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Impact of generative artificial intelligence tools on the academic performance of Iraqi medical students in cross-sectional study

Zainab Abdul Ameer Jaafar[1]
ORCID: 0000-0002-8367-3731

Rania H. Al-Taie[1]
ORCID: 0009-0005-2259-0499

Ammar Sameer Mohammed Raoof[2]
ORCID: 0000-0009-2226-2670

Abdallah M. Mujbel[1]
ORCID: 0000-0008-1284-4207

Mohammed S. Al-Sandooq[1]
ORCID: 0000-0009-5470-0401

Mustafa Abdulameer[1]
ORCID: 0000-0001-4193-0402

Abdulrahman Y. Ghaffoori[1]
ORCID: 0009-0009-4285-5676

Fatima Mohamed[1]
ORCID: 0000-0003-0254-5135

[1]Department of Obstetrics and Gynecology, College of Medicine, Al-Mustansiriya University, Baghdad, Iraq

[2]Al-Karama Teaching Hospital, Baghdad, Iraq

Corresponding Author: Rania H. Al-Taie
E-mail: raniahussain03@gmail.com

~ ABSTRACT ~

Background: Artificial intelligence (AI) has emerged as a transformative tool in medical education, offering significant potential to enhance student learning and engagement. However, its integration also raises challenges, including over-reliance, ethical concerns, and variability in accuracy.

Objective: This study aims to assess the impact of AI tools on the academic performance, knowledge, attitudes, and practices of medical students in Baghdad, Iraq.

Methods: A cross-sectional survey was conducted among 1,340 undergraduate medical students in Baghdad in 2024. The primary measurement tool was a structured, self-administered questionnaire designed to assess multiple domains. These included demographic characteristics, students' knowledge of artificial intelligence, attitudes toward its application in medical education, and the academic impact of AI tool usage. Knowledge was evaluated through binary-response items, while attitudes were measured using a Likert-scale format to capture perspectives on AI's utility, ethical implications, and future role in medicine. Data were analyzed using SPSS version 25.0, employing frequency tables and chi-square tests to determine associations between variables.

Results: The majority of participants (56.9%) expressed positive attitudes toward AI, and 47% demonstrated adequate knowledge of its applications. Significant associations were observed between AI usage and improvements in subject understanding ($\chi^2 = 15.165$, p < .001) and grades ($\chi^2 = 24.808$, p < .001). ChatGPT was the most frequently used AI tool (80.8%), followed by Canva (21.3%). Participants highlighted AI's ease of use (85% agreed or strongly agreed) and time-saving benefits (82.8% agreed or strongly agreed), though concerns about reliability and critical thinking persisted.

Conclusion: AI tools have positively influenced the academic outcomes of Iraqi medical students, particularly in subject understanding and grades. However, ensuring ethical and balanced integration of AI into curricula is essential to maximize its potential while addressing limitations.

Keywords: academic performance, artificial intelligence, ChatGPT, cross-sectional study, Iraq, medical education.

INTRODUCTION

Artificial intelligence (AI) plays a key role in higher education and has great implications for the day-to-day and academic lives of students [1]. AI in medical school has numerous benefits that have the potential to transform this learning process. For starters, AI-based technologies have the ability to enhance students' engagement and retention of information through customization of learning. For instance, AI-based writing software gives automatic feedback in grammar, punctuation, and style. This tool greatly enhanced the students' writing quality. Other examples include AI-based adaptive learning platforms, which enable the creation of personally tailored educational content for learners, and automated evaluation systems that streamline assessment processes [2,3]. Preliminary studies have shown that AI tools like ChatGPT can generate valid knowledge in specific disciplines for medical students. Nevertheless, their standardization, reliability, and integrity are yet to be rigorously tested. Moreover, AI simulates the clinical environment, improving critical thinking skills and decision-making [4,5]. These findings indicate that AI has the potential to greatly enhance the educational experience for medical students. With all these benefits, however, there are challenges which face AI upon integration in the area of medical education. For example, it can be limiting as overreliance may hinder independent critical thinking and problem-solving. Accuracy differs for content produced, and so it could further result in real misinformation. Other key concerns related to AI concern ethical matters involving data privacy and potential biases within algorithms. These challenges clearly indicate that what needs to be done with regard to AI in the medical curriculum includes cautious assessment and responsible integration to make it only complementary, not compromising, in the educational process [1,5].

