



Original Research Article

PERCEPTIONS OF UNDERGRADUATE MEDICAL STUDENTS ON APPLICATION OF ARTIFICIAL INTELLIGENCE IN MEDICAL EDUCATION AND HEALTHCARE: A QUALITATIVE STUDY

Shailaza Shrestha¹, Afreen Arshad Choudhry², Rahul Rai³

¹Associate Professor, Department of Biochemistry, Heritage Institute of Medical Sciences, Varanasi, Uttar Pradesh, India.

²Assistant Professor, Department of Biochemistry, Autonomous State Medical College, Gonda, Uttar Pradesh, India.

³Associate Professor, Department of Anatomy, Heritage Institute of Medical Sciences, Varanasi, Uttar Pradesh, India.

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Corresponding Author:

Dr. Shailaza Shrestha

Associate Professor, Department of Biochemistry, Heritage Institute of Medical Sciences, Varanasi, Uttar Pradesh, India.

Email: shailazarai@gmail.com

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ABSTRACT

Background: In the last few years, the use of artificial intelligence (AI) in healthcare and health profession education has been growing. So, this study was conducted to understand perception of undergraduate medical students (future clinicians) about AI relative to its use in medical education, its impact on healthcare and practice of various AI tools in medicine.

Materials and Methods: The study included 500 undergraduate medical students from various academic years. Demographic data (age, gender, academic year) of the students consented to participate in the study was recorded. The questionnaire assessing perception of students about impact of AI in medical education and healthcare were provided via google form link and the responses were assessed using a 5-point Likert scale.

Results: Most of the students agreed that AI is a useful tool for undergraduate medical students and incorporation of AI systems into their education would facilitate the learning process and provide a positive influence on their medical learning. The students also showed positive attitude towards the use of AI in healthcare as they believed it would prevent errors in clinical practice and facilitate more accurate decision making, though it may raise some ethical challenges. The medical students mostly used AI tools for study and research work. The most commonly practiced AI tool was chat GPT followed by Gemini.

Conclusion: In general, undergraduate medical students have moderate levels of knowledge concerning AI and demonstrated positive attitudes regarding the use of AI in healthcare. Hence, in order to prepare future medical professionals for the rapidly changing environment of healthcare, it is imperative that AI education is incorporated into the medical curriculum.

Keywords: Artificial intelligence, medical education, medical students, perception.

INTRODUCTION

AI, also known as artificial intelligence, harnesses combined approaches of linguistics and computer science. The term AI coined in 1955 by John Mc Carthy, generally originated in mid-20th century from Dartmouth summer research and it was later further expanded with the emergence of machine learning algorithms. The main objective of AI is to develop machines that can perform tasks equivalent to human intelligence.^[1] In addition to learning,

analyzing and summarizing, AI can understand words, materials, visuals and adopt to various circumstances.^[2] With the technological advancement, various AI models have been now increasingly used to access scientific resources easily, comprehension of major points in books and articles as well as in scientific writing.^[3]

Two forms of AI are generally popular, the first one being ML (Machine Learning) that uses programmed algorithms to make machine learn performing specific tasks along with intelligent predictions. The

second one is LLMs (Large Language Models), one of the applications of which is Chatbot. Chatbot is an AI system with chat interface which is operated with prompt (request to query) and a response is obtained in natural language.^[4] Chat GPT, also called Generative Pretrained Transformer, is a new development in AI chatbot with user friendly, enhanced and almost human like attributes. It is successive version of GPT-3 and is widely used for all types of purposes.^[4]

Dwivedi YK et al,^[5] studied the implications of ChatGPT on educational assessment while Thorp HH,^[6] highlighted its significance on scientific research. Biswas SS,^[7] documented its role in public health sector and Bettayeb AM et al,^[8] suggested that ChatGPT can enrich learning experiences. More recently, LLM-based chatbot also known as Gemini has been released to public by search giant google.^[9] AI is rapidly evolving in the healthcare sectors as well. In recent years use of AI has exponentially increased in the day to day practice of medicine. AI tools are used to enhance teaching learning practice, healthcare delivery, medical training, clinical simulation, patient prognosis, diagnosis and treatment.^[10]

