

Perceptions of Medical Students towards Artificial Intelligence in Medical Education.

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Abstract:

Introduction: Artificial Intelligence (AI) means making machines capable of stimulating intelligence by giving the computer human like capabilities such as understanding, reasoning & problem solving. AI systems can provide multi-sensory stimulating environment, feedback about learners performance, opportunity to engage in problem based learning, opportunity to observe medical cases on a model in a variety of grades & introducing different interventions in a safe environment. Implementing technological reform in medical education requires students readiness & awareness regarding importance of adopting the latest technologies in order to equip themselves with knowledge& skills require for future medical practice.

Objectives: To assess perceptions of medical students towards Artificial Intelligence in medical education.

Methodology: A Cross-sectional study is being conducted among MBBS batches and Interns of KIMS&RF, Amalapuram during July 2023. The data was collected using a pre-designed, structured questionnaire using Google forms from MBBS students. They were informed about purpose of the study and students who are willing to participate were included for the study after taking informed consent. 465 students responded within 1 month period. Data was analyzed using SPSS software version 24 and appropriate statistical tests were used.

Results: Among 465 students, 91.4% students perceives that AI aids medical students in research, literature review and Understanding complex medical terminologies 87.3% students perceives that Incorporation of AI system in medical education would ease your learning process, 86.9% students perceives that Artificial intelligence(AI) system would have positive impact on Medical education, 87.09% students disagree that using AI System in medical practice would replace their future role as physician

Conclusion: Students have positive perceptions towards AI systems, showing optimism towards learning more about AI in their medical education This study demonstrates how medical students see AI's contribution to medical practice and education in a good manner. It highlights how important it is to incorporate AI education into medical curriculum in order to ready upcoming medical professionals for the rapidly changing healthcare environment.

Recommendation: To make sure that students are prepared to use artificial intelligence in their medical professions, medical schools should think about integrating AI education and training into their curriculum. To keep medical students aware and involved, it should also be encouraged to have ongoing conversations and updates on AI's changing role in healthcare.

Keywords: Artificial Intelligence, Undergraduate medical students, Perceptions, Medical Education.

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Introduction

Artificial Intelligence (AI) and its subsets, Machine Learning (ML) and Large Language Models (LLMs), have revolutionized various fields, including healthcare. AI empowers computers to emulate human-like intelligence, enabling them to understand, reason, and solve problems. In the medical context, AI supports decision-making in healthcare by leveraging knowledge and data-intensive solutions, ultimately enhancing human care providers' performance [1].

AI is used in medication discovery, health monitoring, personalized medicine, disease diagnostics, medical data management, and health plan and therapy analysis [2]. Recent advancements in AI, especially ML, have showcased their potential to enhance diagnostic accuracy and treatment effectiveness, transforming the way clinicians practice medicine [3].

Including uses and ideas of artificial intelligence in medical education is essential to prepare future healthcare professionals. Students need to be well-versed in AI's capabilities, as it plays a pivotal role in modern medical practice [4]. However, there hasn't been much use of AI in medical education, highlighting the need for educational reforms and increased awareness among students [5].

Recent studies have shed light on medical students' perceptions of AI in healthcare education. Many students recognize AI's importance in healthcare and express readiness to embrace AI systems in their learning journey [6]. However, concerns persist, including the need for ethical considerations, mitigating bias, and ensuring responsible AI use in medical practice [7].

To ensure that future clinicians are equipped to leverage AI in their medical careers, medical institutions must integrate AI education into their curricula. This includes providing students with a deep understanding of AI concepts, practical skills, and the ability to critically evaluate AI systems' performance [8].

AI interprets external data, learns from it, and uses this learning to achieve specific goals and tasks [1]. Incorporating AI concepts and applications into the medical curriculum can be advantageous for students, wherein AI systems can play an important role in the education process [8].

The futurist author Topol's words "Nearly every clinician in the future; from specialist physicians to paramedics, will be using artificial intelligence technology and especially deep learning." underlined the wide field of use of AI in medicine [9].

AI's integration into healthcare education is on the horizon, holding the potential to transform medical

practice and improve patient outcomes. As AI continues to shape the future of medicine, it is crucial to prepare the next generation of doctors to harness its benefits responsibly and effectively. Therefore, the study is aimed to assess perceptions of medical students towards Artificial Intelligence in medical education.

