

Research Article

Educational Trends for Future Physicians in the Era of Advanced Technology And Artificial Intelligence'

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Abstract

Background: Medical institutions are increasingly using AI and other modern technologies in their curriculum. Although research has looked into how AI may be utilized in diagnostic and treatment tools, there is currently no agreement on the best approach to teach medical students and practitioners how to use this technology.

Objective: To assess medical students' opinions on artificial intelligence (AI) in the medical curriculum and to analyze the impact of gender and participation in AI workshops on these opinions.

Materials and Methods: This descriptive cross-sectional study done at a public sector medical college, involved a sample of 90 students selected with a 95% confidence level and 10% precision, calculated via health study software. Data were collected through a Google Forms questionnaire and analyzed using SPSS version 26, with Chi-squared tests, odds ratios, and prevalence ratios applied. Statistical significance was set at $p < 0.05$.

Results: Out of 90 participants, 50 were male and 40 were female. 95.6% of respondents saw AI as essential in current medical education while 85.6% believed AI-related studies should be included in medical schools' curriculums. 92.2% felt medical schools should offer more lessons on AI and sophisticated technologies. Ethical concerns were raised by 80% of participants, and 70.0% were apprehensive about AI replacing certain physician roles.

Conclusion: There is substantial support for incorporating AI into medical education. However, ethical issues and technical preparedness highlight the need for thorough training that covers both practical skills and ethical considerations.

Keywords | Artificial Intelligence, Medical Education, Curriculum, Perception, Advanced technology.

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Introduction

The integration of modern technology has become a popular trend in the ever-changing sector of medical education. There has been a significant increase in the use of cutting-edge technologies in medical schools. Innovative technologies like e-learning, virtual patients, and simulations have enabled a more active, learner-centered approach to medical education.¹ The fast growth of Generative Language Models (GLMs) and artificial intelligence (AI) has caused

a lot of buzz and anxiety lately, and medical education is no exception.² Remarkably, the pace of medical knowledge growth has undergone a staggering evolution. From 1950 to 1980, the doubling period of medical knowledge was seven years; from 1980 to 2010, it was three and a half years. Projections for 2020 indicated a duration of 0.2 years or 73 days.³ Research into artificial intelligence and its applications in healthcare have received substantial funding from developed nations.⁴ The importance of artificial intelligence (AI) has been highlighted by the abundance of research articles published on the topic and the billions of dollars invested in AI companies that focus on health care. This points to the launch and widespread use of artificial intelligence (AI) in the health-care system in the decades to come.⁵

From undergraduate studies to residency programs and



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beyond, medical education encompasses a person's whole professional and personal development. To progress the field of artificial intelligence (AI) in healthcare education in this era of fast technological advancement, In line with a study done on students in the UK, the vast majority of respondents think that AI will be influential in the medical field in the future, with mostly considering understanding AI essential for their future careers as physicians.¹² Moreover, the participants showing concern over the ethical implications of AI was found in a study conducted in Iran,¹³ with another study published in the European Journal of Therapeutics, which contends that incorporating artificial intelligence into health-care education is critical to addressing the changing, quantitative nature of healthcare in the twenty-first century.¹⁴ According to study conducted in Pakistan, Extended reality technology can enhance medical education and patient well-being.¹⁷ It is essential to acknowledge that new work must be constructed on top of the existing materials. Virtual enquiry systems, medical distant learning and management, and medical school recording of instructional films are all ways that digital tools and artificial intelligence might be utilized in medical education.⁶ By simulating real-world education and training tasks, educational technologies have the ability to provide safer, more appropriate, and more cost-effective learning experiences.⁷

While researchers have investigated the use of AI in diagnostic tools and treatment modalities, the precise educational techniques needed to provide medical professionals and students with the ability to navigate this technological terrain have not been thoroughly addressed. A growing number of medical schools are modifying their curricula to match the demands of today's dynamic healthcare system, realizing that a rigid classroom curriculum may not sufficiently teach future doctors to navigate this system.⁸ To help people better understand the many facets of healthcare AI, the World Medical Association is calling for a reevaluation of medical school programs and other educational opportunities for doctors, nurses, patients, and other members of the healthcare industry.⁹

