

Original Article

Unveiling Medical Students' Knowledge and Acceptance Towards Artificial Intelligence in Healthcare

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ABSTRACT

Background: The rapid advancement of artificial intelligence (AI) is poised to revolutionize healthcare delivery systems profoundly. With its capacity to enhance diagnostics, treatment, and patient care, understanding AI's role and integration in healthcare is crucial for medical professionals and students.

Objective: This study aims to assess the familiarity, knowledge, and comprehension of AI among medical students and physicians, identifying both challenges and opportunities associated with its use in medicine.

Methods: A structured questionnaire, adapted from established scales, was used to collect data from students and physicians at a public sector medical university. The study employed simple random sampling to ensure a representative sample, with a focus on collecting comprehensive demographic and AI-related knowledge data.

Results: Of the 600 participants surveyed, 70% reported basic knowledge of AI, yet only 28% were aware of its specific applications in healthcare. Interestingly, 85% of respondents acknowledged the potential of AI to significantly enhance healthcare delivery and research.

Conclusion: While there is a basic awareness of AI among medical professionals and students, there is a notable gap in understanding its specific applications in healthcare. The study highlights the need for mandatory training programs that enhance AI awareness and application in medical settings.

Keywords: Artificial Intelligence, AI awareness, healthcare, medical professionals, medical students.

INTRODUCTION

In the era of technological advancement, the integration of artificial intelligence (AI) into various sectors, including healthcare, has become a critical area of development (1, 2). AI's application in healthcare spans numerous functions such as medical image analysis, early disease detection based on symptoms, and the formulation of treatment strategies (3-5). This adoption is poised to revolutionize health management and service delivery by facilitating optimized treatment approaches and enhancing clinical decision-making processes (6, 7).

AI's potential to expedite complex tasks, efficiently utilize resources, and reduce the workload on physicians is noteworthy (8, 9). Such advancements are expected to lead to more efficient program operations and transform the delivery of medical services, ultimately optimizing patient health outcomes (10-14). However, the successful implementation of AI technologies in healthcare relies fundamentally on the knowledge and acceptance of these technologies by healthcare professionals, from medical students to practicing clinicians (15-17).

Despite the significant implications of AI in healthcare, there is a paucity of literature focusing on the attitudes towards, and the adoption of, AI technologies within this sector. Existing studies are limited and often concentrate on the general attitudes of healthcare professionals rather than on a detailed exploration of their specific knowledge and skills concerning AI applications in medical education, research, and practice (18, 19).

The objective of this study is to assess the current knowledge, attitudes, and acceptance levels of AI among medical students and clinicians to determine their preparedness for the future of AI-driven medicine. This investigation will also identify areas where further education or training might be necessary, ensuring these key stakeholders are equipped to enhance their engagement with AI technologies. This foundation is essential for the progressive adoption of AI in enhancing healthcare delivery and patient care outcomes.

METHODS

The methodology of the study involved the design and administration of two questionnaires, adapted from the recognized works of Castagno et al. (2020) and Syed et al. (2023) (20, 21). These instruments were designed to gather comprehensive data on the demographics, knowledge, and attitudes of respondents towards artificial intelligence in healthcare and medical science. An extensive literature review on behavioral studies related to AI informed the development of the questionnaires, which included a variety of question types such as Likert scales, ranking questions, and open-ended queries to ensure comprehensive data collection. The design process paid careful attention to clarity, avoiding technical jargon to facilitate ease of understanding and accurate responses from participants. The reliability of the questionnaires was confirmed through the calculation of Cronbach's alpha, with a resultant value of 0.79 indicating a high correlation among the test items and consistent measurement of the underlying construct(22,23).

A simple random sampling technique was employed to select participants, ensuring each member of the target population at Liaquat University of Medical and Health Sciences had an equal probability of being chosen. This method was pivotal in reducing selection bias and enhancing the representativeness of the sample, which included 600 participants—420 undergraduate medical students and 180 physicians and clinicians. The demographic breakdown revealed a majority of student respondents aged between 19 and 23 years and a predominance of male participants, reflective of the existing gender imbalance in university enrollment.

