were aware of AI, 72.1% knew of machine learning, and 29.2% had received formal training. Positive attitudes were prevalent—81.6% recognized AI's importance in medicine, and 83.2% supported its diagnostic role. Only 60.3% had applied AI in professional contexts. **Conclusion:** While awareness and favorable perceptions of AI are high among healthcare professionals in Northern India, real-world application remains limited due to inadequate training and exposure.

Keywords:

KEYWORDS

Artificial intelligence, Knowledge, Medical education, Northern India, Machine learning

INTRODUCTION

Advancement in technology significantly propel economic growth and enhance living standards over extended periods of time.(1). Artificial intelligence can be characterized effectively to analyse other information, assimilate, and utilize information to achieve specified goals.(2) Another meaning of AI is 'Making a machine behave in ways that would be called intelligent if a human

were so behaving'.(3) AI is transforming various fields like financial management, transportation logistics, industries etc. (4)In academics, AI can be employed to develop adaptive educational systems tailored adapt to individual requirements, resulting in enhanced learning results across multiple areas, including mathematics and science. AI. (5–7) The World Health Organization projects a global deficit of approximately 12.9 million healthcare professionals by 2035.(8). Artificial intelligence may

mitigate certain disadvantages associated with conventional diagnostic and therapeutic approaches. (10) Wealthy nations have offered substantial financial support for AI advancement in the medical field. But in economically disadvantaged nations, no serious plans have been implemented to make use of AI in healthcare. (11) In certain circumstances, can serve as substitutes for a skilled professional when one is not immediately available, a situation frequently encountered in impoverished regions. (12) AI is utilized in healthcare through the development of machine learning algorithms that evaluate extensive patient data to discern patterns and trends not readily observable by humans. (13) The capacity to analyze larger volumes of data in a less timeframe enhances the constrained processing capacity of the human mind, hence reducing the burden on medical personnel. (15)

Aim & Objective: This study aims to fill that gap by evaluating the current understanding and perception of AI in a medical institute in this region.

MATERIAL & METHODS

Study Design: Cross sectional study

Sampling: Census method

Study setting: The study was conducted in a tertiary care medical institute located in Northern India, covering both academic and clinical departments.

Study duration: The study was carried out over a period of six months (Feb 2023 to August 2023)

Study Population: The sampling frame included all doctors and medical students enrolled or employed at the institute during the study period.

Sample size: A total of 855 participants were included in the study, comprising doctors and medical students given informed consent.

Data collection method

Data were collected using a pre-tested, structured, self-administered questionnaire designed to assess knowledge, attitudes, and practices regarding artificial intelligence. It was pre-tested and refined before final administration.

The questionnaire was pre-validated through expert review and pilot testing prior to data collection. Content validity was ensured by evaluation from subject experts in community medicine and medical education. Internal consistency reliability of the questionnaire was assessed using Cronbach's alpha, which was found to be acceptable ($\alpha > 0.7$), indicating good reliability of the instrument.

The questionnaire was pretested on 50 subjects who were not included in the final analysis, and necessary modifications were made based on the findings before administering the final version.

The questionnaire was self-administered by the participants. Informed consent was obtained in written form from all participants prior to their inclusion in the study.

Inclusion criteria: Doctors and medical students who gave informed consent to participate in the study were included.

Exclusion criteria: Incompletely filled questionnaires and doctors or medical students who could not be contacted after two attempts were excluded.

Data were gathered through a structured, pre-tested questionnaire divided into four parts:

Baseline Details: The baseline characteristics captured demographic details, such as age, gender, academic level, and professional.

Knowledge Assessment- Consisted of 7 question assessing participants' awareness of AI concepts, , and its applications in fields like radiology and pathology

Attitude Assessment- Consisted of 8 questions assessing explored participants' beliefs about the importance of AI in medicine, its inclusion in medical education, and its perceived impact on clinical practice

Practice Assessment- Consisted of 5 questions evaluated participants' personal experiences with AI technologies, their ease of use, and their willingness to work with AI in the future

Data Analysis: SPSS version 24.0 was used for statistical analysis. Descriptive statistics & chi-square tests were done for analysis.

Ethical Considerations: The study received IRB approval, with informed consent from all participants. Data confidentiality and anonymity were maintained.

RESULTS

The response rate of the study was 100 percent, as the census method was used and all eligible doctors and medical students who were approached participated in the study.

The demographic characteristics of the study participants included age, gender, academic designation, and professional status, which were collected as baseline information and analyzed descriptively.

Table 1 depicts that 88.5 % of study participant know about artificial intelligence. It was noted 72% of study participant were aware about machine learning. 68% of s participant were familiar of AI application in the medical . It was also noted that only 29.2% were taught of AI in medical school. It was also noted 74.8% and 63.8% of study participants were familiar of AI application in radiology and pathology field respectively.