In addition to the lack of specificity regarding teaching content on AI and AI ethics, there are less studies on medical students' perception of AI ethics education (including teaching content) is notable.¹⁰ There is a lack of AI expertise among physicians, and allied health and medical students do not often learn about AI in their coursework.¹¹

The purpose of this research was to evaluate medical students' perceptions regarding the inclusion of artificial intelligence (AI) in the medical curriculum and analyze the influence of gender and attendance at AI workshops on these perceptions.

Methodology

This descriptive cross-sectional study was carried out at a

public sector medical college. Sampling technique was Stratified Random Sampling. The study sought to establish a link between gender, attendance at AI workshops, and medical students' attitudes for adopting AI in the medical curriculum. A well-structured data-gathering approach was used, which ensured reliability and precision. A sample size of 90 participants was estimated using 95 percent confidence level, 10 percent absolute precision with expected percentage prevalence of artificial intelligence and advance technology as 61.7 percent. The sample size was calculated through the software "sample size determination in health studies".

Participants who met the inclusion criteria [Medical students from all years (1st to final year), both genders, voluntary participation, explicit consent after full disclosure of study details)] provided informed consent before the study began. Unwilling students were excluded. Data were collected using a self-constructed questionnaire created in Google Forms, divided into two sections: biographical details and data on educational trends, focusing on AI and advanced technology in medical education.

Data were entered and analyzed using SPSS version 26 software. The qualitative data were expressed in frequencies and percentages and the bar graphs were formed with the help of SPSS 26. The Chi-squared test was applied to assess the association between variables, and odds ratios and prevalence ratios were calculated. A p-value of less than 0.05 was considered statistically significant.

Results

In the study, 46.7% of participants reported having attended a course or workshop on AI or advanced technology in healthcare, while 53.3% had not.

Individuals were asked about their desire to include AI in medical curricula, their support for additional funding for AI research, and their satisfaction with the present level of AI teaching at their medical school.

Demographic details are given in the table under:

Table 1: Baseline characteristics of the study population

Categories		Frequencies	Percentage
Class	1 st year	9	10.0
	2 nd year	10	11.1
	3 rd year	7	7.8
	4 th year	57	63.3
	5 th year	7	7.8
	Total	90	100.0
Gender	Male	50	55.6
	Female	40	44.4
	Total	90	100.0

The majority of participants (74.4%) said they used AI-

based tools or applications during their medical education. A sizable proportion (95.6%) believed that AI may improve the learning experience in medical school, and 85.6% supported the incorporation of AI-related courses into the medical curriculum. In addition, 83.3% said that AI may reduce the need for memorization in medical education, while 78.9% were concerned about the ethical implications of utilizing AI in medical care. Notably, 86.7% of respondents were interested in optional courses focused on AI in medicine, while 87.8% wanted to participate in more research projects on AI in healthcare. However, just 36.7% were pleased with the existing level of AI and technology integration in medical school, while 84.4% suggested introducing AI training into Continuing Medical Education (CME) programs for serving physicians. Furthermore, 73.3% of participants believed their medical school was not adequately educating students for the use of technology in medicine, and 92.2% favoured the notion of giving more courses on AI and sophisticated technology. Finally, 88.9% supported funding for greater research into AI applications in medicine, and 90% stated that AI training would improve their clinical abilities. In this section, there was found to be a significant association between gender and AI inclusion in curricula and supporting funding for more research on AI. Males were significantly more likely to support both the inclusion of AI-related subjects in the medical curriculum and increased research funding for medical AI applications.

