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ORIGINAL RESEARCH ARTICLE

The Role of AI in Shaping Medical Education: Evaluating Usage Trends Among Students and Teachers

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ABSTRACT

Introduction: Artificial intelligence (AI) is revolutionizing medical education by enhancing personalization, interactive learning, and clinical simulation. While AI supports improved accessibility, efficiency, and assessment, barriers such as high costs, ethical concerns, and insufficient faculty training persist. The present study was done to assess the knowledge & attitude of medical students and teachers towards AI in medical education.

Material and Methods: A descriptive cross-sectional survey was carried out over a 3-month period among MBBS students, postgraduate residents, and faculty members at SRMS IMS Bareilly. Data were collected using a structured online questionnaire via Google Forms, comprising three sections: demographic information, awareness of AI, and attitudes toward its application in medical education.

Results: A total of 150 participants responded to the online survey, with the majority being first-year MBBS students. Most MBBS students (48%) aged 20 to 30 years use AI tools for education, chatbots (67.4%) being the most popular. A large proportion (56.7%) reported no prior AI training but expressed interest in learning. Quick response (30%) and personalized learning (22%) were reported as key benefits, while concerns included reduced human interaction (47.3%) and AI potentially replacing doctors (26.7%). Most of the respondents believe that AI will revolutionize medical education (57.3%).

Conclusion: AI tools are increasingly utilized by medical students, particularly early-year learners. Despite limited formal training, both students and faculty display a positive outlook toward AI integration. Addressing ethical concerns and enhancing training infrastructure is essential to optimize AI's role in medical education.

Keywords: Artificial intelligence, Medical education, Knowledge, Attitude, Chatbots.

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INTRODUCTION

Artificial intelligence (AI), encompassing a range of computational systems that mimic human cognition, is increasingly being applied in diverse fields, including healthcare and education.[1] Within medical education, AI offers new opportunities for adaptive learning, clinical simulations, automated assessments, and personalized feedback.[2-4] Tools like ChatGPT and other natural language processing models are being used globally to facilitate interactive learning and enhance conceptual understanding.[5-7]

AI facilitates formative and summative assessments, provides real-time feedback, and promotes individualized learning strategies.[8-10] Clinical simulation environments allow medical students to practice clinical reasoning and learn from their errors in a low-pressure setting.[11] The integration of AI into medical education also enhances accessibility, particularly in remote or resource-limited regions, by supporting distance learning.[12]

ChatGPT is a language model developed by OpenAI that responds to a prompt or input in natural language using advanced AI techniques.[13] The application of AI in medical education research and development has grown significantly in recent years, as reflected by a rise in both the volume of publications and their citation frequency over the past two decades.[14]

AI has the potential to manage and process extensive datasets to customize education, broaden reach, and foster active participation through immersive content and virtual reality (VR). This can greatly improve medical education, teaching, and assessment.[15] Students with low teacher-to-student ratios can also benefit from the implementation of various AI techniques.[16]

Similarly, AI systems are already being employed in clinical practice to develop algorithms and dynamically created clinical vignettes that provide quick access to a variety of useful clinical scenarios.[17] However, various limitations—such as a shortage of faculty proficient in AI and the substantial cost of AI software—may restrict its advancement in certain regions.[18]

Surgical robots will have a hugely favorable impact on healthcare because of their high precision in managing the direction, depth, and speed of their movements. In some instances, robotic equipment has been found to be more efficient than human operators performing surgical procedures.[19] But creating these AI robots comes with some major challenges, such as the possibility that a technological error could be lethal.[20] Many professional occupations may someday be replaced by these robots, raising unemployment rates. Additional ethical concerns include risks to data privacy, changes in the dynamics of the patient-physician relationship, and the potential emergence of social inequalities.[21]

Nevertheless, collaborative human-AI approaches have demonstrated superior performance in cognitive tasks compared to either alone.[22] AI will revolutionize healthcare delivery and doctors' professional identities. To successfully incorporate AI into medical education, further research is needed to identify ethical issues and potential solutions. As AI reshapes healthcare delivery and medical training, comprehensive integration requires appropriate curricula, ethical frameworks, faculty training, and infrastructural support.[23,24]

Although earlier research indicates positive attitudes among students, a consistent finding is their limited AI literacy and concerns over professional relevance.[25,26] This study aims to evaluate the current level of knowledge and attitudes regarding AI among medical students and faculty at a tertiary teaching institution.