This present study analyze the influence of AI tools on medical students' academic performance, knowledge, attitudes, and practices. It compares groups of students who use AI-based toolkits with the group that applies traditional assessment methods. It also ascertains attitudes towards AI, particularly in relation to its perceived reliability, competence, ease of use, and time efficiency, constructs aligned with the Technology Acceptance Model and goes on to proffer recommendations for optimum usage in the medical education sphere.

METHOD

Study design and population

This investigation employs a cross-sectional survey design to evaluate the academic performance of medical students in 2024, in regards to AI. Undergraduate medical students who were enrolled in these institutions comprised the target population. The Department of Obstetrics and Gynecology at Mustansiriyah University and College of Medicine supervised the study.

Measurements

The questionnaire from this study is designed in such a manner to comprehensively assess the adoption and perception of AI among medical students. The instrument is divided into several key sections. The demographic section is the first part, including items on age, gender, and year of study. Although this section does not have a scored outcome for the learner, it provides a critical contextualization of the responses. The second areas are those that test knowledge about artificial intelligence. This begins with the assessment of whether the respondents have any prior knowledge of AI basics and proceeds to the different generations of AI that they do know. Scoring is based on binary Yes/No-type answers. Every correct identification or acknowledgement adds up to a knowledge score, which shows familiarity with AI. It further goes on to explore the integration of AI into medical education by asking if the respondents have been taught about AI during their undergraduate studies, and what their understanding is regarding data requirements for AI, more specifically labeled data. Added to this is assessing students' understanding of the barriers that exist toward applying artificial intelligence in medical education. These questions are scored both for the degree of formal education in AI that the students have received and for their level of consciousness with the challenges in AI implementation. The assessment of the attitude toward AI is, therefore, critical to understanding

students' perception and attitude toward the role of AI in medical education. This scale has a set of statements rated by the respondents on a five-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree." The statements query students' beliefs about the necessity of AI education, the potential impact of AI in the medical field and its ethical implications, and what that really means for the future of AI in clinical practice. These responses are summed to provide an overall attitude score, where high scores indicate a more positive or receptive attitude toward AI in relation to the medical field.

The last section is Academic Performance, which seeks to establish the direct effect of AI tool usage on students' results or academic outcomes. This section opens with the main purposes that students use AI tools for. In addition, this section shall aspire to explore any perceived disadvantages of AI. Students are asked to rate the effect of AI tools on their understanding of specific subjects and report any changes in grade after using AI. This section is scored with variables such as the degree of grade improvement and the factors that motivate AI usage, rated on a Likert scale.

Instrument validity and reliability

The questionnaire used in this study was developed based on prior literature and expert consultation in medical education (Supplementary 1). Content validity was ensured through review by a panel of three academic experts in medical education who evaluated the questionnaire for clarity, relevance, and comprehensiveness. To assess reliability, a pilot test was conducted with 10 students from one medical college not included in the final sample.

Data collection procedure

Data were collected through a self-administered online questionnaire using Google Forms between June 2024 to August 2024. The survey link was distributed via official university communication platforms and student WhatsApp groups. Participation was voluntary, and informed consent was obtained at the beginning of the form.

Statistical analysis

The data was analyzed using SPSS version 25.0. We employed frequency tables to visualize the frequencies of the variables.

Ethical approval

This study was reviewed and approved by the Ethics Committee of Mustansiriyah University, College of Medicine. Prior to participation, all students were presented with an online informed consent form embedded at the beginning of the survey. The participant's anonymity and autonomy were prioritized in this observational study. The participant was unable to be identified as the study did not include any names or emails. The privacy of each participant was adequately protected during the course of the investigation. The investigation was conducted in strict adherence to the principles of the Declaration of Helsinki. Before completing the survey, all participants provided informed consent.

RESULTS

The final sample consisted of 1,340 undergraduate medical students from various medical colleges across Iraq, with one incomplete response excluded. The mean age of participants was 21.9 years (SD = 24.1). The gender distribution showed a slightly higher proportion of females (57.9%) compared to males (42.1%). Participants were drawn from more than 30 institutions, with the largest group from Mustansiriyah University (23.6%), followed by the University of Anbar College of Medicine (12.2%) and Baghdad University (5.9%). Regarding academic year, most students were in their 4th year (21.6%), 2nd year (20.1%), or 6th year (20.4%), indicating broad representation across all stages of undergraduate training.