Table 2: Correlation of Gender with Support for AI Initiatives

Variable	Odds Ratio	P-Value
Support for AI research funding	0.070	0.002
Support for AI-related curriculum	0.191	0.011

The vast majority of responders (86.7%) expressed a readiness to adopt AI-driven diagnostics in their future medical practices. Similarly, 86.7% said AI might improve health care via telemedicine. The willingness to learn about AI-powered treatment planning was equally strong, with 88.9% of participants showing interest. Furthermore, 86.7% of respondents said AI might help personalize patient treatment regimens.

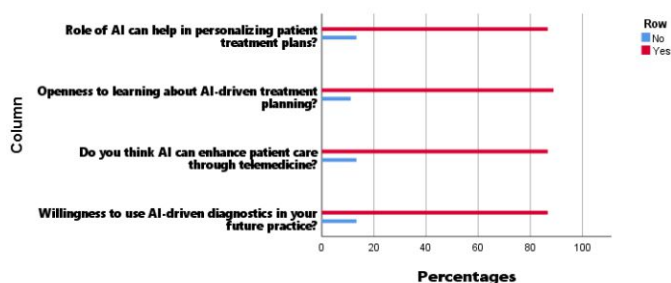


Fig 1: Attitudes Toward Unconventional Approaches to Patient Care

Table 3: Perception of AI in medical education

Variables	Frequency	Percentage
Do you believe that AI is important in modern medical education?	No	4 (4.4%)
	Yes	86 (95.6%)
Have you used any AI-based tools or applications during medical studies?	No	23 (25.6%)
	Yes	67 (74.4%)
Do you think AI improve the learning experience in medical education?	No	4 (4.4%)
	Yes	86 (95.6%)
Would you support the inclusion of AI-related subjects in your medical curriculum?	No	13 (14.4%)
	Yes	77 (85.6%)
Do you feel that AI can help reduce the need for memorization in medical studies?	No	15 (16.7%)
	Yes	75 (83.3%)
Are you concerned about the ethical implications of using AI in healthcare?	No	18 (20.0%)
	Yes	72 (80.0%)
Have your instructors discussed AI and its implications in your courses?	No	53 (58.9%)
	Yes	37 (41.1%)
Would you be interested in elective courses focused on AI in medicine?	No	11 (12.2%)
	Yes	79 (87.7%)
Would you be interested in participating in more research studies about AI in healthcare?	No	11 (12.2%)
	Yes	79 (87.8%)
Are you satisfied with current level of AI and technology integration in your medical education?	No	57 (63.3%)
	Yes	33 (36.7%)
Would you recommend incorporating AI training in continuing medical education (CME) programs for practicing physicians?	No	14 (15.6%)
	Yes	76 (84.4%)
Do you believe medical schools in Lahore are currently preparing students well for use of technology in medicine?	No	66 (73.3%)
	Yes	24 (26.7%)
Do you think medical schools should offer more courses on AI and advanced technology?	No	7 (7.8%)
	Yes	83 (92.2%)
Would you support funding for more research in AI applications in medicine?	No	10 (11.1%)
	Yes	80 (88.9%)
Would you like to use educational simulations incorporating AI for practising medical procedures?	No	16 (17.8%)
	Yes	74 (82.2%)
Do you think AI education will enhance your clinical skills?	No	9 (10.0%)
	Yes	81 (90.0%)
Are you aware of AI applications currently being used in hospitals?	No	52 (57.8%)
	Yes	38 (42.2%)

A sizable number of respondents (64.4%) felt ready to adapt to technology advances in the medical field. However, when questioned about their exposure to AI and advanced technology themes during medical school, 53.3% said they had not been exposed to them, indicating a gap in their training.

The majority (88.9%) of participants expressed the need for more training on AI and advanced technology, reflecting the demand for enhanced educational resources in this area. Confidence in using advanced technology in clinical settings was reported by 66.7% of respondents, indicating a moderate level of self-assurance among the participants.

An astounding 97.8% of respondents predicted AI would play a key role in the future of healthcare., and 88.9% agreed that understanding AI will be essential for their future careers as physicians.

