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Is Artificial Intelligence Remodelling the Medical Education?

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ABSTRACT

Artificial intelligence (AI) is developing rapidly. Currently, concerns exist about its effective and ethical incorporation in medicine, as it is not part of medical curricula. Researchers have suggested the need to further explore the incorporation of AI into medical curricula. This cross-sectional study was conducted to investigate medical students' perspectives and expectations regarding the future of Al in medical education. A total of 578 students from different academic years at a single institution were included in this study. The majority of the students had a limited understanding of Al, and only 18.2% had received previous training on AI. The mean perception score was 6.43 ± 1.31, with poor, moderate, and good perception levels constituting 16.3%, 76%, and 5.5%, respectively. The overall mean attitude score was 27.3 ± 3.74, with 0.5% of the students exhibiting a negative attitude, 59% a neutral attitude, and 40.5% a positive attitude. A positive correlation was found between the perception and attitude scores, which suggested that the perception and attitude scores increased concomitantly. The majority of the students agreed that Al could help doctors improve their practice, with the greatest consensus regarding the inclusion of Al within medical curricula. A distinct finding of the current study is that most of the students believed that the humanistic role of medicine would not be compromised, which could reflect their willingness to adopt and accept AI use in medicine. Al applications are transforming the medical field, and medical students are now recognizing its benefits and ethical concerns. The necessity of including Al education in medical curricula is increasing, and students' enthusiasm for and active participation in AI may make this a trend in medical education.

Keywords: *Artificial intelligence, Machine learning, Medical students, Medical education*

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INTRODUCTION

The term artificial intelligence (AI) was first formulated in 1956 (1). John McCarthy, also known as the father of AI, defined it in 2007 as science and engineering concerned with the creation of intelligent machines, specifically computer programs (2). The term "medical technology" is defined as a wide range of tools that empower healthcare professionals to provide a better quality of life to patients and society by helping make diagnoses, optimize treatment, minimize complications, and shorten hospitalization length. In the past, this term was used to refer only to classic medical devices (e.g., implants, prosthetics, stents); however, nowadays, due to the emergence of modern technologies and devices, the medical field has been revolutionized by AI-powered tools (3). AI has been adapted successfully in many medical specialties and applications, for example, in endocrinology, the use of continuous glucose monitoring devices helps people with diabetes control their blood glucose (4). ChatGPT is another example of AI use in medicine, which is used for medical education, research, and practice. An example of its application in medical education is to help students practice communication and other clinical skills via interactions with unreal virtual patients (5). However, many questions and concerns about the ethical aspects and future directions of AI have been raised as AI continues to revolutionize the medical field (1,3,6).

With each pandemic, such as the recent COVID-19 pandemic, healthcare limitations become obvious, and the need to strengthen the public health system becomes increasingly necessary. Fortunately, after the COVID-19 pandemic, AI reached cognitive intelligence. Nevertheless, public health education remains based on traditional models and curricula (7). In the future, doctors will need to integrate AI ethically and effectively in their day-to-day clinical practices when, for example, gathering history and making decisions and/or diagnoses. In addition, they may encounter and need to deal with patients who use AI in their management. They will also need to employ AI at a larger level to improve the quality of their practice, ensure sustainability, reduce medical errors, and minimize the load on hospitals (1). Certain competencies need to be recognized and adjusted to accommodate the various roles physicians will play in medicine in the future and to ensure the effective integration of AI into medical curricula. AI competencies have a direct effect on the quality of healthcare by minimizing misdiagnoses and enhancing treatments. The expected competencies include but are not limited to basic knowledge of AI, the effective application of AI tools in realistic clinical scenarios, and data security (8,9). This begs the question: Are medical students ready to incorporate AI into medical curricula?

Previous studies have emphasized the importance of providing education about AI in medical education, residency training, and continuing medical education courses (10–17). To develop effective AI curricula, the first and most crucial step is to understand students' perceptions of AI in medicine, how much they know about AI and its limits, and how they comprehend its ethical dimensions. The main areas that have been investigated related to AI implementation in medical curricula can be categorized as "familiarity with AI," "general thoughts of students on AI in medicine," "concerns about replacing physicians and losing jobs," "possible risks of AI in medicine," and "thoughts on the inclusion of AI in medical curricula" (10). These studies concluded that future doctors are passionate about learning more about AI and would like it to be part of medical curricula. However, they are not sufficiently familiar with AI and have considerable concerns about losing their jobs. In the current study, we aimed to re-investigate these concerns to determine whether students' perceptions have changed.