Knowledge scores

The analysis revealed that 53.0% of participants exhibited inadequate knowledge of AI, while 47.0% demonstrated adequate knowledge. Gender-based comparisons showed no significant difference in knowledge scores (χ^2 = 2.195, p = .138), with similar distributions of adequate and inadequate knowledge among males and females (Table 1). Significant variations in knowledge levels were observed across universities (χ^2 = 61.063, p = .001). Students' knowledge varied significantly across academic years (χ^2 = 15.982, p = .007). Higher academic years were associated with increased adequate knowledge scores, particularly among 4th-year students (21.8%) and 6th-year students (20.5%) (Table 2).

Table 1. Gender and knowledge score categories

			Knowledge score categories		Total
			Inadequate knowledge	Adequate knowledge	
Gender	Male	Count	286	279	565
		% of Total	21.3%	20.8%	42.2%
	Female	Count	424	351	775
		% of Total	31.6%	26.2%	57.8%
Total		Count	710	630	1340
		% of Total	53.0%	47.0%	100.0%

Table 2. Knowledge score distribution across academic years

			Knowledge score categories		Total
			Inadequate knowledge	Adequate knowledge	
Academic year	1st year	Count	14	11	25
		% of Total	1.0%	0.8%	1.9%
	2nd year	Count	119	149	268
		% of Total	8.9%	11.1%	20.0%
	3rd year	Count	117	114	231
		% of Total	8.7%	8.5%	17.2%
	4th year	Count	158	134	292
		% of Total	11.8%	10.0%	21.8%
	5th year	Count	153	96	249
		% of Total	11.4%	7.2%	18.6%
	6th year	Count	149	126	275
		% of Total	11.1%	9.4%	20.5%
Total		Count	710	630	1340
		% of Total	53.0%	47.0%	100.0%

Attitudes toward AI

The majority of participants (56.9%) expressed a positive attitude toward AI, with 40.7% remaining neutral and only 2.4% holding negative attitudes. A significant proportion believed AI would revolutionize education (74.3%), though only 7.2% strongly agreed that AI would replace human teachers in the foreseeable future (Figure 1).
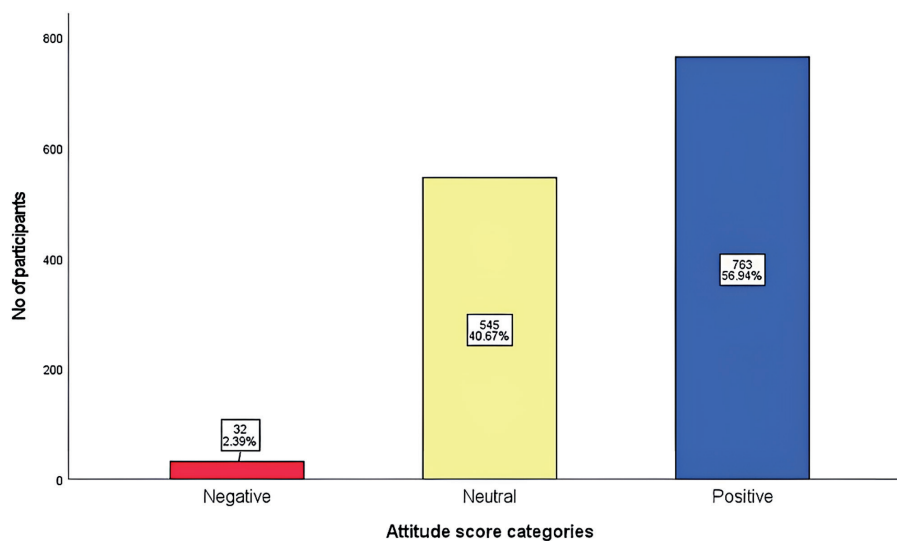
Figure 1. Distribution of participants' attitudes toward AI in medical education

Table 3. Distribution of AI utilization across medical subjects among study participants

		Frequency	Percent
Anatomy	Yes	464	34.6
	No	876	65.4
Physiology	Yes	471	35.1
	No	869	64.9
Biochemistry	Yes	393	29.3
	No	947	70.7
Pharmacology	Yes	343	25.6
	No	997	74.4
Pathology	Yes	334	24.9
	No	1006	75.1
Microbiology	Yes	246	18.4
	No	1094	81.6
Internal medicine	Yes	393	29.3
	No	947	70.7
Surgery	Yes	290	21.6
	No	1050	78.4
Paediatric	Yes	156	11.6
	No	1184	88.4
Obstetrics and gynaecology	Yes	178	13.3
	No	1162	86.7
	Total	1340	100.0

AI usage varied by subject, with the highest reported impacts in anatomy (34.6%), physiology (35.1%), and biochemistry (29.3%). Significant relationships were observed between AI usage and improved knowledge in anatomy ($\chi^2 = 15.165$, $p = .000$), physiology ($\chi^2 = 5.028$, $p = .025$), and biochemistry ($\chi^2 = 7.143$, $p = .008$) (Table 3).