AI when used in medical education also facilitates interactive learning and overall accessibility for learners in remote sectors.^[11] Medical education comprises undergraduates, graduates, continuous medical training to equip healthcare professionals with ethical competencies, clinical skills and essential knowledge. In addition, medical education also encompasses patient and public education so as to ensure and guide the individuals understand treatment options, make informed decisions and manage expectations.^[12] Hence, medical education should continuously adopt to emerging technological advancements so that healthcare professionals are well trained to meet patient expectations in the rapidly evolving field.^[13]

AI - assisted teaching-learning practices like LLMs have been integrated in medical education via various aspects along with reasoning, interactive practice cases, solving or answering queries and facilitating diagnosis.^[14] Further, LLMs also has potential scope for medical curriculum development, personalized study ideas, evaluation and monitoring of programs.^[15]

In medical education, Chat GPT has emerged as a promising tool with potential in writing and conversation tasks, clinical scenario design, small group learning, exam administration and curriculum development. Therefore, it has been increasingly used by medical students, faculty members and even patients these days.^[16] With proper training in Chat GPT model, medical fraternity can foster their clinical reasoning and decision-making abilities which in turn help in improved diagnosis. It is also a potential learning assistant as it has the ability to answer the question given to medical students.^[17]

Despite the technical advancement, use of AI based tools in medical education remains debatable. Several

authors have supported the role of AI in facilitating adaptive learning, developing new assessment models, reducing administrative workload, brainstorming ideas and research activities while some authors have highlighted that chatbots may provide inaccurate information, incorrect response, message error, exhibit biased language, compromise user privacy, create ethical dilemma and risk of plagiarism, unfair assessment practices and risk of excessive dependence on AI thereby affecting academic integrity and critical thinking.^[18]

However, with the recent advancements and increased demand of quality in health care facilities, it is important to learn new and advanced techniques. AI has not been used much in medical education, thus necessitating the need of educational reforms and awareness in students. Attention should be given to medical education as the future doctors need to be well versed with advanced clinical knowledge well powered by AI applications. In addition to teaching foundations of clinical and biomedical sciences, medical education should also cover broad skills required by the future clinicians to effectively use AI in clinical practice since adoption of AI is continuously growing in health care.^[19]

Within the realm of medical education several studies have shown efficacy of AI in diagnostic radiology, dermatology, ophthalmology, pathology and beyond. Existing literatures also documents the acknowledgement of medical students around the globe about significance of AI in health sector. Many are also optimistic on integration of AI in the medical curriculum. However, critical gaps exist as paucity of longitudinal researches that evaluate influence of AI in diagnostic reasoning, performance and patient outcomes with time. There is also lack of region-specific studies especially in India where cultural differences and healthcare structures may uniquely shape perceptions. Thus, in this study we aimed to explore perception of medical students on the role of AI in healthcare at a medical college and tertiary care hospital in UP east.

MATERIALS AND METHODS

This cross-sectional study was conducted at Heritage Institute of Medical Sciences, Varanasi from September to November 2025 among the undergraduate MBBS students. Total 500 students from first year to final year were included in the study. Only those students who voluntarily agreed to participate were included and those not willing to participate were excluded from the study. The study was commenced after taking informed consent from the participants included in the study. Participants were selected randomly from the list of medical students enrolled. Sample size was calculated using 95% confidence interval and 5% error margin. The minimum sample size obtained was 386 based on expected proportion of 50%. Therefore, 500 students were enrolled for the study.

For the assessment, self-designed and semi-structured questionnaire was developed using the literatures from past studies in this sector. The questionnaire included demographic variables, perceptions of students on AI impact on medical education, healthcare and practice in undergraduate level. The questionnaire was provided to the student as a google form link. First a google form was created with all the questionnaire. The link generated was provided to the undergraduate students and their responses were recorded. All the responses were tabulated in the excel sheet and distributive analysis was done as frequencies and percentages.

