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ARTIFICIAL INTELLIGENCE IN MEDICINE: A STUDY OF KNOWLEDGE, ATTITUDE, AND PRACTICES AMONG MEDICAL STUDENTS.

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ABSTRACT

Introduction: Artificial intelligence (AI) encompasses technologies that mimic human intelligence, including speech recognition, decision-making, and visual perception. Its applications in healthcare range from drug development and medical imaging to tailored treatment regimens and predictive analytics. AI improves efficiency and patient care by assisting clinicians and enabling telemedicine. However, its widespread adoption depends on a deep understanding of AI among medical students, highlighting the need for AI-focused education to foster innovation in healthcare.

Materials and Methods: This descriptive cross-sectional study, conducted at a tertiary care teaching hospital, surveyed final MBBS students' knowledge, attitudes, and practices toward artificial intelligence (AI) in healthcare. Approved by the Institutional Ethics Committee, the study used Google Forms to collect 79 complete responses over a 15-day period. The questionnaire assessed students' AI knowledge through 7 yes/no items, attitudes with 10 items rated from 'strongly disagree' to 'strongly agree,' and practices using 7 items rated from 'never' to 'always.

Results: The study found that 55 out of 79 (69.62%) respondents were female, while 24 (30.38%) were male. Notably, 70.3% lacked solid AI knowledge, and 72.2% were unfamiliar with deep learning/machine learning concepts. Only 5.4% attended AI-related courses, indicating a gap in AI education among medical students. Although most students had a neutral attitude toward AI, 43.2% agreed healthcare students should learn AI basics. In practice, AI usage was low, with 41.7% "never" using AI for exam preparation and 43.2% for homework/assignments.

Conclusion: the findings suggest that while medical students show interest in AI, there is a lack of comprehensive education and training in AI, leading to minimal use in practice. The study underscores the need for enhanced AI education and practical exposure to better prepare medical students for the evolving healthcare landscape.

Key words: Artificial intelligence, Medical students, Health care technology.

Introduction

The definition of artificial intelligence (AI) is "the theory and development of computer systems capable of performing tasks, such as speech recognition, visual perception, decision-making, and language translation that ordinarily require human intellect."1Undoubtedly, machine learning, representation learning, deep learning, and natural language processing (NLP) are just a few of the numerous subfields that fall under the umbrella of artificial intelligence (AI). 2

AI is creating machines that are capable of doing tasks that normally call for human intelligence. Understanding natural language, spotting patterns in data, coming to conclusions, and gaining experience are a few examples of these tasks. Though computer science is the foundation of artificial intelligence, its uses go well beyond that. There are connections between AI and a number of academic fields, including statistics, linguistics, philosophy, psychology, and medicine. 3

Applications of artificial intelligence (AI) in medicine include drug development, virtual health assistants, tailored treatment regimens, medical imaging analysis, and predictive analytics. Big data sets are analyzed by AI algorithms to increase the precision of diagnoses, maximize treatment results, and improve patient care. AI is transforming healthcare delivery, increasing efficiency, and enhancing medical research. It can help radiologists detect problems and even enable tailored treatment and telemedicine options.4

AI transformation appears to be a good fit for health care. AI systems could potentially free up time for busy clinicians by diagnosing patients, transcribing notes, and entering and organizing patient data onto portals (for example, EPIC). They could even act as a second opinion for clinicians. Furthermore, patients might profit from follow-up care provided by artificially intelligent systems as well as substitutes for prescription drugs. AI has the ability to diagnose patients remotely, allowing the spread of medical services into rural areas in addition to the world's major cities.Even if there is still a long way to go, AI in healthcare has a promising future. The disadvantages of using traditional methods for diagnosis and treatment—such as the need to examine a large number of patients quickly, the possibility of errors due to psychological effects and medical burnout, the occasional inaccurate diagnosis, and patients' anxiety when seeing a clinical doctor—may be mitigated with the aid of artificial intelligence.5,6 While a lot of research has been done to show how AI algorithms can help to improve education, there are still few studies that specifically address how AI can be used to improve medical education. 7

For AI to be widely adopted, data on students' attitudes, knowledge, and needs regarding AI in healthcare are essential. This data also shows educational policymakers how important it is to have interdisciplinary collaboration among healthcare stakeholders in order to plan for AI-based training, as well as how important it is for students to have access to AI. Furthermore, the advancement of contemporary scientific and technological ideas will provide a foundation for fostering innovation in the healthcare sector, where students are the driving force behind the profession's future. 8

Hence the present study was carried out to determine KAP towards artificial intelligence among medical students.