The frequency of AI usage varied, with 33.4% using it sometimes for exam preparation, 24.0% often, and 11.2% all the time. For research purposes, 26.4% often used AI, and 18.4% reported consistent usage (Figure 2).

AI was rated positively for ease of use ($\chi^2 = 18.152$, $p = .001$) and time preservation ($\chi^2 = 8.573$, $p = .073$). While most participants believed AI tools were reliable (36.3% agreed or strongly agreed), 18.1% highlighted issues with accuracy, and 29.9% identified errors needing further verification (Figure 3).

Participants' perceptions of AI tools were evaluated across four dimensions: reliability, competence, ease of use, and time preservation. Regarding reliability, 36.3% of participants either agreed or strongly agreed that AI tools are reliable, whereas 45% remained neutral, and 18.7% expressed disagreement. In terms of competence, 60.2% of participants believed AI tools to be competent, with 17.2% strongly agreeing and 43% agreeing, while 32.9% held a neutral stance. Ease of use emerged as the most positively rated dimension, with 85% of participants agreeing or strongly agreeing that AI tools are easy to use, and 47.2% expressing strong agreement. Similarly, time preservation was highly rated, with 82.8% of participants agreeing or strongly agreeing that AI tools save time, including 47.9% strongly agreeing. These findings indicate that participants generally view AI tools favorably, particularly for their ease of use and efficiency in saving time, though there is a notable proportion of neutrality in reliability and competence evaluations (Table 4).
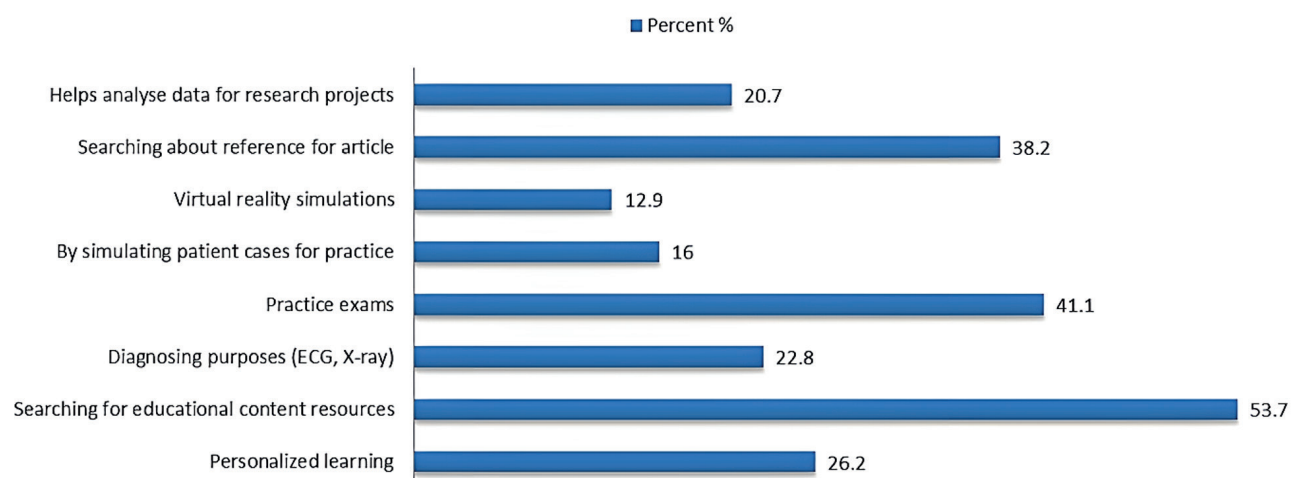
Figure 2. Percentage of AI usage across various academic and clinical applications
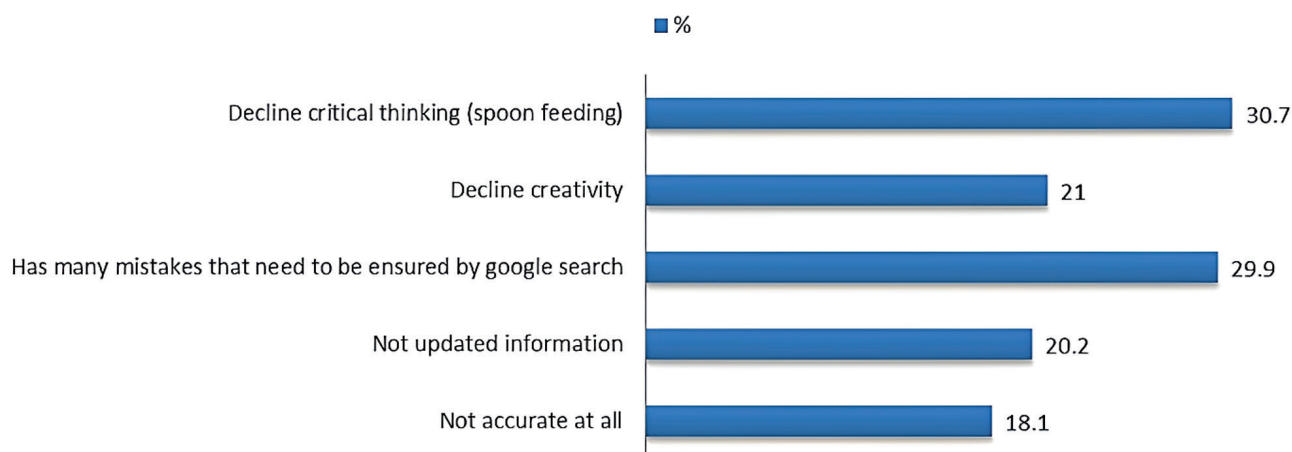
Figure 3. Perceived limitations and concerns of AI usage in academic applications