MATERIAL AND METHODS

Study Design and Setting

A descriptive cross-sectional study was carried out at SRMS IMS Bareilly over three months (January–March 2025). Participants included MBBS students, postgraduate residents, and faculty members.

Instrument and Data Collection

A Google Form-based questionnaire was constructed following a review of the literature and then shared via a Google Form link in WhatsApp groups. The questionnaire comprised three sections: participants' demographic information, awareness of AI, and perceptions regarding the use of AI in medical education. Following the distribution of the survey link, reminder messages were sent weekly to encourage participation.

Informed Consent

Participation was voluntary and unrelated to academic performance, and the anonymity of participants was ensured in the preface of the Google form link. Implied consent was given upon questionnaire completion.

Statistical Analysis

The statistical analysis followed a structured approach to evaluate knowledge, attitude, and AI usage trends among medical students and faculty. We began by summarizing socio-demographic details using frequency and percentage distributions, followed by computing median and interquartile range (IQR) for knowledge and attitude scores across working status groups. To assess group differences, we conducted a Kruskal-Wallis test, followed by Dunn's post-hoc test with Bonferroni correction for significant findings. We then examined AI adoption patterns, performing Chi-square tests to assess differences in general AI usage and AI usage for education. Further, Kruskal-Wallis test was applied to compare AI tool preferences, followed by post-hoc pairwise comparisons.

RESULTS

A total of 150 participants, mostly females (56%), responded to the online survey, most of them (48%) being in the age group 20 to 30 years.

Knowledge of AI

The median and interquartile range for knowledge scores were computed as shown in Table 1.

A comparison between the AI knowledge score of Faculty and MBBS 1st professional students showed a significant difference ($p = 0.001$), as shown in Table 2 and Figure 1. No other group comparisons were statistically significant.

Attitude Towards AI in Medical Education

The median and interquartile range for attitude scores were computed as shown in Table 3. No statistically significant differences were found in attitude scores across any group comparisons, as can be seen in Table 4 and Figure 2. This suggests that attitude toward AI is relatively uniform across different experience levels, meaning that students and faculty generally have a similar perception of AI's role in medical education.

Table 1: Knowledge score table

Working status	*Median knowledge score*	*IQR*
Faculty	2	2
MBBS 1st professional student	2	0
MBBS 2nd professional student	2	0
MBBS 3rd professional part-I student	2	0
MBBS 3rd professional part-II student	2	0
Post-graduate student	2	0
Tutor	0	0

Table 2: Pairwise Kruskal-Wallis test results for knowledge score

Group 1	*Group 2*	*H-statistic*	*p-value*
Faculty	MBBS 1st professional student	10.8	0.001
Faculty	MBBS 2nd professional student	4.5	0.0339
Faculty	MBBS 3rd professional part-I student	1.04	0.309
MBBS 1st professional student	MBBS 2nd professional student	0.13	0.7206
MBBS 1st professional student	MBBS 3rd professional part-I student	3.51	0.0609
MBBS 2nd professional student	MBBS 3rd professional part-I student	1.99	0.1584

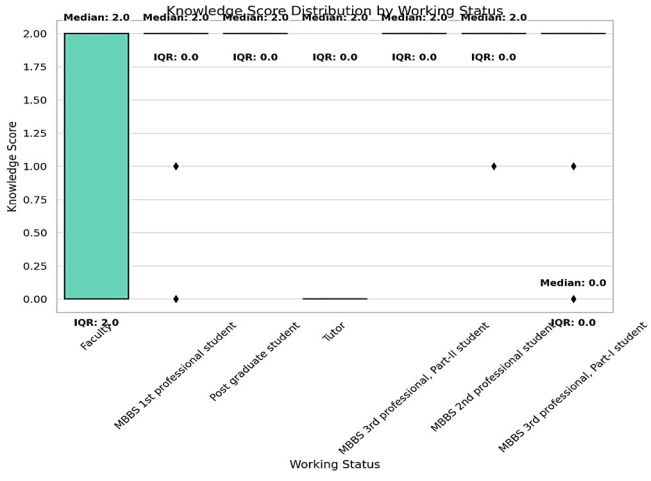

Figure 1: Knowledge score distribution versus working status

AI Usage for Educational Purposes

The usage of AI for educational purposes was found to be less popular among faculty members (65.2%) than students, as shown in Figure 3. Over 90% of MBBS (especially 1st year and 2nd year students) use AI, showing higher adoption among younger students, and the difference was statistically significant, as represented by Table 5.