RESULTS

Age wise categorization of participants is depicted in figure 1. Most of the students were in the age group of 20-21 years (33.4%) followed by 22-23 years (29.2%). Of total 500 students, 56.6% were female while 49.4% were male with male: female ratio of 0.97 (figure 2). From each academic year 100 students were randomly selected (figure 3).

In table 1, perception of MBBS students on impact of AI in medical education is depicted. Most of the students demonstrated positive response towards impact of AI on medical education (44.2%), medical scientific research (49.8%) and reduction of workload for future doctors (42.6%). 47.2% students also agreed to the need of inclusion basic AI concept in medical curriculum as this aids students to master relevant medical knowledge. 28.1% and 29% students respectively agreed that integration of AI in medical curriculum enhances their skills and prepares them for real clinical practices in future. However, 38.3% of the students strongly disagreed to the fact that AI may replace role of medical students as physicians in future while 35.2% of the students gave neutral response on the question that AI reduces employment opportunities for doctors and healthcare workers.

Table 2 shows the perception of MBBS students on impact of AI in healthcare. The table included 15 related questions. Most of the students responded positively indicating significant influence of AI in various aspects of healthcare as depicted in table 2.

Table 3 demonstrates the perception of MBBS students on practice of AI in their medical learning. Most of the students were familiar with the term AI (86%) and its application in healthcare (51%). 63.4% students believed that AI can impact their future

medical career while 84% positively responded to the need of appropriate training in AI to prevent AI related ethical issues and 40.6% students felt that AI will impact their choice of specialty selection in future. Almost 60% students stated that they will use AI in medical care.

The MBBS students used AI mostly for study (45.8%) followed by research (17.6%), assignment (11.8%) and exam preparation (10%) while 3.6% students used it out of interest (table 4). Table 5 shows that most of the medical students used chat GPT (60.8%) followed by Gemini (16.8%). While, 6.4% students used multiple AI tools simultaneously, 3.8% students addressed that they have never used AI.