Table 4. Participants' perceptions of AI tools across key dimensions

		Frequency	Percent
Reliable	Strongly Agree	142	10.6
	Agree	344	25.7
	Neutral	603	45.0
	Disagree	217	16.2
	Strongly disagree	34	2.5
Competent	Strongly Agree	230	17.2
	Agree	576	43.0
	Neutral	441	32.9
	Disagree	74	5.5
	Strongly disagree	19	1.4
Easy to use	Strongly Agree	632	47.2
	Agree	506	37.8
	Neutral	165	12.3
	Disagree	27	2.0
	Strongly disagree	10	.7
Preserve time	Strongly Agree	642	47.9
	Agree	468	34.9
	Neutral	195	14.6
	Disagree	25	1.9
	Strongly disagree	10	0.7
	Total	1340	100.0

Impact of AI tools on academic performance

AI tools had a measurable impact on understanding course subjects, with 39.9% reporting moderate improvement, 24.7% significant improvement, and 5.1% dramatic improvement. A smaller fraction (9.2%) reported no impact. Changes in academic grades were also noted, with 28.3% observing improvement and 8.5% experiencing a decline (χ^2 = 17.254, p = .000). The degree of grade improvement varied, with 28.4% reporting

moderate improvement, 7.8% significant improvement, and 2.3% dramatic improvement (χ^2 = 24.808, p = .000) (Table 5). These findings highlight a generally positive impact of AI tools on students' academic outcomes, with variability in the degree of perceived benefits (Table 6, Table 7).

The table highlights the frequency and percentage of participants using various AI tools. ChatGPT was the most commonly used tool, with 80.8% of participants reporting usage. Canva was utilized by 21.3% of participants, while Copilot (11.0%) and Gemini (13.0%) had lower adoption rates. Additionally, 14.7% of participants reported not using any of these tools (Table 8). These findings reflect a strong preference for ChatGPT among participants, with limited use of other AI platforms.

DISCUSSION

The advent of AI in medical education presents a transformative potential, as reflected in this study of Iraqi medical students. Our findings align with and expand upon prior global research, underscoring the nuanced role AI plays in modern medical education.

Our study also showed that more than half of the participants had poor knowledge about AI, though AI is gaining much importance in healthcare and education. This reflects the general trend, as was also pointed out by Al-Qerem et al. [6] and Allam et al. [5], where foundational AI knowledge among medical students is often limited. While this knowledge gap points to an urgent need for structured AI education in medical curricula, the challenges lie in ensuring that such training is accessible, context-

Table 5. The impact of AI tools on understanding of the learning subjects

			Knowledge score categories	
			Inadequate knowledge	Adequate knowledge
Rate the impact of AI tools on your understanding of the subjects you used them for	No impact	Count	86	37
		% of Total	6.4%	2.8%
	Slight improvement	Count	146	138
		% of Total	10.9%	10.3%
	Moderate improvement	Count	279	255
		% of Total	20.8%	19.0%
	Significant improvement	Count	160	171
		% of Total	11.9%	12.8%
	Dramatic improvement	Count	39	29
		% of Total	2.9%	2.2%
Total		Count	710	630
		% of Total	53.0%	47.0%

