

Assessing Artificial Intelligence Literacy: A Cross-Sectional Study of Knowledge, Attitudes, and Practices Among Medical Students in Rural Haryana for AI Integration in Healthcare

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Abstract

Background: Artificial intelligence (AI), often termed the "fourth industrial revolution," is transforming healthcare by improving decision-making, diagnosis, and patient management. Despite its potential, understanding and integration of AI into medical education and practice remain limited, especially in resource-constrained regions. This study explores medical students' knowledge, attitudes, and practices concerning AI in a rural medical college in Haryana, India. **Material and Methods:** A cross-sectional online survey was conducted among 189 medical students at BhagatPhool Singh Government Medical College for Women, Haryana. Data were collected using a 13-item questionnaire on demographic details, knowledge, attitudes, and practices related to AI. Convenience sampling was employed, and data analysis was performed using SPSS v26.0. Frequency tables were used to summarize the findings. **Results:** Among respondents, 91.5% were aware of AI, yet only 53.4% knew about its medical applications. Most participants (81.5%) reported not being taught about AI during medical school, but 79.9% expressed an interest in learning more. While 76.7% agreed AI aids in early diagnosis, only 20.6% believed it could replace doctors. Regarding AI's potential burden, 18.5% agreed, while 45.5% remained neutral. For future practices, 51.9% showed willingness to work with AI, 66.7% believed it could aid in information gathering, and 78.8% thought AI would revolutionize medical teaching and research. **Conclusion:** The majority of medical students demonstrated a positive attitude toward AI and recognized its potential in healthcare, despite limited knowledge of its applications. Specific training and curriculum integration of AI in medical education are essential to prepare future doctors for the evolving digital landscape.

Keywords: Artificial intelligence, medical education, medical students, rural healthcare, AI applications.

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INTRODUCTION

Artificial intelligence (AI) has received considerable attention in recent decades and has been branded as "fourth industrial revolution."^[1] Artificial intelligence (AI) was pioneered by Marvin Minsky, who described it as "the science of making machines do things that would require intelligence if done by men."^[2] By leveraging data sources to make judgements on its own or to help people make decisions, artificial intelligence is a software system that aims to mimic human cognition. Natural language processing, deep learning, representation learning, and machine learning are all included under this umbrella phrase.^[3] Artificial Intelligence (AI) has use in the healthcare sector across several domains, such as decision-making, streamlined business processes, quality improvement, monitoring and managing tailored treatment plans, and several more.^[4] Numerous medical specialties, such as diabetes, cancer, cardiology, mental health, radiology, and others, have used machine learning.^[3]

By 2035, the World Health Organization predicts that there will be a shortage of over 12.9 million medical personnel globally.^[3] In India, there are just 64 physicians for every 100,000 people, while the global average is almost 150 for

every 100,000. Often severely understaffed and lacking in essential facilities to address patient demands, primary health centres and sub-centers located in rural areas represent the fringes of healthcare access. In rural India, where over 70% of the population resides, this frequently translates into a lack of access to high-quality diagnostic services.^[5]

By diagnosing patients, transcribing notes, entering and arranging patient data onto portals, and serving as a second opinion, AI systems may be able to save up time for busy professionals. Additionally, patients may benefit from prescription medication alternatives and follow-up treatment delivered by artificially intelligent systems. The growth of

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medical services in remote areas is made possible by AI's capacity to diagnose patients remotely, outside of the world's largest towns and cities.^[3] Despite these encouraging early findings, there is still a great deal of debate and misunderstanding about artificial intelligence and its uses, having varying views on the benefits and drawbacks of the technology among the general people and even the scientific community.^[6]

MATERIALS AND METHODS

An online cross-sectional study was conducted using open source 'Google forms' platform among medical students at a rural medical college of Haryana, namely BhagatPhool Singh Government Medical College and Hospital for women, KhanpurKalan. The survey was distributed among students via social media (WhatsApp) and they were made aware that the data may be utilized for study and publishing in medical journals. There was no pressure of any kind, thus participation was entirely optional. Every response was anonymous, and the information provided made it impossible to identify the participants. Only one submission per participant was permitted, and responses were not recorded unless the "submit" button at the conclusion of the questionnaire was clicked. Once the "submit" button was clicked, informed consent was assumed. No personal data was gathered or kept, and only principal investigator had access to data. The survey was completed by 189 students. Convenience sampling technique was used to choose the sample population.

The questionnaire consisted of 13 questions regarding demographic information, understanding of AI and its uses, attitudes about AI, and AI practices. Since there is little chance of psychological or informational harm and the study does not include vulnerable respondents, ethical review board monitoring was considered unnecessary (Whicher and Wu, 2015).^[6]

The data was analysed using SPSS version 26.0. The frequencies of the variables were plotted using frequency tables.