Most Preferred AI Tools for Learning/Teaching

Chatbots are the most commonly used AI tool across all groups. MBBS 3rd year part-I students (83.3%) were found to be using chatbots the most. Grammar and writing tools are more popular among faculty than students. Similarly, AI-powered medical search engines are heavily being used by faculty (41.2%) and postgraduate students (33.3%), but rarely by undergraduates. A statistically significant difference was found between AI tool preferences of different work status groups (*p-value* = 0.00019), as shown in Table 6. Later, the U-statistic and p-value were calculated, and the Bonferroni correction was applied to account for significant findings in the comparison of AI tool preference among different groups, as shown in Table 7. The stacked bar chart, shown in Figure 4, displays AI tool preferences across different user groups. The highest AI tool usage was observed in MBBS 2nd professional students, with chatbots (e.g., for answering questions or explaining concepts) being the most frequently used. This suggests that this group heavily relies on AI-driven assistance, possibly for study purposes. AI-powered medical knowledge

Table 3: Attitude score table

Working status	*Median attitude score*	*IQR*
Faculty	1	1
MBBS 1st professional student	1	1
MBBS 2nd professional student	2	1
MBBS 3rd professional part-I student	2	1
MBBS 3rd professional part-II student	1	0
Postgraduate student	2	0.5
Tutor	1	0

Table 4: Pairwise Kruskal-Wallis test results for attitude score

Group 1	*Group 2*	*H-statistic*	*p-value*
Faculty	MBBS 1st professional student	0.29	0.591
Faculty	MBBS 2nd professional student	2.32	0.1281
Faculty	MBBS 3rd professional part-I student	0.34	0.5584
Faculty	Post-graduate student	0.65	0.4205
MBBS 1st professional student	MBBS 2nd professional student	1.9	0.1682
MBBS 1st professional student	MBBS 3rd professional part-I student	0.08	0.7819
MBBS 1st professional student	Post-graduate student	0.43	0.5138
MBBS 2nd professional student	MBBS 3rd professional part-I student	0.7	0.4023
MBBS 2nd professional student	Post-graduate student	0	1
MBBS 3rd professional part-I student	Post-graduate student	0.2	0.6557

Table 5: Chi-square test results for ai usage trends

Test	*Chi-square statistic*	*p-value*	*Interpretation*
AI usage (General)	23.05	0.00078	Statistically significant difference in AI usage among groups
AI usage for education	23.39	0.00068	Statistically significant difference in AI educational usage among groups

Table 6: Kruskal-Wallis Test for AI Tool Preference

Test	*H-statistic*	*p-value*	*Interpretation*
Kruskal-Wallis for AI tool preference	22.11	0.00019	Statistically significant difference in AI tool usage among groups