Methodology

Study Design: A cross-sectional study.

Study Setting: The study was conducted at 'Konaseema Institute of Medical Sciences & Research Foundation between 1st -31st July 2023.

Participants: All students enrolled in the undergraduate medical program & Interns were included for the study.

Data Collection: Three reminders were given to the participants, and an online questionnaire was utilized to collect the data.

Survey Questionnaire

The questionnaire is closed ended and comprises of 10 questions. To better match the questionnaire with the goals of the study, a group of academics comprising a senior professor and HOD and assistant professor from the Department of community medicine reviewed it. Twenty students participated in a pilot study of the questionnaire to evaluate its applicability and clarity; no changes were needed. Twenty students who answered the questionnaire twice on different Saturdays were used in a test-retest technique to confirm the questionnaire's dependability. The results showed a very good correlation (intraclass correlation value of 0.984).

Questionnaire Structure

The questionnaire included information on demographics, opinions about AI, and how AI is affecting medical education. All batches of MBBS students received the questionnaire link, which was disseminated electronically via Google Forms.

Ethical Considerations: Ethics committee approval was obtained and students were informed about purpose of the study and informed consent is obtained.

Construct Validity of the Items in the Questionnaire

To assess the questionnaire's scales' construct validity, factor analysis was done. The dependability of the 10-item Students' Perceptions Scale was deemed satisfactory, as indicated by its Cronbach's Alpha rating of 0.708.

Statistical Analysis: To analyze the data, SPSS version 24.0 was utilized. Frequencies and

percentages from the questionnaire responses were derived using descriptive statistics. With significance set at $p < 0.05$, to identify significant differences or correlations between categorical variables, chi-square tests were utilized.

Results

A 64% response rate was obtained from the 465 students that answered the questionnaire out of the 720 who were addressed.

Demographic and General Characteristics

Students of 1st MBBS are 21.7% (n= 101), 2nd MBBS are 22.2% (n=103), 3rd MBBS are 24.73% (n=115), 4th MBBS are 14.4% (n=67), Interns are 17% (n=79). Descriptive Statistics shows the demographic characteristics of the study sample, which comprised 465 students aged 18–24 years, with a mean age of 20.76 years (± 2.83 Standard Deviation). Among 465 students, females were 277 (59.6%) and males were 188 (40.4%).

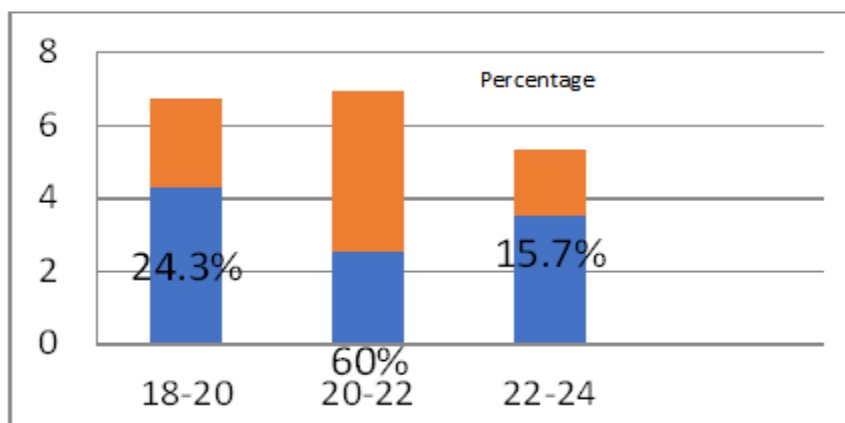


Figure 1: Age in Years

Table 1: Features of the research population

Characteristic	Percentage
Age (in years)	
Mean \pm SD	20.76 \pm 2.83
Gender	
Male	59.6
Female	40.4
The current year of academic study	
1 st MBBS	21.7
2 nd MBBS	22.2
3 rd MBBS	24.7
4 th MBBS	14.4
Interns	17
Computer literacy level	
Literate	17.8
Competent	74.3
Proficient	4.9
Computer technology used to education	
Constantly	57.5
Occasionally	37.4
Not once	2.9

Students' Perceptions of AI

Among 465 students, 425(91.4%) students perceives that AI aids medical students in research terminologies (Table 2). 406(87.3%) students perceives that Incorporation of AI system in medical education would ease your learning process. 404(86.9%) students perceives that

Artificial intelligence (AI) system would have positive impact on Medical education. 405(87.09%) students disagree that using AI System in medical practice would replace their future role as physician.