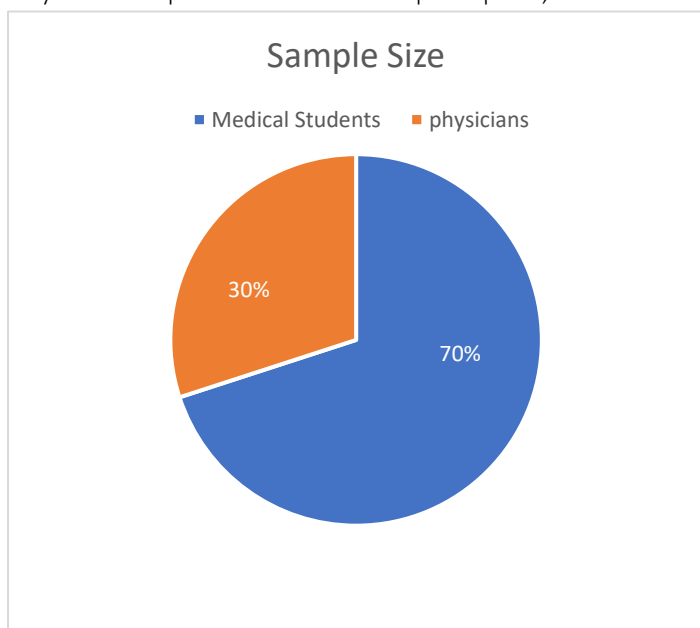


Figure 1 Sample Size

The survey was conducted from September to December 2023 using a self-administration method facilitated by a team of researchers. This approach not only helped in clarifying any ambiguities in the survey questions but also ensured thorough monitoring of the response process and the integrity of the data collected. Participants were briefed about the study's objectives and the significance of their candid participation, with stringent measures adopted to maintain the confidentiality and anonymity of their responses.

The analysis of the gathered data involved initial screening to identify and rectify any discrepancies or missing values, with a final dataset comprising 580 valid responses. Descriptive statistics, along with chi-square and t-tests, were applied to explore the relationships and correlations between different demographic groups and their perspectives on AI in healthcare. This analytical phase was crucial for drawing valid conclusions about the attitudes and knowledge levels regarding AI among the study's diverse participant groups.

Table: Steps in Conducting a Study on Attitudes Towards AI

Step	Description
Questionnaire Design	Designing a comprehensive questionnaire to collect data on demographics, knowledge, and attitudes towards AI.
Participant Selection	Utilizing simple random sampling to select 300 participants, including medical students and physicians.

Step	Description
Data Collection	Systematically distributing the questionnaire among participants via email, online platforms, and in-person.
Questionnaire Administration	Administering the questionnaire with clear instructions to ensure consistency and reliability.
Data Analysis	Analyzing the collected data using descriptive and inferential statistics to draw meaningful conclusions.
Ethical Considerations	Obtaining informed consent, ensuring participant privacy, and adhering to ethical guidelines throughout.
Limitations	Acknowledging potential biases, limitations in generalizability, and the cross-sectional nature of the study.

RESULTS

The study revealed that a substantial proportion of participants, approximately 70%, had a prior understanding of artificial intelligence, reflecting a basic familiarity with AI technology and its applications across various sectors. However, when focusing on the specific applications of AI within the healthcare industry, only 28% of participants demonstrated awareness, indicating a significant knowledge gap regarding the practical uses of AI in healthcare settings.

The attitudes towards AI in healthcare were generally positive. About 35% of the respondents strongly endorsed the essential role of AI in improving healthcare services, while an additional 40% agreed with this viewpoint. This consensus suggests a favorable perception of AI's potential to enhance patient outcomes and healthcare delivery. Data presented in Table 2 highlighted these patterns in the participants' responses.