In their study, Bisdas et al. demonstrated that besides having positive attitudes toward AI and expressing a willingness for it to be part of their curricula, students have basic knowledge about AI principles (18). In addition, the researchers pointed to the high demand for incorporating AI into university curricula, which needs further exploration. In this study, we therefore aimed to measure medical students' perceptions and the potential effects of AI on education in addition to enhancing perceptions of diseases and clinical approaches, medical practice, and patient outcomes.

METHODS

Study Design and Participants

In this era, tremendous developments in technology dominate all areas of life, including medicine. We therefore conducted this cross-sectional study to investigate students' perspectives and expectations regarding the future of AI in medical education. Medical students were encouraged to participate in our online anonymous questionnaire-based study from December 2023 to April 2024. The study included all medical students, both sexes and all academic years (2nd, 3rd, 4th, 5th, and 6th years). Permission was obtained from the institutional review board (IRB-2023-01-588), and all the participating students provided their informed consent.

Sample Size

The minimum required sample size was calculated as 304 students based on a 95% confidence level and 5% margin of error. A total of 578 students responded to the study questionnaire, and each student was only allowed one attempt to complete the survey. It was essential to respond to every question to submit the entire questionnaire. The participants were clearly informed about the aim of this study in the brief description at the beginning of the questionnaire, and informed consent was obtained by clicking the "next" button at the end of the description. The participants were guaranteed anonymity and data confidentiality, and their participation was entirely voluntary. The participants received no rewards for filling out the questionnaire.

Questionnaire Data

We used a self-administered questionnaire that had been developed using QuestionPro software, and whose reliability had previously been tested (10). The questionnaire was in English, and it was distributed among the targeted students via online platforms. The questionnaire contained six domains with 16 items: introduction and informed consent, sociodemographic information, assessment of the effects of AI utilization on choice of specialization field, background perceptions of AI, training received in medical AI, opinions about the applicability, reliability, benefits, and harms of AI, scale of the possible effects of AI application in medicine, and topics to be added in the medical curriculum.

Data Processes

The perceptions of the medical students on AI were evaluated using a two-item questionnaire with a Likert scale. The total perception score was determined by summing the scores of the two items, which resulted in a range of 2–10 points, with a higher score indicating a more positive perception of AI. The

medical students were categorized as having poor perceptions of AI if the score was below 50%, moderate if it fell between 50% and 75%, and good if it exceeded 75%. Additionally, a 12-item questionnaire was used to measure the students' attitudes toward AI, with scores ranging from 12 to 60 points. Similar to the perception assessment, their attitudes were classified as negative (score <50%), neutral (score 50%–75%), and positive (score >75%). These criteria were employed to ascertain the medical students' perceptions and attitudes toward AI.

Statistical Analysis

The categorical variables were presented as frequency and percentage, while the continuous variables were calculated and summarized using mean and standard deviation. The chi-squared test was used to represent the association between the students trained in AI and the choice of future specialty. We also investigated whether perception scores about AI differed significantly across sociodemographic factors based on the hypothesis that these scores would vary between the different groups. An independent samples *t*-test or one-way ANOVA test was used, as appropriate, to assess these differences. Similarly, we hypothesized that attitudes toward AI would show significant variations across sociodemographic factors and assessed these differences using the same statistical tests. Moreover, we hypothesized that a relationship existed between the perception and attitude scores and investigated the correlations between these two variables using Pearson's correlation test. Lastly, we theorized that significant differences in attitude scores existed between specific academic years and performed a post hoc analysis using the ANOVA test to determine this. When the one-way ANOVA test was indicated, Levene's test was performed to confirm the assumption of homoscedasticity. The data were analyzed using the statistical package SciPy in Python. Statistical significance was defined as $p < 0.05$.

RESULTS

Characteristics of the Participants

A total of 578 medical students participated in the study, of which 60.4% were female and 39.6% male. A significant proportion of the medical students were 21 years old (28.9%), and 31.3% were in their 4th year of study. Notably, only 18.2% of the participants had undergone previous training on AI. The majority of the students (81.8%) indicated that the implementation of AI across various medical specialties had not influenced their career choices (Table 1).

Table 1: Socio-demographic characteristics of medical students.