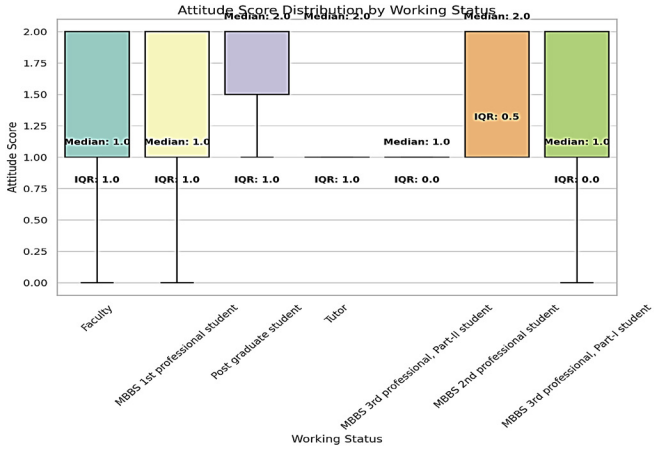

Figure 2: Attitude score distribution versus working status

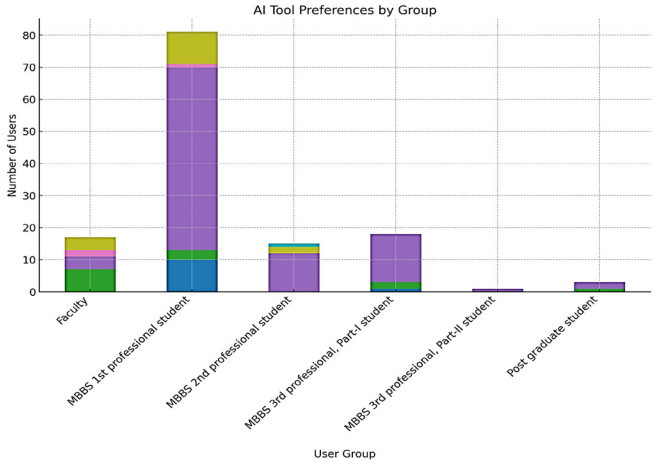

Figure 4: AI tool preferences by different groups

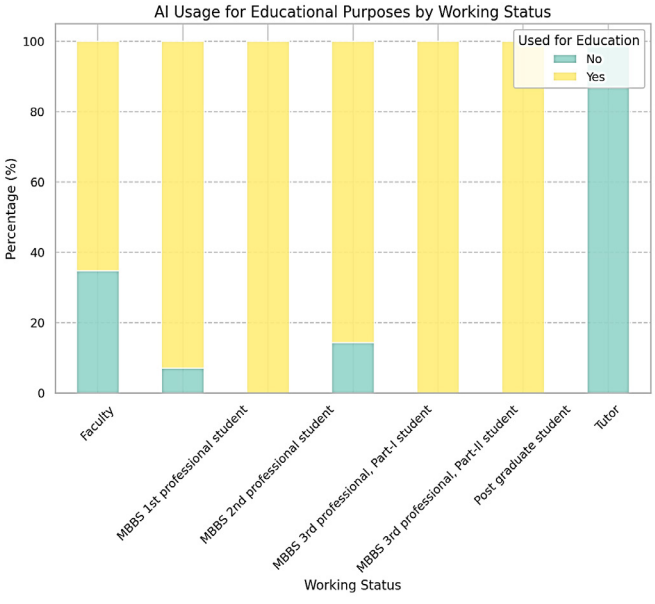

Figure 3: AI usage for educational purposes by different working status

search engines and interactive case studies appear to be commonly used in faculty groups. MBBS 3rd professional (both Part-I and Part-II) and postgraduate students show significantly lower AI tool adoption.

DISCUSSION

Artificial intelligence (AI) is increasingly recognized as a game-changing technology across various sectors, including medical education. The growing enthusiasm for incorporating AI into academic settings highlights its potential to enhance both instructional methods and student learning.[2,3,27] This study underscores AI's expanding influence in medical education, especially among younger learners who exhibit a higher level of familiarity with AI-based tools.

In our study, the majority of respondents were MBBS students aged 20 to 30 years (48%), suggesting that younger learners may be more familiar with AI tools, likely due to greater exposure to and awareness of technological advancements. Faculty members (65.2%) reported lower levels of AI familiarity compared to students, indicating a potential gap that could be addressed through targeted faculty development programs. Despite this difference in familiarity, both groups shared a broadly similar attitude toward AI, recognizing its role in transforming medical education.

These findings are consistent with previous research. For example, Wood *et al.*, reported that faculty were significantly more likely to lack basic AI knowledge compared to students (36 vs. 18%).[28] In our study, a substantial proportion (56.7%) of participants acknowledged not having received any formal AI training but expressed interest in learning—an observation echoed in Civaner *et al.*'s study, where 75.6% of Turkish medical students reported similar training gaps.[21]