An interesting divergence appeared when comparing the knowledge levels between medical students and more seasoned healthcare practitioners. Medical students displayed a more profound understanding of AI compared to their senior counterparts, hinting at a generational gap in the acceptance and comprehension of technology. Despite this variation, the support for integrating AI into healthcare practices was overwhelmingly positive across both groups.

The study further explored the integration of AI into medical education. Over 75% of participants agreed that AI should be an essential component of both undergraduate and postgraduate curricula, with average scores of 3.78 (SD = 0.87) for undergraduate and 4.15 (SD = 0.90) for postgraduate education. This strong consensus reflects a recognized need to embed AI knowledge within medical training programs to better prepare future healthcare professionals.

Despite the overall positive attitudes, only 36% of respondents were aware of existing plans to incorporate AI training in their education, with 34% disagreeing and 30% remaining neutral. These findings underscore the necessity for educational institutions to develop targeted programs that can effectively bridge the AI knowledge gap in the healthcare sector.

Participants' perspectives on AI were further quantified using a 5-point Likert scale, revealing that a significant majority (49%) strongly recognized the importance of AI in healthcare, with a mean score of 3.87. The relevance of AI across various medical practices was even more pronounced, with 88% of participants acknowledging its significance, reflected by a high mean score of 4.29. While opinions on AI's implications were mixed, with some viewing it as a potential threat, the overall sentiment highlighted both the challenges and the opportunities presented by AI in the medical field. Concerns about AI's impact on traditional practices were minimal but notable, with 8% of respondents expressing apprehension.

Table 2: Key Findings from the Survey

Survey Item	Percentage of Participants
Participants with a prior understanding of AI	70%
Participants aware of AI in the medical industry	28%
Participants strongly agree with AI in healthcare	35%
Participants agreeing with AI in healthcare	40%

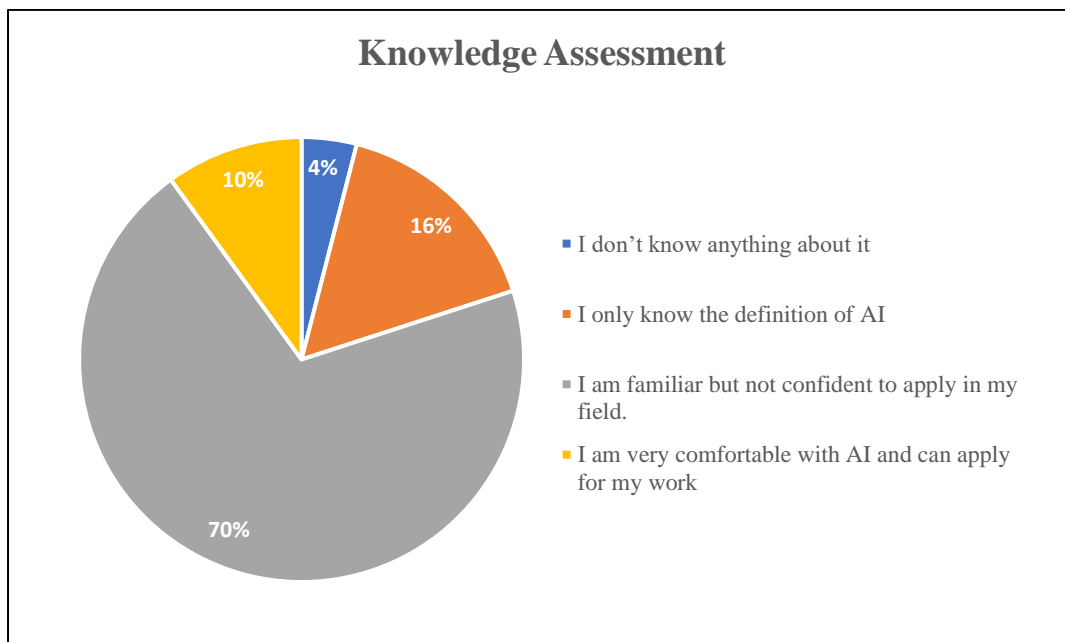


Figure 2 Knowledge Assessment

Table 3: Descriptive statistics about Knowledge Assessment

	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	St. Deviation
Basics of AI should be included in teachings	2	5	18	47	28	3.8	0.89
Undergraduate program should integrate AI	1	7	14	48	30	3.78	0.87
Postgraduate program should integrate AI	1	4	12	44	39	4.15	0.9
I have a basic concept of AI	1	3	27	53	16	4	0.79
I can use AI applications in my field	3	23	34	28	12	3.2	1.03
I have attended training programs and online course of AI	10	24	30	23	13	3.07	1.17