RESULTS

One hundred and eighty-nine medical students responded to the questionnaire. First-year medical students made up 50.3% of the responses, followed by second-year students (20.1%), third-year students (14.8%), and fourth-year

students (14.8%). [Figure 1]

Respondents were questioned about the fundamental idea of artificial intelligence and its applications in the "knowledge base" section of the survey. In all, 91.5% of respondents claimed to understand what "artificial intelligence" meant, but only 53.4% were aware of its uses. The majority of the respondents (81.5%) responded that they had never been taught about AI in medical school. Interestingly, 79.9% of students desired to study more about AI. [Table 1]

Three-quarters of respondents (76.7%) felt that AI helps with early diagnosis and assessment of disease severity. In regard to the notion that artificial intelligence (AI) may eventually take the role of doctors, 20.6% of respondents agree, 48.1% disagree, and 31.2% said they would rather remain neutral. In response to the question of "whether the inclusion of AI would be a burden for practitioners," 18.5% agreed, 36% disagreed, and 45.5% stayed neutral. When asked if "AI would increase the errors in diagnosis," 21.2 % agreed, 36.5 % disagreed, and 23.2% remained neutral. [Table 2]

Concerning the practice in the future, 51.9 % of respondents were prepared to use AI, while 32.8% of medical students were unsure about their future plans to use AI. Almost 2/3rd of respondents (66.7%) believe that AI will facilitate in information gathering from patients. Majority (78.8%) believe that AI will revolutionize medical teaching, training and research. The overwhelming majority of respondents (77.8%) said that specialised AI training and courses would be required. [Table 3]



Figure 1: Distribution of study participants according to MBBS professional year. (n=189).

Table 1: Knowledge of Artificial Intelligence among study participants (n=189)

Statement	Response	Percentage
Do you know what artificial intelligence is?	Yes	91.5%
	No	8.5%
Do you know about any application of AI in the medical field?	Yes	53.4%
	No	46.6%
Have you ever been taught about Artificial intelligence in medical school?	Yes	18.5%
	No	81.5%

Table 2: Attitude of study participants toward artificial intelligence. (n=189)

Statement	Response	Percentage
AI should be included in the curriculum in medical school as well as specialist training?	Agree	79.9%
	Don't know	14.3%

	Disagree	5.8%
AI aids practitioners in early diagnosis and assessment of the severity of disease?	Agree	76.7%
	Don't know	20.1%
	Disagree	3.2%
AI will replace physicians in the future?	Agree	20.6%
	Don't know	31.2%
	Disagree	48.1%
AI would be a burden for practitioners?	Agree	18.5%
	Don't know	45.5%
	Disagree	36%
AI would increase the %age of errors in diagnosis?	Agree	21.2%
	Don't know	42.3%
	Disagree	36.5%

Table 3: Practices related to artificial intelligence among study participants. (n=189)

Statement	Response	Percentage
Would you like to work on AI in future?	Yes	51.9%
	No	15.3%
	Neutral	32.8%
Do you think AI will facilitate information gathering from patients?	Yes	66.7%
	No	14.3%
	Neutral	19.0%
Do you think AI will revolutionize medical teaching, training and research?	Yes	78.8%
	No	6.4%
	Neutral	14.8%
Do you think that doctors should receive specific training on the use of AI tools in healthcare?	Yes	77.8%
	No	5.3%
	Neutral	16.9%

DISCUSSION

Our study aims to gain insight into medical school student's perceptions towards AI technology in medical education. This study advances our knowledge of medical students' perspectives on the function and prospects of AI medicine in medical education.

Based on the results of our study, 91.5% of respondents heard about artificial intelligence and more than half (53.4%) were aware of AI application in medical field. A study conducted by Gnanambigai Kalaimani et al. showed that 63.5% of participants were aware of artificial intelligence.^[4] The difference in AI awareness could be due to variations in demographics, curriculum integration, and exposure to AI tools or workshops. Rural settings and limited access to technology may also contribute to lower awareness levels.

This number is comparable to and in line with other research done in France (87%) and Syria (87.4%), where students recognised the critical role AI plays in the medical industry.^[2,3] The consistent acknowledgment of AI's importance in medicine reflects a growing global awareness of its potential to enhance healthcare. According to Elena A. Wood et al.'s study, 60% of participants expressed interest in AI for both teaching and patient care training.^[7] This might be due to differences in study focus, participants' training levels, or direct exposure to AI in medical education and practice. The results of another study conducted in Korea, which found that 35.4% of participants felt that doctors will be replaced by AI, are consistent with the 20.6% of participants in our study who concurred.^[8] This could stem from the growing visibility of AI's capabilities in diagnostics and automation, fostering concerns about its potential to overshadow traditional medical roles.

When we compared our results to those of other studies conducted in various countries and medical specialities, we discovered the following: 18.5% of respondents in our study agreed that AI will burden medical practitioners, which is similar to a study done in Syria where 10.2% of respondents agreed.^[3] Possibly reflecting apprehensions about increased workload from adapting to new technologies or over-reliance on AI systems. Furthermore, concerning, our study indicated that just 51.9% of participants were eager to work with AI in the future, compared to 78.6% in the Syria study results.^[3] This disparity might be attributed to varying levels of exposure to AI tools, differences in training infrastructure, or cultural and educational factors affecting attitudes towards AI integration. 78.8% of respondents believed that AI would "revolutionize medicine" which was higher in contrast to study done by Sarya Swed et al.^[2] This optimism likely reflects a recognition of AI's transformative potential to enhance patient care, streamline processes, and improve outcomes, even among those with reservations about its practical implementation.

Strengths and limitations: Only one institution carried out the study. Self-selection bias may occur because the survey was optional, and it's probable that only students with an interest in artificial intelligence and cutting-edge medical technology finished it.

Second, in order to increase the completion rate, we chose a comparatively brief questionnaire. To enable more thorough examinations of the obstacles and enablers of AI adoption, qualitative and mixed-methods research is required.

CONCLUSION

Although most medical students are not well-versed in AI and its uses in healthcare, they have a favourable opinion of it and are prepared to use it in practice.

Recommendations: More funding must be set aside for the

development and application of AI in medical education as well as for educating physicians on how to use AI in their day-to-day work. Artificial intelligence concepts should be included into undergraduate medical education, and medical education should be modernised to meet the demands of the digital age.

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Conflicts of interest

There are no conflicts of interest.

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