Table 7: Comparison of AI tool preference after correction

Group 1	*Group 2*	*U-statistic*	*p-value*	*Significant (after Bonferroni correction)*
Faculty	MBBS 1st professional student	1002.5	0.0007	Yes
Faculty	Post graduate student	35.5	0.2898	No
Faculty	MBBS 3rd professional, part-ii student	15	0.2254	No
Faculty	MBBS 2nd professional student	202	0.0026	No (after correction)
Faculty	MBBS 3rd professional, part-i student	238	0.0021	Yes
MBBS 1st professional student	Post graduate student	117.5	0.9167	No
MBBS 1st professional student	MBBS 3rd professional, part-ii student	52.5	0.5444	No
MBBS 1st professional student	MBBS 2nd professional student	668	0.444	No
MBBS 1st professional student	MBBS 3rd professional, part-i student	818.5	0.3024	No
Post-graduate student	MBBS 3rd professional, part-ii student	2	1	No
Post-graduate student	MBBS 2nd professional student	26	0.6252	No
Post-graduate student	MBBS 3rd professional, part-i student	31	0.6069	No
MBBS 3rd professional, part-ii student	MBBS 2nd professional student	6	0.7499	No
MBBS 3rd professional, part-ii student	MBBS 3rd professional, part-i student	7.5	0.7736	No
MBBS 2nd professional student	Mbbs 3rd professional, part-i student	138	0.8931	No

Regarding AI tool usage, chatbots emerged as the most commonly used across all groups, particularly among MBBS second-year students, suggesting their preference for AI-driven learning aids like question-answering systems and concept explainers. In contrast, grammar and writing tools were more commonly used by faculty, likely due to their utility in academic writing and research. AI adoption appeared to decline among senior students and postgraduates, which may reflect a shift in learning approaches or reduced reliance on such tools at advanced stages.

Comparable findings were reported by Wobo *et al*., where conversational AI tools were most commonly used among Nigerian doctors, though a majority (61.2%) were unfamiliar with AI applications in medical education.[29]

When asked about the benefits of AI, participants in our study most frequently cited quick and accurate information retrieval (30%) and personalized learning (22%) as key advantages. However, notable concerns were raised, including reduced human interaction (47.3%), technical difficulties (21.3%), and ethical implications (15.3%). The most pressing ethical issues involved fears of AI replacing doctors (26.7%) and the risk of fatal outcomes due to AI errors (22.7%). These concerns align with findings from Civaner *et al*. and Wobo *et al*., where ethical apprehensions, lack of human interaction, high costs, limited access, and unreliable internet connectivity were major barriers to AI adoption.[21,29]

Importantly, over half of our respondents (57.3%) believed that AI would significantly transform medical education, with 50.7% supporting its formal inclusion in curricula. This sentiment is strongly supported in the literature. Civaner *et al*. found that 93.8% of Turkish students advocated for structured AI education, while Pinto Dos Santos *et al*. reported that 77% of German students felt AI would revolutionize medical science, with 71% supporting its curricular integration.[21,24] Similar positive attitudes were documented by Wood *et al*., Songhee *et al*., and Abid *et al*., the latter noting that 64.1% of medical students in Peshawar supported AI inclusion despite limited prior exposure.[26,28,30] Wobo *et al*. further emphasized the need for institutional support and infrastructure development to facilitate effective AI integration in medical education.[29]

Overall, the study supports the integration of structured AI training in medical curricula and underlines the need for ethical guidelines and institutional support to foster safe and effective implementation.

LIMITATIONS

This study is subject to certain limitations. The online, voluntary nature of the survey introduces the possibility of self-selection bias, as participants may have been those already interested in AI and medical technology. The majority of student responses came from first-year MBBS students, and most faculty responses were from phase 1 faculty, which may have skewed the results. Furthermore, as the study was conducted at a single institution, the applicability of its findings to broader populations may be limited.

CONCLUSION

This study reveals that younger students exhibit a higher level of familiarity with AI, likely reflecting their greater exposure to digital technologies and adaptive learning environments. Notably, both students and faculty members demonstrate broadly similar attitudes toward the integration of AI in medical education, with a shared belief in its transformative potential. This consensus highlights the pressing need to integrate formal training in AI tools and establish robust ethical guidelines to ensure the responsible and effective use of these technologies.

The preferences for AI tools differ between groups: students primarily favor chatbot-based applications for learning support and quick information retrieval, while faculty members gravitate toward grammar and writing assistance tools to enhance academic productivity. Despite the enthusiasm surrounding AI, participants also voiced significant concerns—chief among them being the potential erosion of human interaction in educational settings and unresolved ethical issues surrounding AI use. Addressing these challenges will be crucial in establishing a balanced and ethical framework for integrating AI in medical education.

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