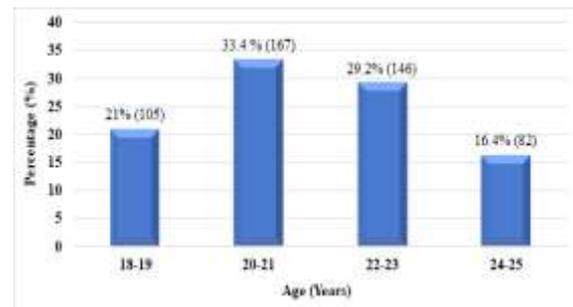


Figure 1: Age of the MBBS students

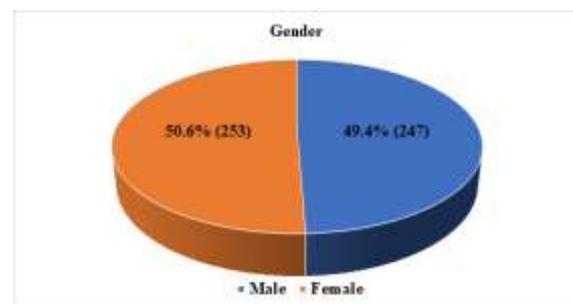


Figure 2: Gender of the MBBS students

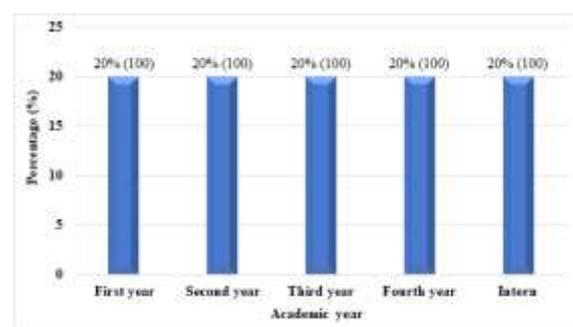


Figure 3: Academic year of the MBBS students

Table 1: Perception of the MBBS students on impact of AI in medical education

| SN | Question | SD % (N) | D % (N) | N % (N) | A % (N) | SA % (N) |
|----|--|-----------|-----------|------------|-------------|------------|
| 1 | Do you think AI has a positive impact on medical education? | 1.4% (7) | 4.8% (24) | 30% (150) | 44.2% (221) | 19.6% (98) |
| 2 | Do you think integration of basics of AI in medical curriculum better equip students with relevant knowledge and skills? | 3.8% (19) | 15% (75) | 39.4%(197) | 28.1%(141) | 13.7%(68) |
| 3 | Do you think AI tools assist students to learn complex medical knowledge? | 0.6% (3) | 4.4% (22) | 31.7%(158) | 47.2%(236) | 16.1%(81) |

| | | | | | | |
|---|--|-------------|-------------|------------|------------|-----------|
| 4 | Do you think use of AI in medical education prepares future healthcare professional for real clinical practices? | 4.8% (24) | 24.2% (121) | 34.6%(173) | 29% (145) | 7.4% (37) |
| 5 | Do you think use of AI in medical education replaces role of medical students as physicians in future? | 38.3% (191) | 23.6% (118) | 21% (105) | 12.2%(61) | 4.9% (25) |
| 6 | Do you think AI will decrease job opportunities for doctors and other healthcare workers? | 8% (40) | 12.2%(61) | 35.2%(176) | 34% (170) | 10.5%(53) |
| 7 | Do you think AI can reduce workload for future doctors? | 4.4% (22) | 7.4% (37) | 37% (185) | 42.6%(213) | 8.6% (43) |
| 8 | Do you think AI has positive role in medical scientific research? | 1.4% (7) | 3% (15) | 36% (180) | 49.8%(249) | 9.8% (49) |

SD: Strongly disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly agree

Table 2: Perception of the MBBS students on impact of AI in health care

| SN | Question | SD % (N) | D % (N) | N % (N) | A % (N) | SA % (N) |
|----|---|------------|------------|------------|------------|------------|
| 1 | Do you agree that AI improves patient's access to healthcare services? | 5.6% (28) | 24% (120) | 32.6%(163) | 23.6%(118) | 14.2%(71) |
| 2 | Do you agree that AI assists patients in selecting appropriate medical care? | 3.8% (19) | 17.8%(89) | 43.8%(219) | 30.8%(154) | 3.8% (19) |
| 3 | Do you agree that AI enhances clinicians' access to healthcare information? | 2.6% (13) | 3.8% (19) | 15.2%(76) | 63.2%(316) | 15.2% (76) |
| 4 | Do you agree that AI contributes to more accurate decision making by healthcare professionals? | 3% (15) | 17.2%(86) | 35% (175) | 35% (175) | 9.8% (49) |
| 5 | Do you agree that AI will positively or negatively affect doctor patient relationship? | 5.6% (28) | 16% (80) | 32.6%(163) | 34.6%(173) | 11.2%(56) |
| 6 | Do you agree that AI reduces empathy, sympathy and emotional contact between doctor and patient? | 3.8% (19) | 12.4%(62) | 27.2%(136) | 34.8%(174) | 21.8%(109) |
| 7 | Do you agree that AI decreases or prevents errors in clinical practice? | 3.8% (19) | 15.4%(77) | 34% (170) | 36.4%(182) | 10.4%(52) |
| 8 | Do you agree that AI increases ethical issues related to data privacy, consent and potential biases? | 5.6% (28) | 11.6%(58) | 38.2%(191) | 27.8%(139) | 16.8%(84) |
| 9 | Do you agree that AI can provide faster and more diagnostic assistance in healthcare? | 4.2% (21) | 9.4% (47) | 37.6%(188) | 38.2%(191) | 10.6%(53) |
| 10 | Do you agree that AI algorithms analyse vast medical data quickly and more accurately? | 0.6% (3) | 5% (25) | 26.8%(134) | 52.6%(263) | 15% (75) |
| 11 | Do you agree that AI will replace role of clinicians to develop personalised prescriptions and treatment plans for patients? | 18.2%(91) | 21.4%(107) | 39% (195) | 16.4%(82) | 5% (25) |
| 12 | Do you agree that AI will replace role of clinicians to monitor patient compliance to prescribed medications, exercise and dietary recommendations? | 17.4%(87) | 17.4%(87) | 40.6%(203) | 19% (95) | 5.6% (28) |
| 13 | Do you agree that AI will replace role of clinicians to provide psychiatric counselling? | 35% (175) | 20.6%(103) | 25.6%(128) | 13.2%(66) | 5.6% (28) |
| 14 | Do you agree that AI will replace role of clinicians to analyse patient information to reach a proper prognosis or diagnosis? | 9.8% (49) | 18.6%(93) | 38.2%(191) | 27.8%(139) | 5.6% (28) |
| 15 | Do you agree that AI will replace role of clinicians to perform robotic surgery? | 30.8%(154) | 2.6% (13) | 8.6% (43) | 43.8%(219) | 14.2%(71) |