Table 4: Descriptive statistics of knowledge and attitudes of respondents

Respondents	Perceptions	Mean	St. Dev	p-value
Undergraduate	Knowledge of AI	1.65	1.77	0.039
	Attitude towards AI	6.21	2.08	0.041
Physicians	Knowledge of AI	1.57	1.56	0.051
	Attitude towards AI	6.21	2.08	0.048

Table 5: Attitude assessment descriptive statistics

	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	St. Deviation
AI play vital role in healthcare	1	11	13	39	49	3.87	0.846
AI can be integrated into various healthcare applications and practices	1	11	9	44	44	4.29	0.78
Is there a perceived threat or disruption to medical practice posed by AI?	6	20	37	25	18	3.34	1.23

	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	St. Deviation
Will AI pose a threat or disruption to certain health careers?	6	14	23	37	20	3.52	0.997
Are there perceived limitations to AI in your work?	5	19	26	32	18	3.40	1.127

DISCUSSION

The study conducted at Liaquat University of Medical and Health Sciences explored the familiarity, attitudes, and receptiveness of medical students and physicians towards artificial intelligence in healthcare. The findings revealed a substantial general awareness of AI among respondents, yet a limited understanding of its specific applications within the medical sector. This gap highlights the essential need for targeted educational and training initiatives to enhance comprehension of how AI can influence healthcare delivery.

Despite the disparity in sector-specific knowledge, the prevailing sentiment among participants was positive regarding the integration of AI into healthcare. Most respondents acknowledged the potential of AI to develop more effective treatment plans, aid in clinical decision-making, and improve patient outcomes. The optimism surrounding AI suggests a readiness to adopt and adapt to technological advancements in medical practice (12).

However, the study also unveiled a digital generational gap, with younger medical students exhibiting greater AI proficiency compared to their senior counterparts. This discrepancy underscores the importance of continuous professional development programs tailored to all levels of healthcare providers, ensuring they remain proficient in the latest technological tools and methodologies (13).

The strengths of this study include a robust sample size and the use of validated questionnaires, which enhance the reliability of the findings. However, limitations are also present, including the study's confinement to a single institution, which may restrict the generalizability of the results. Additionally, the self-reported nature of the data could introduce bias, as participants might have overestimated their understanding of AI (16).

To address these limitations and build on the study's strengths, future research should consider a multi-center approach to include a more diverse participant pool from various geographical and institutional backgrounds. Such studies could also benefit from integrating objective assessments of AI knowledge to complement self-reported data, thereby providing a more comprehensive analysis of AI literacy among healthcare professionals (18).

While the enthusiasm for AI in healthcare is evident among medical professionals and students, the need for ongoing education and training is critical. By equipping healthcare workers with the necessary knowledge and skills, the full potential of AI can be harnessed to foster advancements in medical care and patient outcomes.

CONCLUSION

This study investigated the perception and awareness among medical students and faculty at a public sector university regarding artificial intelligence in healthcare. It found a foundational understanding of AI but a significant gap in recognizing its healthcare applications. Enhancing AI literacy through curriculum revision is crucial for preparing healthcare professionals to effectively utilize future technologies for improved patient care. Future research should explore the ethical and legal dimensions of AI in healthcare. Limitations include the study's restriction to one university, potentially biasing the context and limiting generalizability. Longitudinal studies are recommended to deepen understanding of attitudes towards AI and facilitate its acceptance and integration in medical practice.

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