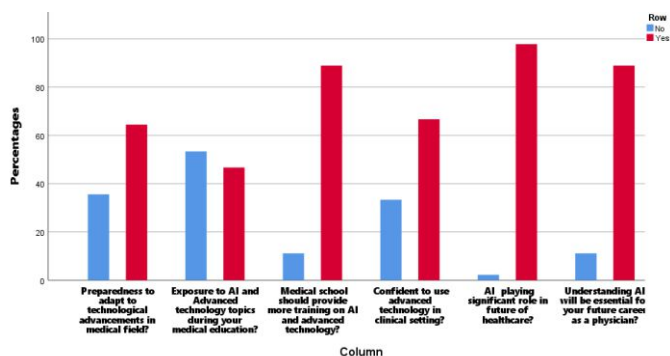


Fig 2: Readiness of medical students for technological advancement

A significant number of respondents expressed concern about the possible influence of AI on their duties as physicians, with 70% fearing that AI would replace certain portions of their work. This underscored a widespread concern among healthcare workers about the changing role of AI in medicine and the consequences for job security. Furthermore, the vast majority of participants (81.1%) expressed concerns regarding the privacy and security of patient data utilized by AI systems. This worry was consistent with larger conversations in the healthcare profession about the ethical and security challenges posed by AI when managing sensitive patient information.

Finally, the impact of AI on specialty selection was clear, with 56.7% of respondents reporting that AI has either influenced or is likely to influence their choice of medical specialization. This showed that AI is becoming an important component in future physician career decisions, which might be related to varied levels of AI integration across specialties.

The study found that the odds ratio for the impact of attending AI workshops on specialty selection was 3.214, with a p-value of 0.008. This indicates a statistically significant positive association, suggesting that students who attended AI

workshops were more likely to be influenced by AI when selecting their medical specialty.

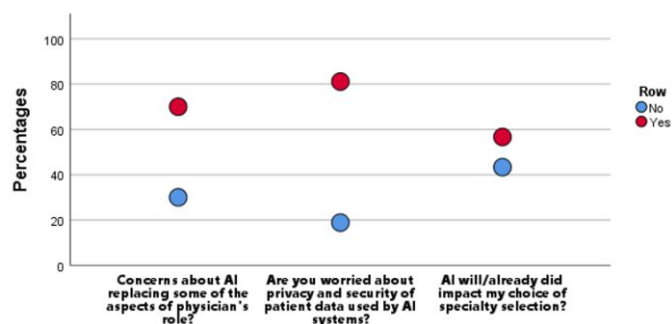


Fig 3: Concerns regarding the use of AI in health services

Discussion

The survey's findings on the changing nature of medical students' educational backgrounds in the age of AI and advanced technology shed light on how these factors will influence their training and professional lives.

An overwhelming majority of participants (95.6%) believe that AI is important in modern medical education and perceive AI as a crucial component in improving the learning experience. Despite positive opinions regarding AI, there remain difficulties. For example, 33.3% of respondents lack confidence in their capacity to employ modern technology in clinical settings, demonstrating a disconnect between theoretical knowledge and actual use of AI. The majority of students (92.2%) favor the inclusion of AI-related subjects in their curriculum and feel that more sophisticated technology courses are required. Interestingly, while 70.0% of students are concerned that AI may replace some elements of a physician's function, 86.7% are eager to adopt AI-powered diagnostics and feel AI may improve patient care through telemedicine. This reflects a nuanced viewpoint in which students are open to AI's benefits yet concerned about its larger ramifications.