Study variables	All patients, N (%) 578 (100%)
Age	
• 18 years	3 (0.5%)
• 19 years	62 (10.7%)
• 20 years	143 (24.7%)
• 21 years	167 (28.9%)
• 22 years	101 (17.5%)
• 23 years	86 (14.9%)

• 24 years	14 (2.4%)
Gender	
• Male	229 (39.6%)
• Female	349 (60.4%)
Nationality	
• Saudi	571 (98.8%)
• Non-Saudi	7 (1.2%)
Academic year	
• 2nd year	85 (14.7%)
• 3rd year	166 (28.7%)
• 4th year	181 (31.3%)
• 5th year	71 (12.3%)
• 6th year	75 (13.0%)
Is your specialization choice affected by how artificial intelligence is used in that field?	
• Yes	119 (20.6%)
• No	287 (49.7%)
• Not sure	172 (29.8%)
Previous training on AI	
• Yes	105 (18.2%)
• No	473 (81.8%)

Knowledge and Trust

Our analysis revealed no statistically significant correlation between "Previous training in AI" and "Choosing a field of specialization affected by AI" ($p = 0.462$), as seen in Table 2. In the assessment of the medical students' perceptions of AI (Table 3), 45.7% reported a limited understanding of AI, while 55.2% were not sure if they would be able to evaluate the reliability of a diagnostic application using AI. The mean perception score was 6.43 ± 1.31, with poor, moderate, and good perception levels constituting 16.3%, 76%, and 5.5%, respectively. On the other hand, the mean attitude score stood at 27.3 ± 3.74, with 0.5% of the students exhibiting a negative attitude, 59% a neutral attitude, and 40.5% a positive attitude (Table 4).

Table 2: The association between the training in AI and the choice of speciality

Choosing a field of specialization was affected by AI	Yes (AI Training)	No (AI Training)	P-value
• Yes	30 (5.2%)	119 (20.6%)	0.462
• No	40 (6.9%)	247 (42.7%)	
• Not sure	8 (1.4%)	134 (23.2%)	

Table 3: Assessment of medical students' perception on AI

Perception Statement	All patients, N (%) 578 (100%)
1. How would you describe your level of knowledge about AI applications in medicine?	
● I am very knowledgeable	6 (1.0%)
● I am quite knowledgeable	37 (6.4%)
● I have partial knowledge	264 (45.7%)
● I've heard about it but possess no knowledge	187 (32.4%)
● I have no knowledge	84 (14.5%)
2. Can you evaluate the reliability of a diagnostic application using AI?	
I can definitely evaluate it	33 (5.7%)
I think I can mostly evaluate.	124 (21.5%)
I am not sure.	319 (55.2%)
I generally think that I cannot evaluate.	71 (12.3%)
I absolutely cannot evaluate it.	31 (5.4%)
Total Perception score (mean ± SD)	**6.43 ± 1.31**
Level of perception	
● Good	32 (5.5%)
● Moderate	439 (76.0%)
● Poor	94 (16.3%)

Table 4 Assessment of medical students' attitude toward AI

Attitude Statement	All patients, N (%) 578 (100%)
1. Negatively affects the relationship of the physician with the patient.	
● Totally agree	41 (7.1%)
● Mostly agree	162 (28.0%)
● Unsure	197 (34.1%)
● Mostly disagree	148 (25.6%)
● Totally disagree	30 (5.2%)
2. Reduces errors in medical practice.	
● Totally agree	74 (12.8%)
● Mostly agree	314 (54.3%)
● Unsure	146 (25.3%)
● Mostly disagree	37 (6.4%)
● Totally disagree	7 (1.2%)
3. Devalues the medical profession.	
● Totally agree	29 (5.0%)
● Mostly agree	100 (17.3%)
● Unsure	229 (39.6%)
● Mostly disagree	143 (24.7%)
● Totally disagree	77 (13.3%)
4. Facilitates patients 'access to the service.	
● Totally agree	139 (24.0%)
● Mostly agree	283 (49.0%)

- Unsure 128 (22.1%)
- Mostly disagree 21 (3.6%)
- Totally disagree 7 (1.2%)

5. Damages the trust which is the basis of the patient-physician relationship.

- Totally agree 48 (8.3%)
- Mostly agree 133 (23.0%)
- Unsure 202 (34.9%)
- Mostly disagree 158 (27.3%)
- Totally disagree 37 (6.4%)

6. Reduces the humanistic aspect of the medical profession.

- Totally agree 118 (20.4%)
- Mostly agree 192 (33.2%)
- Unsure 141 (24.4%)
- Mostly disagree 93 (16.1%)
- Totally disagree 34 (5.9%)