Table1 Knowledge of Artificial Intelligence N=855

S.no	Knowledge Parameters	Yes (%)	No (%)
1	Are you familiar with the concept of artificial intelligence?	88.5	11.5
2	Are you familiar with machine learning and deep learning, which are subcategories of artificial intelligence?	72.1	27.9
3	Are you aware of any applications of artificial intelligence in the medical sector?	68	32
4	Have you received training in Artificial Intelligence during your medical education?	29.2	70.8
5	Are you familiar with the usage of AI in radiology?	74.5	25.5
6	Are you aware of the usage of AI in the field of pathology?	63.8	36.2

Table 2 depicts that attitude of study participant regarding AI . It was noted that 81% of study participant responded positively of AI essentiality. It also shows that 83% of study participant were agreed that AI help in diagnosis . It was also noted

that only 42% of study participant were agreed to AI will replace. It was also noted that 78% and 71% of study participant were agreed to AI essentiality in radiology and pathology respectively.

Table 2 Attitude of Artificial Intelligence

S.no	Attitude Parameters	Agree (%)	Neutral/Disagree (%)
1	Artificial intelligence is important in the medical domain.	81.6	18.4
2	Artificial Intelligence should be integrated into the medical school curriculum and specialist training programs	76.9	23.1
3	AI helps in early diagnosis and disease evaluation	83.2	16.8
4	Artificial intelligence will take over physicians in the future.	42.7	57.3
5	Artificial intelligence is significant in the domain of radiology.	78.5	21.5
6	Artificial intelligence is important in the domain of pathology	71.4	28.6
7	Artificial intelligence would elevate the incidence of diagnostic errors	34.6	65.4
8	AI would impose a burden on practitioners	22.5	77.5

Table 3 depicts that practice of study participant regarding Artificial Intelligence. It was noted that 60% of study participant have applied AI in any field. It was noted that 52% and 55% of study

participant were agreed to AI is easy to apply and AI makes task easy respectively. It was also noted that 80% of study participant would like to work in future.

Table 3 Practice of Artificial Intelligence

S.no	Practice Parameters	Yes (%)	No/Never applied (%)
1	Have you ever personally used or applied AI technology in any professional field?	60.3	39.7
2	Did you find it easy to use or apply AI technology?	52.1	47.9
3	Has using AI technology made your tasks easier?	55.5	44.5
4	Do you think the role of physicians is important in the application and evaluation of AI?	84	16
5	Would you like to work with AI technologies in your future professional practice?	80.3	19.7

Figure 1 depicts that Knowledge and Attitude Scores increase steadily with designation, reflecting more exposure and experience with AI in senior roles. Practice Scores remain low across all groups, though slightly higher in faculty (Assistant to

Professor), suggesting limited hands-on use even among experts. Undergraduates have the lowest practice score despite moderate knowledge and attitude, indicating a theoretical but not practical exposure.

Figure 1 KAP Score Comparison by Designation

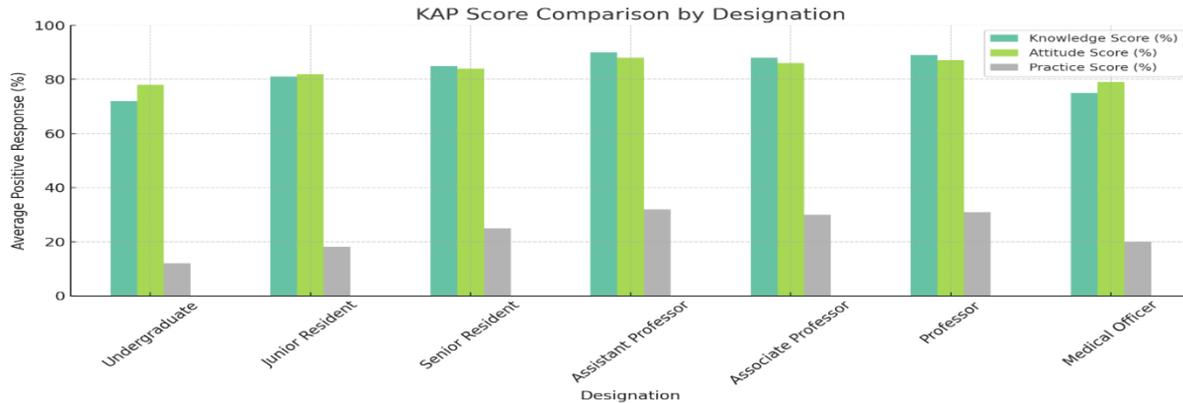


Table 4 illustrates the relationship between professional designation and levels of knowledge, attitude, and practice related to Artificial Intelligence (AI). Knowledge: The table shows a clear trend—knowledge about AI increases with professional seniority. Undergraduate students reported the lowest high-knowledge percentage (75.2%), while professors reported the highest (93.6%). This suggests that greater clinical exposure and academic involvement are associated with better understanding of AI concepts. Attitude: A similarly positive trend is seen with attitude. While 70.5% of undergraduates had a positive attitude toward AI, this figure rose to 87.8% among professors. This likely reflects increased appreciation for AI’s clinical utility and impact with