Table 2: Views on artificial intelligence

Question	Yes	No
1) Artificial intelligence(AI) system would have positive impact on Medical education	404 (86.9%)	61(13.1%)
2) AI play important role in Health care	381 (81.9%)	84(18.1%)
3) Incorporation of AI system in medical education would ease your learning process	406(87.3%)	59(12.7%)
4) Using AI system in medical education would prepare you for real clinical practice	294(63%)	171(136.8%)
5) Using AI System in medical practice would replace your future role as physician	60 (12.91%)	405(87.09%)
6) AI Algorithms can analyze vast amount of Medical data quickly and accurately	383(82.4%)	82(17.6%)
7) AI Raises ethical concern related to data privacy, consent and potential biases	376(80.9%)	89(19.1%)
8) Are you willing to use AI in medical education	341(73.3%)	124(26.7%)
9) AI will replace some specialtie's in Health care during my lifetime	324(69.7%)	141(30.3%)
10) AI aids medical students in research, literature review and understanding complex medical terminologies	425(91.4%)	40(8.6%)

Association with Academic Years

Students of third MBBS believes AI aids medical students for research, literature review and understanding medical terminologies ($p = 0.003$). Students of second MBBS felt that incorporation of AI would ease their learning process ($p = 0.000$). Interns were more likely to think they would know how to use AI in everyday clinical practice ($p = 0.031$). Academic phases did not significantly correlate with either readiness to use AI in medical education ($p = 0.333$).

Discussion

The sample's average age (20.76 ± 2.83) and male-to-female ratio (59.6% % to 40.4%) in this study indicate that the majority of "Konaseema Institute of Medical Sciences & Research Foundation" students are female and young. The majority of pupils showed that they could operate a computer well and that they frequently used technology to learn. Most students thought AI will help their careers and had positive impressions of its role in healthcare. While some students believed AI may take the role of specific medical specialties, most did not think AI will completely replace doctors [10,12]. The majority of students stated that they would be open to receiving instruction or AI instruction as a requirement for their medical degree [11].

Just about 25% of the students reported having formal AI instruction or training.. The absence of official AI instruction in the curriculum suggested that medical education should include AI principles [14,10].

The potential of AI to improve medical learning was well-received by students, especially in light of the COVID-19 epidemic. They thought AI may facilitate learning and better equip students for

practical clinical experience. The majority of students said they would be open to using AI in their medical education [15].

Healthcare can benefit from AI, but there are risks as well, such as privacy invasions, security lapses, and moral conundrums. Effective risk management requires careful strategy, execution, and governance [16,17,18].

Conclusion

The survey found that students like AI systems and want to learn more about them in medical school. Thus, it is encouraged that university curriculum writers to include AI training in its scholar medical program. This could include data science, AI, and moral and ethical issues. Along with other medical practice advancements, they should consider using AI in medical education. AI will undoubtedly impact medical education and practice. First, we must allow AI to take over medicine. Medical students must understand the risks, ethical, and social aspects of AI before using it in medicine. AI will benefit medical professionals by offering them new tasks and opportunities, not replacing them. Future AI advances will help explain its healthcare applications and potential drawbacks.

Limitations: This study had shortcomings. First, a single-center investigation. Second, the study's willing participants' features may have suggested selection bias. Third, students may have overestimated their knowledge of AI and their willingness to use it after graduating from medical school because the survey was based on a self-reported questionnaire that may have had reporting bias. Therefore, future studies should incorporate an objective assessment, such as true/false questions. Fourth, because there was little study on similar populations in the region, most results were compared to related studies, although other

populations may have different cultures and learning contexts. Future studies should investigate multiple medical schools to improve generalizability.

Recommendations: Given the good opinions of students, the study advocates for the use of AI in medical education. The necessity to offer AI instruction or training, incorporate AI ideas into currently offered courses, and investigate AI-based teaching and clinical training applications are some of the implications. To prepare upcoming medical professionals for AI integration in healthcare, post-graduate AI training programs and certification processes for AI abilities and competences are recommended.

List of abbreviations:

AI- Artificial Intelligence

ML- Machine Learning

LLMs- Large Language Models

SD- Standard deviation

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