SD: Strongly disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly agree

Table 3: Perception of the MBBS students on practice of AI tools in medical learning

| SN | Question | Yes % (N) | No % (N) | Don't know % (N) |
|----|---|-------------|-------------|------------------|
| 1 | Do you understand meaning of the term AI? | 86% (430) | 14% (70) | - |
| 2 | Are you familiar with AI applications in health care? | 51% (255) | 21.6% (108) | 27.4% (137) |
| 3 | Will AI impact your future medical career? | 63.4% (317) | 15.4% (77) | 21.2% (106) |
| 4 | Will AI impact your choice of specialty selection in future? | 40.6% (203) | 33.8% (169) | 25.6% (128) |
| 5 | Will you ever use AI in medical care? | 59.6% (298) | 19.2% (96) | 21.2% (106) |
| 6 | Is training in AI necessary to prevent ethical issues in health care? | 84% (420) | 12% (60) | 4% (20) |
| 7 | Do you have knowledge of Chat GPT in medical field? | 72.4% (362) | 19.6% (98) | 7.8% (39) |
| 8 | Do you use chat GPT for medical learning? | 74.6% (373) | 25.4% (127) | - |
| 9 | Do you use or have knowledge of AI tools other than Chat GPT in medical learning? | 51% (255) | 49% (245) | - |

Table 4: Purpose of using AI tools by the MBBS students

| Purpose | Percentage (N) |
|-----------------------------------|----------------|
| Study | 45.8% (229) |
| Research work | 17.6% (88) |
| Assignment | 11.8% (59) |
| Exam preparation | 10% (50) |
| Know various treatment modalities | 6.2% (31) |

| | |
|--------------------------|------------|
| Diagnosis | 5% (25) |
| Others (out of interest) | 3.6% (18) |
| Total | 100% (500) |

Table 5: AI tools frequently used by the MBBS students

| AI tools | Percentage (N) |
|------------|----------------|
| Chat GPT | 60.8% (304) |
| Gemini | 16.8% (84) |
| Multiple | 6.4% (32) |
| Grok | 5.6% (28) |
| Perplexity | 3.4% (17) |
| Claude | 1.6 % (8) |
| Black box | 1.6% (8) |
| None | 3.8% (19) |
| Total | 100% (500) |

DISCUSSION

The physicians are key members of the health-care team. Hence, they should play a critical role in both driving and guiding changes to incorporate AI into health-care system. They also are tasked with alleviating any anxiety, questions, or uncertainty that patients may have about artificial intelligence by giving them reliable information. Hence, the current study focused on the perception of medical students, the future doctors, about impact of AI in healthcare.