greater experience in the healthcare system. Practice: The percentage of participants who have practically applied AI also increased with designation, from 40.1% in undergraduates to 72.5% in professors. However, this rise is less pronounced than for knowledge and attitude, indicating a gap between theoretical awareness and actual use of AI across all professional levels. Statistical Significance: The p-value < 0.05 across all three KAP components indicates a statistically significant association between designation and knowledge, attitude, and practice of AI. This reinforces that professional hierarchy influences familiarity with and application of AI in clinical and academic settings.

Table 4 Association between Designation and Knowledge , Attitude and Practice of AI

S.No	Designation	High Knowledge (%)	Positive Attitude (%)	Applied AI in Practice (%)
1	Undergraduate Student	75.2	70.5	40.1
2	Junior Resident	82.3	76.3	58.6
3	Senior Resident	88.0	82.0	63.2
4	Assistant Professor	90.2	85.5	68.3
5	Associate Professor	91.4	86.0	70.1
6	Professor	93.6	87.8	72.5
7	Medical Officer	85.7	80.0	61.9
8	χ ² value	34.72	29.15	41.86
9	p-value	0.001	0.003	<0.001

High knowledge, positive attitude, and practice regarding artificial intelligence were determined based on predefined scoring criteria of the questionnaire. Knowledge, attitude, and practice scores were calculated by summing the responses to their respective items. Participants scoring equal to or above the predetermined cutoff value (based on the median score) were categorized as having high knowledge, positive attitude, and having practiced artificial intelligence, respectively.

DISCUSSION

This investigation aimed to assess the knowledge, attitudes, and practices (KAP) regarding artificial

intelligence (AI) among healthcare professionals at a tertiary institution in Northern India. The results indicated that although most participants had heard of AI and held favorable views about it, its practical use was still limited. For instance, 88.5% were familiar with the concept of AI, which is similar to findings from other countries, such as reports by Swed et al.(3) that showed a high awareness of AI among Syrian healthcare professionals even in settings with fewer resources.

However, only 29.2% of respondents in this study reported having formal education or training in AI, pointing to a significant gap in the medical curriculum. Literature by Kaplan and Haenlein

notes that, despite technological advances, the formal incorporation of AI education into academic programs has fallen behind, especially in developing nations(2). Most participants viewed AI positively; over 81% felt that AI was crucial in medicine, and more than 83% agreed that AI-supported tools can help with decision-making and diagnostics(7). This perspective is consistent with comments from thought leaders like Topol and projections from the WHO, both of whom highlight AI's potential in improving healthcare delivery and reaching underserved populations(8)

Despite these optimistic views, participants expressed hesitancy around practical application. Just 42.7% thought AI could replace doctors, echoing concerns about reliability and the irreplaceable role of human clinicians. Maddox et al. have similarly noted skepticism toward fully integrating AI into practice. In our study, only a small fraction had applied AI in their work, indicating that challenges such as insufficient training, lack of infrastructure, and systemic barriers persist.(15) Research from Saudi Arabia has mirrored these findings, where AI's promise is recognized, but actual hands-on experience is limited(4).

Furthermore, our analysis highlighted that attitudes toward AI improved with greater professional experience. Professors and senior faculty had the strongest positive outlooks, aligning with studies that show expertise and exposure increase confidence in using AI systems. Thus, there is a pressing need to embed AI education within medical training and to provide structured learning opportunities.(13) This will help bridge the gap between theoretical understanding and practical implementation. As AI continues to advance, training healthcare professionals with appropriate skills is vital for ensuring its ethical, effective, and efficient use.

CONCLUSION

Awareness and attitudes toward artificial intelligence were generally high among doctors and medical students, especially in higher designations. However, actual use of AI tools in clinical or academic practice remained modest despite this interest. Integrating structured AI training and hands-on exposure into medical education is essential to translate knowledge and positive perceptions into meaningful practice

RECOMMENDATION

AI concepts and applications should be systematically incorporated into undergraduate and postgraduate medical curricula through

dedicated modules and workshops. Institutions need to provide practical exposure via simulations, case-based exercises, and access to validated AI tools in clinical departments. Policymakers and administrators should support faculty development and infrastructure to ensure safe, ethical, and evidence-based integration of AI into healthcare.