Materials and methods:

This was a descriptive cross-sectional study. It was conducted at Vinayaka Mission Medical College, atertiary care teaching hospital. The study was initiated after obtaining approval from the Institutional Ethics Committee. . Final MBBS students were included in the present study. Questionnaire in the form of Google Forms were circulated to the students . Only the lead investigator had permission to examine the data. No personal information was gathered or kept. A minimum of 15 days was chosen for the process, and reminders were sent out two or three times. A total of 79 responses were complete and satisfactory about answering all questions and these questions were subjected for data analysis.

The questionnaire comprised different questions that evaluated the students' Knowledge,attitude and perceptions of AI in health care. The first segment included questions that evaluated the awareness. of the students about basic terms related to AI and its role in health care. The second and third segment of the questionnaire assesses the student's attitude and practices towards the role of AI in health care respectively. The knowledge-assessing part consisted of 7 items, the attitude-assessing part of 10 items, the practice-assessing part of 7 items, and the part The total knowledge was assessed by responses Yes or No. Attitude was analysed by considering responses ranging from 'strongly disagree' to 'strongly agree'and for attitudes, from 'never'to 'always'. 9

Results:A total of 79 responses were analysed in the present study. The majority of responses were from female students 55(69.62%) followed by male responses 24(30.38). A majority (70.3%) do not have a solid knowledge of the basics of AI, while 29.7% claim to have it. Similarly, the majority (72.2%) do not know what deep learning/machine learning is, while 27.8% claim to know. This is more evenly split, with 45.9% claiming to know some applications of AI in their field of interest, while 54.1% do not.Overall, it appears that the respondents had very little exposure to and understanding of artificial intelligence (AI), with the majority lacking any official education or training in the field. Even yet, there is a limited understanding of its significance and range of uses. (Table.1)

Participantsresponses towards knowledge (Table.1)

S.no	Questions	Yes	No
1.	Do you have a solid knowledge of the basics of AI?	29.7	70.3
2.	Do you know what deep learning/machine learning is?	27.8	72.2
3.	Do you know any application of AI in your field of interest?	45.9	54.1
4.	Have you attended any previous online/offline courses regarding AI?	8.1	91.9
5.	Have you ever been taught about AI in your undergraduate studies?	5.4	94.6
6.	AI requires a lot of labeled data to learn (data already processed by a human).	67.6	32.4
7.	I understand the barriers of applying AI in medicine	59.5	40.5

When evaluating the attitudes of medical students towards artificial intelligence (AI), it was observed that the majority of students tended to select responses within the neutral range (35.1-54.1%) across various items provided in the questionnaire. This suggests that medical students generally exhibit a moderate stance or lack of strong inclination towards either positive or negative views regarding AI. Their attitudes appear to be balanced, indicating a cautious and measured approach to considering the implications of AI in healthcare. (Table.2)

Attitude of medical students towards artificial intelligence.(Table.2)

S.No	Attitude	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1.	I believe healthcare students should learn the basics of AI	2.7	5.4	43.2	35.1	13.5
2	I believe AI will be a highly required tool in my field	0	16.2	54.1	24.3	5.4
3.	I believe ethical implications of AI must be understood by different students	0	5.4	37.8	37.8	18.9
4.	I believe AI will revolutionize the educational system	0	5.4	40.5	43.2	10.8
5.	I believe human teachers will be replaced in the fore- seeable future	10.8	16.2	45.9	24.3	2.7
6	I believe the upcoming developments in the educational system will excite me	0	5.6	50	33.3	11.1
7	I believe AI should be a part of the training system among students of medicalfields	0	29.7	37.8	27	5.4
8.	Clinical AI will be more accurate than physicians	21.6	37.8	35.1	2.7	2.7

9	I believe some specialties are more prone to be replaced by AI than others	18.9	10.8	37.8	24.3	8.1
10	I believe AI would increase the percentage of errors in diagnosis	0	2.7	43.2	35.1	18.9

1. Strongly disagree 2. Disagree 3.Neutral 4.Agree 5. Strongly agree.

It is evident that the majority of medical students tend to avoid using AI for various practices, as indicated by the prevalence of the "Never" option across different items. Additionally, there was a notable absence of responses towards the "Always" option, with only two exceptions.A small percentage of students(2.5%) reported using AI always or very frequently when conducting research, suggesting a relatively higher reliance on AI tools in this aspect of their academic work. Similarly, a minority of students(2.5%) indicated that they consistently use AI for spelling and grammar checking, indicating a higher reliance on AI tools for this specific task.