Table 6. Impact of AI tools on participants' understanding and academic performance

		Frequency	Percent
Rate the impact of AI tools on your understanding of the subjects you used them for	No impact	123	9.2
	Slight improvement	284	21.2
	Moderate improvement	534	39.9
	Significant improvement	331	24.7
	Dramatic improvement	68	5.1
Have you seen changes in your grades in that specific lecture	Improved	379	28.3
	Neutral	847	63.2
	Declined	114	8.5
If your grades have changed, how much was the change?	No impact	448	33.4
	Slight improvement	376	28.1
	Moderate improvement	381	28.4
	Significant improvement	104	7.8
	Dramatic improvement	31	2.3
	Total	1340	100.0

specific, and inclusive of both technical and ethical dimensions. Interestingly, gender-based analysis in our study showed no significant differences in AI knowledge levels, contrasting with some regional findings, such as those reported by Al-Qerem et al. [6], where a slight male predominance in AI knowledge and use was noted. These regional differences may stem from variations in cultural attitudes, exposure to technology, or educational opportunities, emphasizing the need for a tailored approach to integrating AI education in diverse contexts.

The largely optimistic attitudes of participants in the present research are promising, with a vast majority aware of the potential of AI to revolutionize the educational system. Such results agree with the results provided by Jackson et al. [7] and Civaner et al. [8], when students were also optimistic that AI will play a useful role in enhancing efficiencies and reducing errors in medicine. The participants, however, remain skeptical about the possibility of AI replacing the jobs of human doctors, with 37.6% of participants indicating fear of replacement at the workplace. This tallies with the findings of Kansal et al. [9], and Swed et al. [10], where the majority did not agree with the statement that AI will take over human expertise. Ethical implications related to AI confidentiality breaches, loss of patient trust, and dehumanization of care were huge concerns among our respondents. Most of the participants were wary of AI, expressing apprehension that AI may exert an adverse influence on the physician-patient relationship. Evidence of such results can

Table 7. Association between AI tool usage and academic outcomes: understanding, grades, and magnitude of change

Category	Negative	Neutral	Positive	Total
Impact of AI Tools				
No Impact	8 (0.6%)	57 (4.3%)	58 (4.3%)	123 (9.2%)
Slight Improvement	9 (0.7%)	126 (9.4%)	149 (11.1%)	284 (21.2%)
Moderate Improvement	12 (0.9%)	232 (17.3%)	290 (21.6%)	534 (39.9%)
Significant Improvement	2 (0.1%)	109 (8.1%)	220 (16.4%)	331 (24.7%)
Dramatic Improvement	1 (0.1%)	21 (1.6%)	46 (3.4%)	68 (5.1%)
Change in Grades				
Improved	6 (0.4%)	109 (8.1%)	264 (19.7%)	379 (28.3%)
Neutral	17 (1.3%)	385 (28.7%)	445 (33.2%)	847 (63.2%)
Declined	9 (0.7%)	51 (3.8%)	54 (4.0%)	114 (8.5%)
Magnitude of Change				
No Impact	18 (1.3%)	224 (16.7%)	206 (15.4%)	448 (33.4%)
Slight Improvement	4 (0.3%)	145 (10.8%)	227 (16.9%)	376 (28.1%)
Moderate Improvement	5 (0.4%)	132 (9.9%)	244 (18.2%)	381 (28.4%)
Significant Improvement	2 (0.1%)	31 (2.3%)	71 (5.3%)	104 (7.8%)
Dramatic Improvement	3 (0.2%)	13 (1.0%)	15 (1.1%)	31 (2.3%)
Total	32 (2.4%)	545 (40.7%)	763 (56.9%)	1340 (100.0%)

Table 8. Frequency and percentage of AI tool usage among participants

		Frequency	Percent
ChatGPT	Yes	1083	80.8
	No	257	19.2
Copilot	Yes	148	11.0
	No	1192	89.0
Canva	Yes	285	21.3
	No	1055	78.7
Gemini	Yes	174	13.0
	No	1166	87.0
None of them	Yes	197	14.7
	No	1143	85.3
	Total	1340	100.0

be represented in Jackson et al. [7] and Civaner et al. [8]. These concerns underscore the importance of embedding ethical training within AI-related education to equip future professionals with the skills needed to navigate these challenges responsibly.