7. Facilitates physicians 'access to information.

- Totally agree 222 (38.4%)
- Mostly agree 243 (42.0%)
- Unsure 89 (15.4%)
- Mostly disagree 15 (2.6%)
- Totally disagree 9 (1.6%)

8. Violations of professional confidentiality may occur more.

- Totally agree 57 (9.9%)
- Mostly agree 155 (26.8%)
- Unsure 275 (47.6%)
- Mostly disagree 79 (13.7%)
- Totally disagree 12 (2.1%)

9. Enables the physician to make more accurate decisions.

- Totally agree 103 (17.8%)
- Mostly agree 290 (50.2%)
- Unsure 148 (25.6%)
- Mostly disagree 27 (4.7%)
- Totally disagree 10 (1.7%)

10. Increases patients 'confidence in medicine.

- Totally agree 51 (8.8%)
- Mostly agree 145 (25.1%)
- Unsure 267 (46.2%)
- Mostly disagree 92 (15.9%)
- Totally disagree 23 (4.0%)

11. Allows the patient to increase their control over own health.

- Totally agree 73 (12.6%)
- Mostly agree 228 (39.4%)
- Unsure 227 (39.3%)
- Mostly disagree 39 (6.7%)
- Totally disagree 11 (1.9%)

12. Facilitates patient education.

- Totally agree 147 (25.4%)
- Mostly agree 270 (46.7%)
- Unsure 139 (24.0%)

● Mostly disagree	17 (2.9%)
● Totally disagree	5 (0.9%)
Total attitude score (mean ± SD)	**27.3 ± 3.74**
Level of attitude	
● Positive	234 (40.5%)
● Neutral	341 (59.0%)
● Negative	3 (0.5%)

When analyzing the perception scores according to academic year, the students in their 2nd year exhibited the lowest levels of perception with an average of 6.2, whereas those in their 3rd and 4th years attained the highest perception scores (average 6.5), as depicted in Figure 1. Conversely, the final-year medical students demonstrated the highest average attitude scores at 31.3, while the 5th-year students displayed the lowest average attitude scores (28.9), as illustrated in Figure 2.

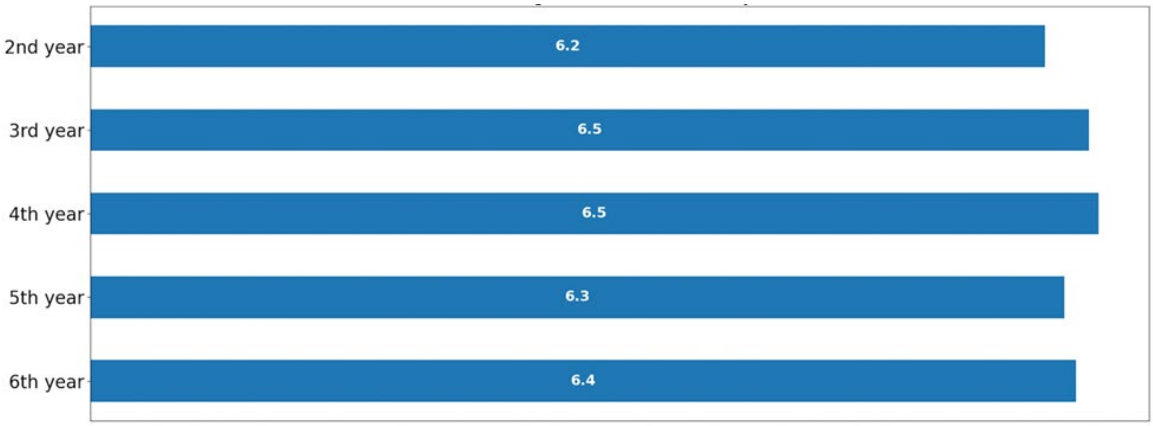

Figure 1: Total score of perception in relation to the academic year.