The present study assessed the perception of medical students on impact of AI in medical education. In this study, 44.2% and 19.6% students agreed and strongly agreed that AI has positive impact on medical education. About 41.8% of the students felt the necessity of inclusion of AI in medical curriculum. In the study of Keerthana V et al,^[20] more than 85% believed that AI competency training should be part of medical education. Additionally, 80% of respondents in their study thought that it should be taught at the undergraduate level. These results were consistent with the studies conducted in Germany and Spain,^[21,22] where the majority of students suggested that AI should be taught in medical institutions. According to a multinational survey conducted across 63 countries, medical students demonstrated a strong interest in learning about AI. Further, as per study by Ahmed Z et al, 76.7% of medical students were in favor of integrating AI into the curriculum, and 78.3%, 59.8%, and 57.2% of them discussed the necessity and significance of AI technology in radiology and pathology.^[23] Likewise, in the study of Alhithlool AW et al, students were similarly enthusiastic, with many of them supporting the inclusion of AI-related subjects in medical education programs.^[24]

These studies thus demonstrate the increasing awareness of the necessity of formal AI education and training in order to prepare aspiring physicians for new medical technology trends. Medical institutions can close the gap between present practice and future innovations by providing students with a foundational understanding of AI. However, concerns regarding who and how to train medical students may also arise.

In the current study, 44.5% students agreed that AI will reduce job opportunities for healthcare workers. Nearly 50% of the respondents enrolled in the study of Hosny A et al,^[25] agreed that AI will make fewer jobs available to them. According to a UK report, 35% of UK jobs may be automated within the next ten to twenty years.^[26] Similarly, according to the study by Perrier E et al, 6% of participants feared losing their jobs due to AI, and 39% of participants feared losing their clinical skills.^[27]

In the present study the perception of medical students on impact of AI in healthcare was also assessed. Almost 50% of the student respondents in the study of Davenport T et al agreed that artificial intelligence (AI) can review patient data to produce a diagnosis. Additionally, the authors also indicated that AI can match or exceed human performance with respect to the diagnosis.^[28] In the study of Jha N et al,^[21] only 25% of the respondents felt that AI could create an individualised treatment plan for each patient, while a smaller percentage believed that AI could recommend a personalised medication regimen and would be able to monitor follow-up with respect to taking prescribed medications, exercising, and following dietary recommendations which was in agreement with the result of the current study (21.4% and 24.6% respectively). Study of Keerthana V et al reported 41.2% of the students to have belief that AI will play an important role in the field of medicine; while 30.4% students thought AI would eventually take over the role of physician in developing the individualised treatment plans and providing patients with psychiatric counselling.^[20]

In a systematic review of Baigi MSF et al,^[29] 76% of enrolled medical students had positive attitude toward AI's potential role in the clinical practice. Another systematic review was conducted by Chen M et al,^[30] among physicians and medical students. This review included 8 studies focussing on acceptance of AI in healthcare and it showed that the majority of studies assessed (5 out of 8) had an overall awareness of 65% or greater with respect to utility of AI in clinical practice.

In the present study, 58% of students supported the fact that AI assisted tool can perform robotic surgeries, while 33.4% disagreed for the same. However, in the study of Jha N et al,^[21] only 12% of

the respondents indicated that AI systems were capable of performing surgery (i.e., robot-assisted surgery). According to a study conducted in Saudi Arabia, there was a positive response from 63.2% of medical students stating that robotic surgery will improve surgical results. However, almost 50% of the medical students also believed that patients would not readily accept the use of robotic surgery for their treatment.^[31]

Robotic surgical systems are rapidly evolving due to advances in technology and have an excellent ability to perform surgical procedures safely and precisely. Currently, the human surgeon controls robotic surgical systems; however, human variables (e.g., physical, mental and technical) introduce inconsistency into robot-assisted surgery. Conversely, surgical robots are not subjected to the same type of fatigue, tremors, etc., as humans; therefore, they have the potential for improved movement, greater range of motion, and higher precision with lower morbidity rates than surgery performed by humans. It is anticipated that AI algorithms may enhance the quality of robot-assisted surgical outcomes by decreasing human errors, and time to complete procedures thus improving the outcome of the surgery performed by the robot.^[32]

It is also suggested that in healthcare, AI and robotics may promote dehumanization of medicine, and hence may potentially decrease the human touch in the delivery of treatment. According to a study from Cyprus, 54.5% of medical students believed that AI and robotics is a dehumanizing method of delivering healthcare.^[33] While in the present time, it is rather difficult to predict dehumanising effect of AI, we still cannot deny the probability that these technologies can lead to the dehumanization of medical care and complicate our adherence to standards of basic human rights.