A high number of participants also noted improvements in the understanding of course content with the help of AI tools, most notably in anatomy and physiology. This corroborates Stogiannos et al.' [11] results, who noted AI's ability to improve comprehension of key concepts in medicine via adaptive learning tools and virtual simulation. However, the use of AI for more complex clinical applications, such as patient simulations and diagnostic training, remains underutilized, pointing to an opportunity for future innovation. Interesting to note here that these uses turned out to be skewed toward more practical and accessible areas, like grammar checking and basic research support, as seen in Al-Qerem et al. [6]. In other words, this would mean that while AI related to advanced clinical and judgment areas is talked about, its practical application may turn out to be far from reality, either because it has not been adequately trained in the field or the access route to such an advanced tool is obscure. This gap could be minimized, for example, by subjecting students to AI-powered clinical scenarios and decision-support systems. Despite its benefits, AI's integration into education raises important concerns. In our study, 30.7% of participants believed over-reliance on AI could inhibit critical thinking, a sentiment mirrored by Jackson et al. [7] and Sarwar et al. [12]. This highlights the delicate balance required in leveraging AI as an aid rather than a replacement for traditional learning methods. AI should augment rather than undermine the

development of problem-solving skills, creativity, and clinical judgment. This cross-sectional design precludes the possibility of determining causality or evaluating the longitudinal effects. Furthermore, the fact that the data comes from self-reported responses predisposes it to biases, including social desirability or overestimation of the benefits of AI. Future studies should overcome such limitations by using longitudinal designs and, via the use of survey triangulation.

The findings of this study highlight the urgent need to integrate AI into medical curricula—not only as a technical tool but as a subject of ethical and clinical significance. As emphasized by Knopp et al. [13], ethical oversight and responsible adoption are essential as AI reshapes medical education. Structured training should include hands-on, interdisciplinary approaches, supported by Fatima et al. [14], who advocate for AI-driven, project-based learning to build real-world skills. Access disparities must also be addressed. Muhammad and Orji [15] stress that democratizing AI tools is vital to ensure equitable educational outcomes, particularly in under-resourced settings. Furthermore, Lu et al. [16] argue that AI ethics, including data privacy, algorithmic bias, and patient autonomy, must become a core part of medical training to prepare students for complex decision-making in digital healthcare.

A recent study by Murad [17] offers valuable initial insights into the perceptions of Iraqi medical students toward artificial intelligence, highlighting strong interest in AI and a recognized need for educational integration. Building on this foundational work, our study expands the scope by incorporating a larger, more diverse national sample and examining not only attitudes but also knowledge, usage patterns, and self-reported academic impact. To our knowledge, this makes the present study among the first comprehensive, multi-institutional analyses of AI in undergraduate medical education in Iraq, offering practical insights to inform curricular reform and policy.

Limitations

This study has several limitations. First, its cross-sectional design prevents causal inferences about the long-term impact of AI tools on academic performance. Second, the reliance on self-reported data introduces potential biases, including social desirability and recall bias. Lastly, the measurement tool, while piloted and expert-reviewed, may not fully capture the nuanced competencies and ethical reasoning required for effective AI integration in clinical practice.

CONCLUSION

This research has justified the significant impact of AI tools on students' academic performances and their perception at medical schools in Baghdad, Iraq. In fact, AI tools, particularly ChatGPT, are considered to be taken into great account in developing understanding in medical subjects and academic grades considerably. While most of the participants had presented a positive approach toward AI, a large number had also raised certain challenges like over reliability, ethics, and un reliability. Future research should explore longitudinal impacts of AI integration, focus on its role in clinical training, and evaluate methods to mitigate its limitations. By fostering a thoughtful, ethical, and inclusive approach to AI in education, medical institutions can unlock its full potential to enhance learning outcomes and prepare students for the evolving demands of the healthcare field.

Author contribution

Study conception and design: ZAAJ and RHA-T; data collection: AMM, MSS, MA, AY Gh, FM, and RHA-T; analysis and interpretation of results: ASMR; draft manuscript preparation: AMM, MSS, MA, AY Gh, FM, and RHA-T. All authors reviewed the results and approved the final version of the manuscript.

Ethical approval

The study was approved by the Ethics Committee of Mustansiriyah University, College of Medicine.

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Conflict of interest

The authors declare that there is no conflict of interest.