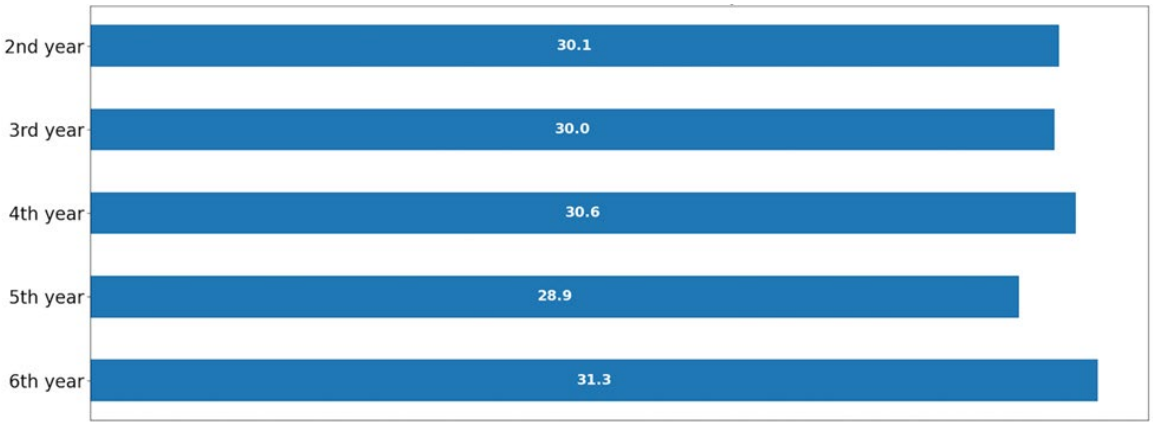

Figure 2: Total score of attitudes in relation to the academic year.

The analysis shown in Figure 3 revealed a noteworthy finding, namely, a positive and statistically significant correlation between the perception and attitude scores (rs = 0.1391, p = 0.0008). This suggests that as the perception scores increased, there was a corresponding increase in the attitude scores. This observation demonstrated the weak positive effect of perceptions of AI in shaping favorable attitudes toward its integration within the medical field.

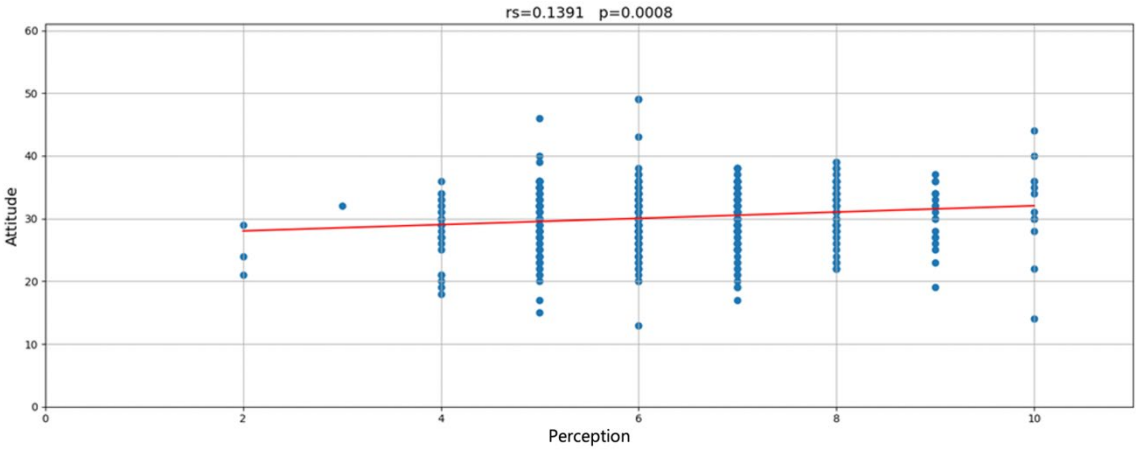

Figure 3: Correlation between perception score and attitude score.

When examining the variations in perception and attitude scores with regard to the sociodemographic characteristics of the medical students (Table 5), we found a greater perception score was linked to having received prior training in AI (t = 1.210; p < 0.001). Meanwhile, the attitude score was not significantly correlated to having received prior training in AI. A significant positive correlation was found between the attitude score and the participants' academic years (F = 3.039; p = 0.017), although no significant correlation was apparent between the participants' perceptions and their academic years. A post hoc analysis was therefore performed to determine the exact difference between the different academic years and the participants' attitude scores. This revealed a significant difference in the attitude scores between the 5th- and 6th-year medical students (p = 0.0331), as seen in Table 6. All the variables that were analyzed using one-way ANOVA showed equal variances across the groups.