About 45.8% of the students responded that AI may positively or negatively affect doctor patient relationship while 56.6% students responded that AI decreases empathy, sympathy and emotional connection between doctor and patient. According to research conducted by Civaner MM et al, 58.6%, 45.5%, and 42.7% of participants felt that implementing AI in healthcare would decrease the value of the medical field, create mistrust between patients and doctors, and ultimately lead to deteriorating relationships between the doctors and their patient respectively.^[22] Likewise, more than half of the students in study of Nogueroles TM et al,^[34] and Hirani R et al,^[35] expressed concern that AI might undermine the human elements of patient care, such as trust in the doctor-patient relationship, empathy, and emotional connection. International literature echoes these worries, cautioning that an over-reliance on AI tools may diminish in-person interactions and the comprehensive care that patients frequently expect from medical professionals.

The results of the researches though encouraging, indicate need of addressing ethical, emotional and professional concerns of students about AI as

technology. The intent with pursuing improvements in these areas will require educational modules that are comprehensive in scope and include discussions about both humane and ethical aspects of AI as well as its technical characteristics.

There are a number of major ethical challenges associated with the use of AI in health care, such as accountability, transparency, consent, and privacy. 44.6% of students enrolled in the current study believed that AI increases ethical challenges related to data privacy and can cause potential biases. In a French paediatric study, nearly half of the participants viewed the use of AI in medicine as a threat to the security of medical data, while 35% viewed AI as a risk to different aspects of ethics in medical practice. The participants believed that AI in healthcare presents a number of new ethical and social challenges, and will also have an impact on health equity.^[36] Likewise, in the study of Parrey MR et al, more than half of those surveyed expressed concern about AI impacting patient confidentiality. This legitimate concern is due to increased use of cloud-based and data-dependent technologies.^[37] However, major guidelines have also been developed by organizations such as the European Union/EU (guidelines on trustworthy AI) and the World Health Organization (guidelines on ethics and governance of AI for Health). The core ethical principles articulated by these organizations must be taught to undergraduate students in medical field.^[21]

In the present study, the perception of medical students on practice of AI tools in medical learning was assessed as well. About 86% of the medical student participating in this study understand the term AI. The Canadian study also showed that 83.3% of respondents had either agreed or strongly agreed that they understood the meaning of AI.^[38] Similar results were noted in a study conducted in Syria and a survey conducted in Pakistan where 70% and 68% of medical students respectively had previous knowledge of AI.^[23,39] In an Indian study, similar result was reported in which 62.5% of medical students accepted of having been exposed to AI.^[40] In contrast, a Spanish study found that 51.9% of participants could not clearly define AI.^[41]

A German study involving three medical universities showed that 68% of medical students were unaware of the technology behind artificial intelligence.^[42]

The present study demonstrated that 51% of medical students know the application of AI in health care while 80% of medical students in UK believed that AI would play a crucial role in improving the quality of healthcare delivery.^[26] In contrast, according to research conducted by Swed S et al, only 23.7% of undergraduate and postgraduate medical students had knowledge about AI and its use in clinical field.^[39] Similar findings were obtained in research conducted in Pakistan, where only 27.3% of physicians and 19.4% of medical students reported being familiar with clinical implication of AI.^[23]