LIMITATION OF THE STUDY

The cross-sectional design precludes establishing causal relationships between knowledge, attitude, and practice of AI. Conducting the study in a single tertiary institute limits generalizability to other regions and healthcare settings. Self-reported questionnaire responses may be affected by recall and social desirability bias, particularly for practice items.

RELEVANCE OF THE STUDY

The study provides valuable insight into the current status of knowledge, attitude, and practice regarding artificial intelligence among doctors and medical students in Northern India, a region where such data are limited. The findings highlight existing gaps between awareness and practical application of artificial intelligence and underscore the need for structured training and curriculum integration. The results can inform policymakers, medical educators, and institutional administrators in designing targeted educational interventions and capacity-building programs to promote effective and ethical use of artificial intelligence in healthcare.

AUTHORS CONTRIBUTION

AK -Contributed to study design, data acquisition, and manuscript preparation, AM-Assisted in literature search, data collection, and editing AV-Involved in data acquisition and initial drafting , SB-Corresponding author, guarantor, handled data analysis, statistics, and journal correspondenceSK-: Provided overall guidance, departmental support, and critical review, AK-Contributed to data acquisition and manuscript review.

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CONFLICT OF INTEREST

There are no conflict of interest

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DECLARATION OF GENERATIVE AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors haven't used any generative AI/AI assisted technologies in the writing process.

REFERENCES

1. Blazhevskva V. Looking to future, UN to consider how artificial intelligence could help achieve economic growth and reduce inequalities [Internet]. New York: United Nations Sustainable Development; 2017 [cited 2024 Mar 31]. Available from: <https://www.un.org/sustainabledevelopment/blog/2017/10/looking-to-future-un-to-consider-how-artificial-intelligence-could-help-achieve-economic-growth-and-reduce-inequalities/Accessed> on 08 march 2024
2. Kaplan A, Haenlein M. Siri, Siri, in my hand: who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence. *Bus Horiz*. 2019 Jan;62(1):15–25.
3. Swed S, Alibrahim H, Elkalagi NKH, Nasif MN, Rais MA, Nashwan AJ, et al. Knowledge, attitude, and practice of artificial intelligence among doctors and medical students in Syria: a cross-sectional online survey. *Front Artif Intell*. 2022 Sep 29;5:1011524.
4. Alowais SA, Alghamdi SS, Alsuhebany N, Alqahtani T, Alshaya AI, Almohareb SN, et al. Revolutionizing healthcare: the role of artificial intelligence in clinical practice. *BMC Med Educ*. 2023 Sep 22;23:689.
5. Jordan MI, Mitchell TM. Machine learning: trends, perspectives, and prospects. *Science*. 2015 Jul 17;349(6245):255–60.
6. VanLehn K. The relative effectiveness of human tutoring, intelligent tutoring systems, and other tutoring systems. *Educ Psychol*. 2011 Oct;46(4):197–221.
7. Topol EJ. High-performance medicine: the convergence of human and artificial intelligence. *Nat Med*. 2019 Jan;25(1):44–56.
8. World Health Organization. Big data and artificial intelligence for achieving universal health coverage: an international consultation on ethics: meeting report, 12–13 October 2017, Miami, Florida, USA [Internet]. Geneva: World Health Organization; 2017 [cited 2024 May 31]. Available from: <https://iris.who.int/handle/10665/275417> Accessed on 10 May 2024
9. Yu KH, Beam AL, Kohane IS. Artificial intelligence in healthcare. *Nat Biomed Eng*. 2018 Oct;2(10):719–31.
10. Rabaan AA, Alhumaid S, Mutair AA, Garout M, Abulhamayel Y, Halwani MA, et al. Application of artificial intelligence in combating high antimicrobial resistance rates. *Antibiotics (Basel)*. 2022 Jun 8;11(6):784.
11. Wahl B, Cossy-Gantner A, Germann S, Schwalbe NR. Artificial intelligence (AI) and global health: how can AI contribute to health in resource-poor settings? *BMJ Glob Health*. 2018 Aug;3(4):e000798.
12. Khasha R, AlFayyad I, Qudah M, Shakhathreh H. Fuzzy expert system in the prediction of neonatal resuscitation. *J Med Syst*. 2004 Apr;28(2):215–21.
13. Panch T, Szolovits P, Atun R. Artificial intelligence, machine learning and health systems. *J Glob Health*. 2018 Dec;8(2):020303.
14. Lauritzen AD, Rodríguez-Ruiz A, von Euler-Chelpin MC, Lynge E, Vejborg I, Nielsen M, et al. An artificial intelligence-based mammography screening protocol for breast cancer: outcome and radiologist workload. *Radiology*. 2022 Jul;304(1):41–9.
15. Maddox TM, Rumsfeld JS, Payne PRO. Questions for artificial intelligence in health care. *JAMA*. 2019 Jan 1;321(1):31–2