Table 5: Differences in the score of perception and attitude in relation to the socio-demographic characteristics of medical students

Factor	Perception Score (10) Mean ± SD	Test of Significance; P-value §	Attitude Score (60) Mean ± SD	Test of Significance; P-value §
Gender				
● Male	6.34 ± 1.31	-1.346; 0.179	30.10 ± 4.46	-0.602; 0.547
Female	6.49 ± 1.29		30.34 ± 4.83	
Academic year				
● 2nd year	6.20 ± 1.08	1.217; 0.302 ‡	30.12 ± 4.70	3.039; **0.017*** ‡
● 3rd year	6.48 ± 1.25		29.98 ± 4.84	
● 4th year	6.55 ± 1.39		30.64 ± 4.24	

●	5th year	6.32 ± 1.35		28.87 ± 5.03	
●	6th year	6.40 ± 1.34		31.33 ± 4.67	
Specialty choice affected by AI					
●	Yes	6.25 ± 1.24	1.684;	29.45 ± 5.12	2.562;
●	No	6.51 ± 1.39	0.187 ‡	30.30 ± 4.84	0.078 ‡
●	Not sure	6.42 ± 1.18		30.71 ± 4.01	
Previous training on AI					
●	Yes	6.50 ± 1.32	1.210;	29.98 ± 5.32	0.732;
●	No	6.11 ± 1.21	**<0.001 ***	30.30 ± 4.54	0.623

§ P-value has been calculated using the independent t-test.
‡ P-value has been calculated using one-way ANOVA.
* Significant at p<0.05 level.

Table 6: Post hoc analysis for the multiple mean differences in the score of attitude in relation to medical students' academic year.

(I) Academic year	(J) Academic year	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
					Lower Bound	Upper Bound
2nd year	3rd year	-0.1417	0.6398	1.0	-1.4	1.11
	4th year	0.5232	0.5772	1.0	-0.67	1.71
	5th year	-1.2444	0.7803	1.0	-2.81	0.32
	6th year	1.2157	0.7424	1.0	-0.26	2.69
3rd year	2nd year	0.1417	0.6398	1.0	-1.11	1.4
	4th year	0.665	0.4876	1.0	-0.3	1.63
	5th year	-1.1027	0.6949	1.0	-2.51	0.3
	6th year	1.3574	0.6665	0.3674	0.05	2.66
4th year	2nd year	-0.5232	0.5772	1.0	-1.71	0.67
	3rd year	-0.665	0.4876	1.0	-1.63	0.3
	5th year	-1.7676	0.6263	0.2259	-3.11	-0.42
	6th year	0.6924	0.5996	1.0	-0.55	1.93
5th year	2nd year	1.2444	0.7803	1.0	-0.32	2.81
	3rd year	1.1027	0.6949	1.0	-0.3	2.51
	4th year	1.7676	0.6263	0.2259	0.42	3.11
	6th year	2.4601	0.8026	**0.0331***	0.86	4.06
6th year	2nd year	-1.2157	0.7424	1.0	-2.69	0.26
	3rd year	-1.3574	0.6665	0.3674	-2.66	-0.05
	4th year	-0.6924	0.5996	1.0	-1.93	0.55
	5th year	-2.4601	0.8026	**0.0331***	-4.06	-0.86

Advantages and Risks

In Figure 4, the statement "It cannot replace the physician, but it can help him" garnered the highest level of agreement among the medical students, with 50.7% expressing total agreement. Similarly, the majority (39.8%) of the students concurred that they would become better doctors with the extensive utilization of AI applications. Furthermore, 24.4% of the medical students expressed total disagreement with the notion that the use of AI would diminish the need for physicians.

The greatest consensus regarding the inclusion of AI within medical curricula was evident in the domains of applications aimed at reducing medical errors (definitely should be included: 35.8%), followed by the application of AI in scientific research (definitely should be included: 33.1%), and the application of AI to increase patients' compliance with treatment (definitely should be included: 32.8%), as seen in Figure 5.

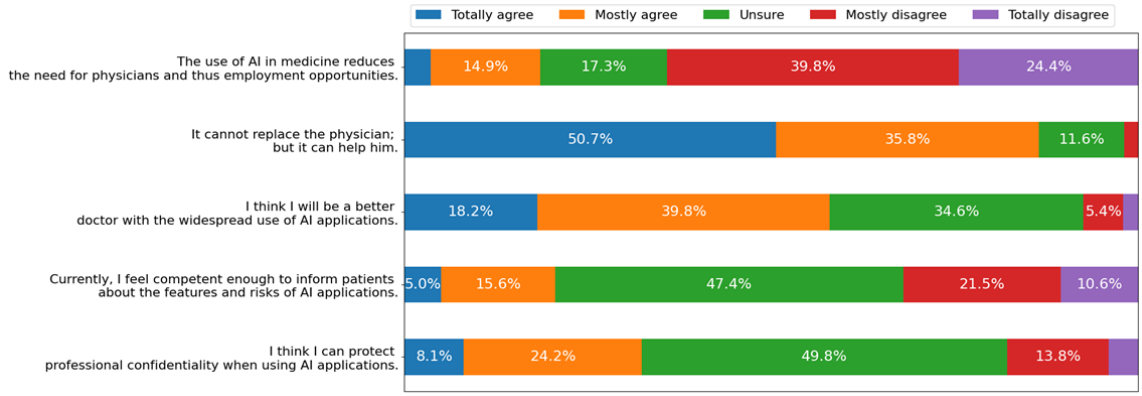

Figure 4: Assessment of medical students' opinions about the use of AI in the medical practice.