Practices of medical students towards artificial intelligence (Table.3)

S.no	Practice	Never	Occasionally	Sometimes	Often	Always
1.	How frequently do you use AI to prepare for your exams?	41.7	27.8	27.8	2.8	0
2	How frequently do you use AI to prepare for your homework/assignments?	43.2	18.9	37.8	0	0
3	How frequently do you use AI to conduct your research?	51.4	13.5	27	5.4	2.7
4	How frequently do you use AI for personal choices/career guidance?	40.5	27	24.3	8.7	0
5	How frequently do you use AI for spelling and grammar checking?	32.4	13.5	27	24.3	2.7
6	How frequently do you use AI for personality development and other skills?	43.2	24.3	24.3	8.1	0

Discussion: The study examined the views of final year medical students who had received no formal training in AI about incorporating AI into healthcare. It sought to clarify their understanding of, attitudes towards, and perspectives of AI's function in the healthcare industry. The majority of the sample was made up of students who had little experience with AI principles. In order to inform training programmes and policy choices, the study aimed to get insight into how future healthcare professionals would respond to and be prepared for AI integration.

In the present study, the majority (70.3%) do not have a solid knowledge of the basics of AI, while 29.7% claim to have it. Similarly, the majority (72.2%) do not know what deep learning/machine learning is, while 27.8% claim to know. This is more evenly split, with 45.9% claiming to know some applications of AI in their field of interest, while 54.1% do not. The results unveiled a notable lack of awareness among medical students regarding AI, coupled with a negative perception of AI's potential contributions to both individual patient care and the broader healthcare system. The findings underscored a gap in understanding among students about AI's capabilities and its implications for healthcare delivery. The present study results are similar to the previous findings. In a Spanish study, 51.9% considered themselves to not clearly understand AI. 10In a survey from Germany involving three medical universities, 68% were unaware of the technologies involved in AI. 11

A sizable majority of the students polled for this study (43%) agreed that AI had the ability to revolutionise the educational system. This agreement indicates that students are becoming more aware of how AI might transform education and are willing to accept new developments in AI-driven teaching and learning strategies. Many respondents exhibited a neutral stance towards the various items assessing their attitudes, which may stem from a pervasive lack of awareness among medical graduates regarding AI's intricacies and applications in healthcare. This neutrality suggests a hesitancy or ambivalence, potentially rooted in insufficient exposure or understanding of AI concepts. Such a phenomenon underscores the necessity for comprehensive educational initiatives aimed at bridging this knowledge gap and fostering informed perspectives among medical graduates. Addressing this gap in awareness is crucial for cultivating a workforce that is adept at leveraging AI technologies to enhance patient care and healthcare delivery. Mehta et al, 12 have revealed that students have a strong expectation that artificial intelligence (AI) would significantly alter the medical workforce. This suggests that they anticipate AI having a big influence on their future employment. Surprisingly, 25% of the students who responded to the study said that factors pertaining to artificial intelligence were influencing their choice of speciality..Similarly, a study by Topol EJ found that using AI in healthcare could reduce certain medical specialties' workforce. 13
According to Zhang et al., healthcare workers believed that AI might eventually replace humans in some functions and were worried about losing their jobs as a result.14Ahmed et al. found that healthcare professionals perceive radiology and pathology as the specialties most vulnerable to AI's influence due to their reliance on interpreting medical imagery. AI's potential to perform image analysis tasks accurately and swiftly underscores its anticipated impact in these fields.15
In our study, spell and grammar checking are among the most prevalent applications of AI due to their widespread utility in various domains. AI usage for clinical or career-focused purposes, like exam readiness and personal decision-making, seemed to be less common. This is in agreement with the previous study conducted by Qerem etal.9
Several limitations were evident in this study. Firstly, it was conducted at a single site, thereby limiting the generalizability of its findings. Additionally, there's a possibility of selection bias due to the characteristics of the students who volunteered to participate. Lastly, the statistical analysis relied on a simplistic percentage-based approach