In the present study, 84% of the students agreed to the necessity of AI training in healthcare. In a multi-

site study conducted in UK, 89% of students felt that being familiar with several AI applications would benefit them professionally in the future and 78% agreed that the students should get some kind of AI education or training while they are studying for their medical degrees.^[26] In the present study, majority of the students were open to using AI in medical care. Furthermore, a study conducted in Syria found that faculty and assistant professors used artificial intelligence tools approximately 2.371 and 4.422 times more than students did respectively.^[39]

The present study showed that 40.6% of student believe that AI will impact their choice of specialty selection. A study in Spain found that 36.7% of survey respondents reported having concerns regarding the potential impact of AI on their decision to pursue radiology as a specialty,^[43] while 67.7% of Canadian respondents felt that AI would decrease the need for radiologists, and 1/6th of those who chose not to apply to become a radiologist stated that their decision was due to concerns about how AI might affect this field in future.^[44] Similarly, a UK study indicated that 49% of future medical professionals would no longer pursue a career in radiology because of concern over the role of AI in this sector.^[26]

In the present study, AI tools were mostly used for study purpose (45.8%) followed by research work (17.6%), writing assignment (11.8%) and exam preparation (10%). Likewise, the study of Sit C et al also showed that more than half of the students that participated in their study have used a variety of artificial intelligence tools to help with their studies, to assist them with writing assignments (28.8%), conducting research (25.2%) and to help diagnose and learn about different treatment options (23.2% and 17.6% respectively).^[26]

In this study, 60.8% students used chat GPT as a major AI tool in medical learning. Another commonly used tool was Gemini (16.8%) while 6.4% used multiple AI tools simultaneously. Similar to our study, 54% of the students surveyed in the study of Keerthana V et al are Chat GPT users and 83.2% of the students were aware that Chat GPT was one of the major forms of AI being used among students, which was similar to this study (72.4%).^[20]

In this study, 51% of the students were familiar with various forms of AI tools used in medical practice (i.e., machine learning, algorithm, neural network) which was in accordance to that of Keerthana V et al, in which 31.6% of students were familiar with the various forms of AI tools used in medicine.^[20] In the study of Jha N et al, only 42.6% said they were familiar with the term machine learning, and only 41.2% said they could identify neural networks.^[21] The results in these studies and the present study are well below the Canadian results where 65.9% of the respondents were familiar with machine learning and 42.3% of respondents were familiar with neural networks.^[40]

CONCLUSION

AI is a powerful tool for improving clinical decision-making and efficiency in the practice of medicine. The majority of medical students surveyed were positive about having access to AI technologies. They believe that being taught about how AI works and how to apply it in a clinical setting will make them better clinicians. However, many medical students though reported having some knowledge of AI, there is a significant gap in their training in how to use AI and implement it in a clinical setting. The most common barriers to providing medical students with further education on the use of AI include: lack of integration of AI into existing clinical workflows and medical curriculum, lack of concern about accuracy or reliability of an AI system; and lack of real-world validation of AI systems. There are wide-ranging deficits in the use of AI in medical education in terms of knowledge, exposure, and practical implementation.

Therefore, AI use in the medical field should be motivated with proper training and development of various approaches that will be fruitful for future generations and help in providing both therapeutic and preventive healthcare services to the patients in need.

Limitation

The research project took place at one medical institution and so it may not apply to other medical institutions. There may be a possibility of response bias because of use of self-reported data. Students may have given inflated responses regarding their knowledge of AI and willingness to utilize AI in their future medical career. Also, only a small amount of research has been conducted on similar population of a region, therefore it may not reflect differences in cultural and learning environments of other population. Future studies should be undertaken at multiple medical institutions in order to make generalizations.

Recommendation

Many students supported the use of AI as a tool to improve the learning experience in medical education by offering courses, workshops, or simulated clinical decision-making scenarios that facilitate AI literacy. Education about AI should focus on both technological expertise and ethical issues (e.g., patient confidentiality, reducing bias, and maintaining empathy in patient care). To ensure that new medical professionals are prepared to integrate AI into the delivery of health care services, it is recommended that there should be training programs and certifying processes available for medical students to demonstrate their competence and capabilities regarding AI.

Conflict of interest: Nil

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