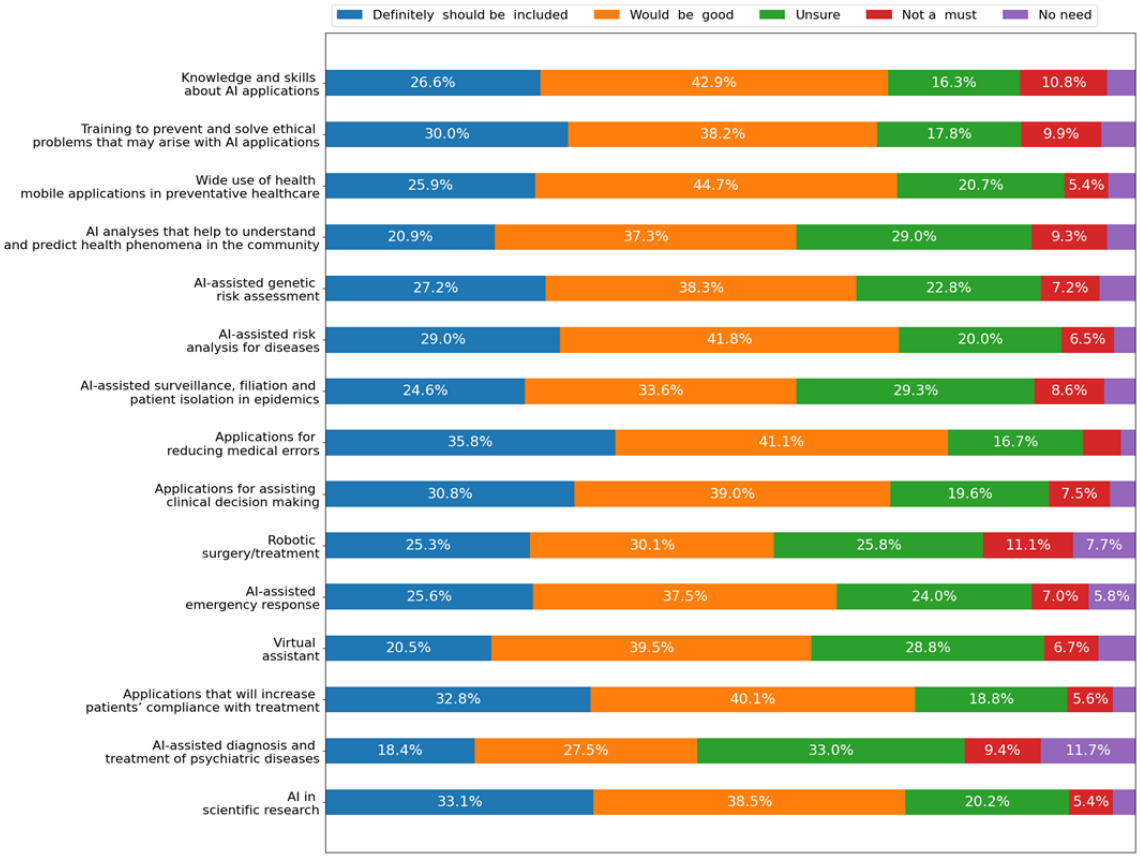

Figure 5: Training in AI as part of the medical school curriculum.

DISCUSSION

In our study, we investigated the perception levels among medical students along with the perspectives that they hold regarding the use of AI in medicine and their willingness to integrate AI education into medical curricula. A considerable proportion of the students were in favor of incorporating this emerging technique into medical practice in a way that could revolutionize the provision of healthcare. However, some students expressed concerns, particularly regarding the possible negative impact of AI on the physician–patient relationship. These findings align with those of prior studies that emphasized the promising yet complex role of AI in healthcare (10,18,19).

In this study, we found a significant correlation between the attitudes toward AI and the year of education, where the students in their 6th year showed a higher attitude toward AI. In contrast, a previous study showed no change in the level of attitude toward AI and the year of education (10). This discrepancy may be attributed to the evolving global discussion on AI and differences in curricula designs. Further exploration of the impact of curriculum design on AI perceptions is warranted. In addition, we found that a higher level of attitude was significantly observed in the students who had high scores for their perceptions of AI. In addition, the students who had received previous training in AI were more knowledgeable. This indicates that students' attitudes toward AI are improving. Conversely, AI education is important, as it increases attitudes toward it.

The majority of our study population agreed that AI use in healthcare could compromise patient privacy and confidentiality, which is consistent with previously published data. However, our results varied in relation to medicine's humanistic role, in that most of the study participants did not believe that patient privacy and confidentiality would be negatively affected (6,11,20–22). Talking about AI raises concerns about whether it will replace doctors. The medical and dental students in a previous study agreed that AI can replace non-interventional doctors (18). However, in this study, most of the students agreed that it can be used to guide physicians rather than replace them. Similarly, previous studies have indicated that doctors can benefit from AI instead of being eliminated through its adoption (10,23).

Based on the growing role that AI plays in medicine, we reviewed the study participants' viewpoints regarding the need to integrate AI into medical school curricula. The results showed that the majority were affirmative regarding all the items relating to including AI in the curriculum, such as using it to prevent and settle ethical dilemmas, implement genetic risk assessments, robotic surgery, emergency situations, and as an assistive tool to diagnose people with psychiatric disorders.

The need to incorporate education about AI into medical curricula has been raised in previous studies (6,10,16). In one such study, 93.8% of the students agreed that they should receive education about AI in their curriculum, especially on the following topics: "the knowledge and skills related to AI applications," "the applications for reducing medical errors," and "the training to prevent and solve ethical problems that may arise with AI applications" (10). However, the participants in our study prioritized the role of AI as minimizing medical errors, supporting scientific research, and improving patient compliance with treatment. This variation in preferences across different populations suggests that while the need for AI education is widely acknowledged, the specific focus areas may differ based on institutional and regional contexts.

These insights have important implications for curriculum design. The growing support for AI education among medical students suggests a readiness for curriculum updates that reflect technological advancements in healthcare. One effective framework for guiding such reforms is competency-based medical education (CBME). CBME emphasizes outcomes-based learning, where students develop specific competencies rather than merely completing coursework (24). Integrating AI education into a CBME framework could ensure that students not only gain theoretical knowledge but also develop practical skills to apply AI tools in clinical settings. For example, AI modules could focus on enhancing diagnostic accuracy and ethical problem-solving and reducing medical errors, that is, the areas in which the students in this study expressed the most interest.

Novel Contribution and Implications

While previous studies have explored general attitudes toward AI in medical education, our study offers a novel contribution by emphasizing the relationship between prior AI education, academic years, and attitudes. It reinforces the idea that structured AI education enhances positive attitudes toward its clinical application. Furthermore, our findings highlight the importance of aligning AI education with modern curriculum frameworks, such as CBME, to ensure practical competency development. This study contributes to the ongoing conversation on integrating technology-enhanced education by underscoring the need for targeted educational interventions that address both technical competence and ethical considerations.

Limitations

This study had several limitations, which should be acknowledged. First, the study population was drawn from a single medical school, which potentially limits the generalizability of the findings to broader student populations with varying educational backgrounds. Second, the use of an online survey may have influenced the depth of the responses, as some of the participants may have completed the survey without fully reflecting on the questions. Future studies involving a more diverse sample and mixed-methods research could provide a deeper understanding of medical students' perceptions and readiness for AI integration.

CONCLUSION

AI applications are becoming integral to the medical field, with students showing reduced ethical concerns, particularly regarding the humanistic aspects of care and the potential for physician replacement. The students in our study with greater AI knowledge, especially those with prior education, exhibited more positive attitudes toward its use. Our study emphasizes the growing need for AI education in medical curricula in alignment with emerging frameworks, such as CBME.

This study makes a novel contribution, as it demonstrates how prior AI education influences students' perceptions and attitudes and suggests that such education should be prioritized in future curricula. In future studies, researchers should examine the impact of AI education on long-term clinical competencies and explore how different educational models can be integrated across diverse institutions.

ACKNOWLEDGEMENTS

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ETHICAL APPROVAL

The Review Board (IRB) permission was obtained from Imam Abdulrahman bin Faisal University (IRB-2023-01-588) and informed consent from all participating students was obtained.

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