Conclusion: The findings of this study highlight several important insights into the knowledge, attitudes, and practices of medical students regarding artificial intelligence (AI). Firstly, it is evident that a significant majority of students lack a solid understanding of AI basics, with a majority also unfamiliar with concepts such as deep learning/machine learning. This suggests a considerable gap in formal education or training in the field of AI among medical students. Secondly, when evaluating attitudes towards AI, the majority of students demonstrated a neutral stance, indicating a balanced and cautious approach towards the implications of AI in healthcare. Lastly, the study reveals that the majority of medical students tend to avoid using AI for various practices, with a notable absence of frequent usage reported across different tasks.

References:

1. Sapci AH, Sapci HA. Artificial Intelligence Education and Tools for Medical and Health Informatics Students: Systematic Review JMIR Med Educ 2020;6(1):e19285 doi: 10.2196/19285.
2. Perrier E, Rifai M, Terzic A, Dubois C, Cohen JF. Knowledge, attitudes, and practices towards artificial intelligence among young pediatricians: A nationwide survey in France. Front Pediatr. 2022;10:1065957. doi: 10.3389/fped.2022.1065957. PMID: 36619510; PMCID: PMC9816325
3. He J, Baxter SL, Xu J, Xu J, Zhou X, Zhang X. The practical implementation of artificial intelligence technologies in medicine. Nat Med. 2019;25(1):30-36.doi: 10.1038/s41591-018-0307-0

4. Shorey S, Ang E, Yap J, Ng ED, Lau ST, Chui CK. A virtual counseling application using Artificial Intelligence for Communication Skills Training in nursing education: Development Study. J Med Internet Res. 2019;21(10):e14658
5. James CA, Wachter RM, Woolliscroft JO. Preparing clinicians for a clinical world influenced by artificial intelligence. JAMA.2022;327(14):1333–4. 10.1001/jama.2022.3580
6. Popenici S.A., Kerr S. Exploring the impact of artificial intelligence on teaching and learning in higher education. Research Res. Pract. Technol. Enhanc. Learn. 2017;12(1):1–13.
7. Bayne S. Teacherbot: interventions in automated teaching. Teach. High. Educ. 2015;20(4):455–467.
8. Popenici SA, Kerr S. Exploring the impact of artificial intelligence on teaching and learning in higher education. Res PractTechnolEnhanc Learn. 2017;12(1):22.
9. Al-Qerem W, Eberhardt J, Jarab A, et al. Exploring knowledge, attitudes, and practices towards artificial intelligence among health professions' students in Jordan. BMC Med Inform DecisMak. 2023;23(1):288. doi: 10.1186/s12911-023-02403-0
10. CaparrósGalán G, SendraPortero F. Medical students' perceptions of the impact of artificial intelligence in radiology. Percepciones de estudiantes de medicinasobre el impacto de la inteligencia artificial enradiología. Radiologia. 2021;63(5):419-426. doi: 10.1016/j.rx.2021.03.006.
11. Pinto Dos Santos D, Giese D, Brodehl S, et al. Medical students' attitude towards artificial intelligence: a multicentre survey. EurRadiol. 2019;29(4):1640–1646. Doi:10.1007/s00330-018-5601-1.
12. Mehta N, Harish V, Bilimoria K, et al. Knowledge and Attitudes on Artificial Intelligence in Healthcare: A Provincial Survey Study of Medical Students. MedEdPublish. 2021;10(1):75. doi: 10.15694/mep.2021.000075.1
13. Topol EJ: High-performance medicine: the convergence of human and artificial intelligence. Nat Med. 2019, 25:44-56.
14. Zhang Y, Luo M, Wu P, Wu S, Lee TY, Bai C: Application of computational biology and artificial intelligence in drug design. Int J Mol Sci. 2022, 23:10.3390/ijms232113568
15. Ahmed Z, Bhinder KK, Tariq A, et al. Knowledge, attitude, and practice of artificial intelligence among doctors and medical students in Pakistan: a cross-sectional online survey. Ann Med Surg (Lond). 2022;76:103493. doi: 10.1016/j.amsu.2022.103493.