The survey indicates that 80% of participants are concerned about the moral consequences of using AI in healthcare. This concern is coupled with a majority (64.4%) feeling somewhat prepared to adapt to technological advancements, suggesting that while there is enthusiasm for AI, there is also a recognition of the ethical challenges and the need for comprehensive training to address these concerns. In line with a study done on students in the UK, the vast majority of respondents (97.8%) think that AI will be influential in the medical field in the future, with 88.9% considering understanding AI essential for their future careers as physicians¹². Despite the positive attitudes towards AI, there are challenges. For instance, 33.3% of respondents are not confident in their ability to use advanced technology in clinical settings, indicating a gap between the theoretical understanding and prac-

tical application of AI. Most students support the integration of AI-related subjects into their curriculum and believe that more courses on advanced technology are needed (92.2%).

Interestingly, while 70.0% of students are concerned about AI potentially replacing some aspects of a physician's role, 86.7% are willing to use AI-driven diagnostics and believe AI can enhance patient care through telemedicine. This indicates a nuanced view where students are open to AI's benefits but remain cautious about its broader implications. Moreover, the participants show concern over the ethical implications of AI, with 80% of participants being concerned about it, as found in a study conducted in Iran. Among the most important ethical issues in AI-driven education are those related to cyberattacks, patient privacy, confidentiality, and visual security breaches, which arise from the integration of AI into medical education, particularly in clinical and case-based learning, which involves entering large amounts of patient data into databases.¹³

The study's findings that AI should be included in medical curricula are consistent with another study published in the *European Journal of Therapeutics*, which contends that incorporating artificial intelligence into healthcare education is critical to addressing the changing, quantitative nature of healthcare in the twenty-first century. In order to narrow the educational gap, new technologies must be developed, human capacities must be improved, technology must be integrated into clinical procedures, and practical skills for using and comprehending AI in healthcare settings must be imparted¹⁴. The findings of S. Ahuja's literature review corroborate the claims made by 56.7% of participants that AI has influenced their choice of specialty. The review suggests that AI could soon outperform physicians in forecasting and image recognition, as humans are unable to handle thousands of images in a reasonable amount of time. Because of this, some people are worried that AI systems will eventually supplant doctors, particularly radiologists.¹⁵ Findings from research done in China in 2023 corroborate students' perceptions of their own lack of preparedness (35.6%), as well as medical institutions' failure to provide adequate training and standardized instruction (73.3%). The author claims that it is certain that future undergraduate and graduate medical students will work in a different professional environment given the growing use of AI technology in the medical area. Students now don't receive an organized and uniform education on medical AI, which might make them feel unprepared and ignorant despite this paradigm change.¹⁶

Research among Turkish medical learners revealed that artificial intelligence (AI) is urgently needed. Among the students, three-quarters (74.4% to be exact) believed that AI will help them become better doctors.⁹

It should be noted that this study includes multiple limitations. To begin, there is some concern that the 90 participants may not accurately reflect the medical student body as a whole due to the small sample size. The results may not apply to other schools or areas because the study only included one medical college. There is also the possibility of sample bias, as the questionnaire was sent using Google Forms, which may have predominantly drawn students with a pre-existing interest in AI, resulting in biased replies. Furthermore, the survey's self-reported structure may introduce response bias, with participants overestimating or underestimating their knowledge or attitudes on AI-related issues. These concerns underscore the need for more research to corroborate these findings using a larger, more representative sample and more rigorous techniques.

Conclusion

This study emphasizes the crucial significance of AI in current medical education and demonstrates participants' great interest in incorporating AI into curriculum and clinical training. The promise of artificial intelligence (AI) to improve healthcare is widely welcomed, but worries about the moral ramifications and readiness for future technical developments remain. The results point to the necessity of thorough instruction and training in artificial intelligence (AI), including resolving moral dilemmas and honing useful abilities for using AI in healthcare. It is essential to acknowledge that new work must be constructed on top of the existing materials. Virtual enquiry systems, medical distant learning and management, and medical school recording of instructional films are all ways that digital tools and artificial intelligence might be utilized in medical education.

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Ethical approval: Obtained from IRB of King Edward Medical University.

Authors Contribution:

IK, MA: Involved in conceptualization of study

MAA, MN: Involved in data collection

MA, MB, MK: Involved in manuscript writing

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