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Supplementary 1. Questionnaire on AI Use in Medical Education

Section 1: Demographics

1. Age:

[Open response]

2. Gender:

☐ Male

☐ Female

3. University: (Select one)

Baghdad University

Al-Kindy College, University of Baghdad

Mustansiriyah University

Nahrain University

Iraqia University

Ibn Sina University

University of Fallujah College of Medicine

University of Anbar College of Medicine

University of Tikrit College of Medicine

University of Babylon College of Medicine

University of Babylon College of Medicine Hammurabi

University of Karbala College of Medicine

University of Kufa College of Medicine

Jabir ibn Hayyan University College of Medicine

University of Mosul College of Medicine

University of Nineveh College of Medicine

University of Kirkuk College of Medicine

University of Wasit College of Medicine

University of Maysan College of Medicine

University of ThiQar College of Medicine

University of Sumer College of Medicine

University of Muthanna College of Medicine

University of Qadisiya College of Medicine

University of Basra College of Medicine

Al-Zahraa College of Medicine, University of Basra

University of Diyala College of Medicine

University of Sulaymaniyah College of Medicine

University of Warith Al-Anbiyaa College of Medicine

University of Ameer College of Medicine

University of Al-Ain College of Medicine

University of Hawler College of Medicine

University of Dohuk Faculty of Medicine

4. Academic Year:

☐ 1st Year

☐ 2nd Year

☐ 3rd Year

☐ 4th Year

☐ 5th Year

☐ 6th Year

Section 2: Knowledge Assessment

5. Do you have a solid knowledge of the basics of AI?

☐ Yes

☐ No

6. Do you know what type of generation of AI (Rule-based, ML, DL, RL)?

☐ Yes

☐ No

7. Do you know any application of AI in your field of interest (e.g., medicine)?

☐ Yes

☐ No

Section 3: AI Usage and Exposure

8. Which AI tools do you use most frequently in your academic activities? (Select all that apply)

☐ ChatGPT

☐ Copilot

☐ Canva

☐ Gemini

☐ None of the above

9. Have you attended any online/offline courses regarding AI?

☐ Yes

☐ No

10. Name the AI program you use most frequently:

[Open response]

11. Have you ever been taught about AI in your undergraduate studies?

☐ Yes

☐ No

12. AI requires a lot of labeled data to learn.

☐ Yes

☐ No

13. I understand the barriers to applying AI in medicine.

☐ Yes

☐ No

Section 4: Attitude Assessment

14. Healthcare students should learn the basics of AI.

15. AI will be a highly required tool in my field.

16. Ethical implications of AI must be understood by all students.

17. AI will revolutionize the educational system.

18. Human teachers will be replaced in the foreseeable future.

19. I'm excited about upcoming changes in education due to AI.

20. AI should be part of the training system in medical fields.

21. Clinical AI will be more accurate than physicians.

22. Some specialties are more prone to be replaced by AI.

23. AI could increase errors in diagnosis.

Response options for all above:

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

Section 5: Frequency of AI Use

24. How frequently do you use AI to prepare for exams?

25. …for homework/assignments?

26. …for research?

27. …for idea generation and brainstorming?

28. …for personal choices/career guidance?

29. …for spelling and grammar checking?

30. …for personality development or other skills?

Response options for all above:

☐ All the time ☐ Often ☐ Sometimes ☐ Rarely ☐ Never

Section 6: Academic Performance and AI Perception

31. For what purposes do you use AI in your studies? (Select all that apply)

☐ Personalized learning

☐ Searching for content

☐ Diagnosing (ECG, X-ray)

☐ Practice exams

☐ Simulating patient cases

☐ Virtual reality

☐ Searching for references

☐ Analyzing data

☐ Standardizing guidelines

☐ Other: [Open field]

32. What are the disadvantages of AI in your studies? (Select all that apply)

☐ Inaccurate information

☐ Not updated

☐ Requires validation

☐ Reduces creativity

☐ Reduces critical thinking

33. Impact of AI on understanding subjects used for:

☐ No impact ☐ Slight ☐ Moderate ☐ Significant ☐ Dramatic

34. For which subjects have you used AI? (Select all that apply)

☐ Anatomy ☐ Physiology ☐ Biochemistry ☐ Pharmacology

☐ Pathology ☐ Microbiology ☐ Internal Medicine

☐ Surgery ☐ Pediatrics ☐ Obstetrics/Gynecology

☐ I did not use AI at all

35. Have you seen changes in your grades in these lectures?

☐ Improved ☐ Neutral ☐ Declined

36. If grades changed, how much?

☐ No impact ☐ Slight ☐ Moderate ☐ Significant ☐ Dramatic

37. In your opinion, what makes you use AI?

Rate the following:

• Reliable

• Competent

• Easy to use

• Time-saving

Response options:

☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree