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Knowledge, Attitudes, and Practices [KAP] toward Artificial Intelligence in Medical Education among Medical Students and Teachers: A Cross-Sectional Survey

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***Abstract*— Artificial intelligence [AI] is shaping the delivery of teaching, learning, and clinical training. This is transforming Medical education rapidly. The application and awareness of AI in medical students and faculty from developing nations such as India have not been widely studied. This survey study was performed at Datta Meghe Institute of Higher Education & Research, Maharashtra. We tried to assess how students and teachers view and use AI in medical education. The pre-validated questionnaires were provided to participants. In total, 271 people [156 students and 115 teachers] responded to the Google form questionnaire. The study used Chi-square or Fisher's Exact tests for categorical data and the Mann–Whitney U test for Likert-scale responses. Teachers had more formal training in AI, but students used AI-based educational tools more often [$p < 0.001$]. We concluded that students were generally more enthusiastic, trusting, and dependent on AI for learning. On the other hand, teachers were more cautious. They raised ethical concerns along with highlighting possible negative effects on clinical skills [all $p < 0.001$]. In case of unexpected clinical situations, both groups were uncertain about the reliability of AI. The findings suggest notable differences in perceptions of AI between students and teachers. This highlights the need for structured training in AI literacy and ethics for both groups. Both students and teachers show a clear difference regarding the use of AI in medical education. Structured AI training is still uneven, especially among students. AI should complement traditional teaching, not replace it.**

***Index Terms*— Artificial intelligence, Medical education, Education Structure, Ethics in medical education, and Clinical skills.**

I. INTRODUCTION

Artificial intelligence in education means using computer programs that act like humans to improve teaching, learning and training for healthcare workers [1]. Medical education is increasingly integrating Artificial Intelligence (AI) in its medical curriculum [1]. This change is reshaping how knowledge is delivered and applied in training [2].

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New tools like simulation modules, intelligent tutoring systems and automated assessment platforms are being added[1,2]. They are changing learning environments by providing data-driven education to students [1,2]. Artificial intelligence driven innovations enhance real-time feedback and diagnostic training in education. [3]. They also assist in creating customized study plans that support competency-based education [3,4]. However, this transformation has generated diverse perspectives on the use of AI [5]. AI is considered essential for improving learning efficiency and accessibility by some educators [5,6]. In contrast, some educators perceive it has an influence with respect to the traditional mentor-based teaching and training model in medical education [7,8].

Medical education has traditionally relied on direct student–teacher interaction for both learning and clinical experience [5]. The emergence of AI-based learning tools such as chat-bots, virtual anatomy platforms, diagnostic simulators, and predictive analytical systems, has challenged these orthodox pedagogical methods [9,10]. Association of American Medical Colleges' (AAMC) competency-based medical education framework keeps patient care, professionalism, and systems-based practice at utmost importance [11]. Since the integration of AI tools to competency assessment and performance tracking is happening, the educators are providing more personalized feedback and improving learners' progression [11]. These tools transform learning environments by enabling data-driven educational strategies [12,13]. Although AI is perceived as beneficial for students, educators raise concerns that its extensive use may compromise the development of critical reasoning, ethical judgment, and empathetic communication, which are traditionally fostered through mentorship and clinical experience [14,15].

The balance of technological advancement and preservation of humanistic values in education is the paramount goal for medical councils and academic institutions globally [15,16]. Efforts are being made to integrate AI literacy and ethical competence into curricula emphasize ability to interpret , responsibility, and patient-centred care [17,18]. These discussions have intensified following the National Medical Commission's withdrawal of Competency Based Medical Education Curriculum (CBME) medical programs in 2024 [19,20]. Faculty preparedness, institutional support, and infrastructural disparities plays vital role in the rate and effectiveness of AI adoption in academic medicine [21,22].

There has been a substantial increase in conceptual and review-based literature on this topic, but there is limited empirical evidence regarding the actual knowledge, attitudes, and practices (KAP) of medical students and educators related to AI applications in teaching, research, and clinical training [23,24]. Understanding these perspectives is important for developing context-sensitive, ethically grounded, and culturally adaptive strategies that complement, rather than replace, conventional methods of medical instruction [25–27].

A. Global Overview of AI in Medical Education

The balance of technological advancement and preservation of humanistic values in education is the paramount goal for medical councils and academic institutions globally [15,16]. Efforts are being made to integrate AI literacy and ethical competence into curricula emphasize ability to interpret , responsibility, and patient-centred care [17,18]. These discussions have intensified following the National Medical Commission's withdrawal of Competency Based Medical Education Curriculum (CBME) medical programs in 2024 [19,20]. Faculty preparedness, institutional support, and infrastructural disparities plays vital role in the rate and effectiveness of AI adoption in academic medicine [21,22].

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B. Global Overview of AI in Medical Education

Artificial Intelligence (AI) is reforming medical education by creating a learner-centred environment for medical learning [23]. Recent studies report that adaptive learning platforms, natural language chatbots, and image-recognition algorithms have been embedded into pre-clinical and clinical teaching to support energetic learning and performance feedback [23]. These technological developments facilitate differentiated learning and allow instructors to monitor performance metrics using predictive analytical dashboards [24].

According to studies from institutions in the United States, the United Kingdom, and Singapore, concludes AI-assisted simulation and virtual patient systems can significantly improve diagnostic reasoning, decision-making accuracy, and long-term knowledge retention in combination with traditional instruction [24]. AI assisted systems helps students to practice image interpretation, identify patterns, and improve their reasoning in a

controlled environment. Moreover, for the students from the area of anatomy, radiology, and pathology such systems are proven to be valuable in their curriculum [25]. However, there are several concerns such as unclear decision-making mechanisms, bias in algorithms and excessive dependence on automation can affect their safe use, as clinical reasoning still persist while using these systems in medical education [26]. Independent human judgment remains essential in medical education due to above mentioned concerns [26]. Also ethical issues related to data confidentiality and patient agreement in AI-integrated education is still not completely addressed [26].

C. Knowledge and Awareness

The lack of conceptual understanding of AI among medical students and faculty is came in to light when some pragmaitic studies based onn AI suggested that there is need of awareness of AI amongst medical field [27]. Both educators and studentys are well versed with the transformative potential of AI in healthcare. However, very few have a comprehensive understanding of its underlying mechanisms or limitations [27,28,29]. Hence there is need of leaning how these tools can be meaningfully used in medical education [27,28,29]. Most of the people think of use of AI in diagnostic imaging but its use in decision support and personalized learning is less recognized till now [28]. Factors like digital literacy, academic rank, and speciality may affect educators' awareness and confidence in AI integration [29]. When it comes to applying AI tools for teaching and assessment, senior faculty are often exhibit lower self-efficacy as compared to junior faculty [30].

D. Attitude Toward AI Integration

It is predominantly observed that both medical students and educators demonstrate a positive attitude toward AI [31]. Studies report that many teachers and students show enthusiasm for AI. They value its ability to provide fast feedback. AI simplifies the assessment process along with expanding access to virtual learning resources [32]. However, they also worry about the potential replacement of educators, the loss of interpersonal mentorship, and ethical ambiguity in automated grading systems [33]. Educators have also expressed concerns that use of AI in medical training may reduced personal engagement. This may result in potential loss of empathy if technology-driven platforms dominate early learning experiences [34]. Recent studies indicate that students are increasingly dependent on AI tools to improve learning efficiency [31]. Institutions also play important role in shaping the attitude of educators and students towards use of AI [34]. It is observed that the universities that are technologically updated hold more positiveness towards integration of AI in education as compared to those in resource-limited or terminologically weaker settings [34].

E. Practices and Adoption

Though most of the teachers and students showed favourable perceptions towards use of AI, its routine use in medical education is still limited [34,35]. Adoption of AI in medical education remains inconsistent across institutions [34,35]. Technical challenges contribute to this variation [35]. Another barrier in adoption process is limited financial support to access highly developed AI tools [35]. Adaptive learning platforms and virtual anatomy systems are not under effective use due to lack of faculty training [35]. One of the for inconsistent student engagement and academic outcomes is many institutions use these tools only as pilot initiatives without proper evaluation methods [36].

Another key barrier to the implantation of AI in medical education is lack of proper match between new tools and the existing curriculum [37]. Many AI tools function outside officially defined standards that outline the essential knowledge, skills, and abilities learners must develop in a specific field [37]. The overall educational value of AI tools is degraded due to its function outside officially defined standards that outline the essential knowledge, skills, and abilities learners must develop in a specific field [37]. Because of this integration of emerging technologies into the core curriculum has become need of the time in medical education [11,37]. This integration should align with standards set by organizations such as the AAMC that ensures sustainable implementation [11,37]. Collaboration among educators, clinicians, and data specialists is the key for effective integration of AI in medical curriculum [36].

F. Challenges in Low- and Middle-Income Countries (LMICs)

Systemic, infrastructural, and cultural factors influence adoption in medical education in low - and middle-income countries, including India [38]. Factors like poor broadband, inconsistent funding, and the lack of national guidelines affects scalability [39]. Adequate technical expertise is often lacking among faculty, even where digital initiatives exist [38]. Self-directed learning models are rarely implemented due to teacher-centered traditions [40]. Concerns about data privacy and the lack of localized tools also act as barriers [38]. Recent

Indian studies have emphasized the need for national strategies. A balanced approach between innovation and cultural and ethical considerations is considered necessary [38].

G. Theoretical Framework

The Technology Acceptance Model (TAM), a theoretical framework developed by Fred Davis that explains how users accept and adopt new technology explains the dynamics of AI adoption in medical education [41]. According to TAM it is considered that perceived usefulness and ease of use of new technology directly influence a user's intention to engage in it [41]. The educators who believes AI as enhancing teaching efficiency are the ones to adopt it rapidly.

However user-friendlyness and institutionally support plays important role in adoption of new technology too [42]. Another theory of Rogers' Diffusion of Innovation explains spread of new ideas, technologies, or practices within a social system over time. It also explains how it depends on communication channels, institutional readiness, and perceived advantage [42]. Comparative KAP analyses based in these theories proved that positive perception alone does not ensure complementation of AI in medical curriculum [43]. The current study, therefore, aims to find the knowledge, attitude, and practice [KAP] of medical students and educators with respect to AI in medical education as per the plan of study.

II. RESEARCH GAP

Though global studies mention AI readiness and adoption in medical education with respect to educators and students, there is a scarcity of data on Indian and similar low-and middle-income contexts [41,42]. Technological feasibility and algorithmic performance is given more importance rather than the pedagogical and ethical dimensions of AI integration in curriculum in available research work [43,44]. There is scarcity of research work on how AI-assisted tools influence orthodox teaching values that form the foundation of medical professionalism [45–47].

Apart from this very few evidences are available regarding comparisons of knowledge, attitude, and practice [KAP] between students, residents, and faculty member - particularly in medical settings and AI based learning environments [48–50]. Comparative KAP study data can help curriculum developers, accreditation bodies, and policymakers in designing context-appropriate frameworks for AI literacy. It may also support ethical training within Indian medical institutions and similar global settings [51–54].

III. MATERIALS AND METHODS

A. Study Design and Setting

A cross-sectional questionnaire-based study assessed knowledge, attitudes, and practices related to AI among medical students and teachers [55].

The already established guidelines for educational and survey-based research were followed and the study was carried out at medical colleges affiliated with Datta Meghe Institute of Higher Education and Research [DMIHER], Maharashtra, India [56].

B. Study Population

The undergraduate medical students [MBBS/MD] and medical teachers involved in undergraduate and postgraduate teaching were included to study population to conduct the KAP study. Participation was voluntary, and only participants who willingly answered to the questionnaire were included in the study. To ensure data quality, incomplete or partially filled responses were excluded from the final analysis [57].

C. Data Collection Tool

Total two structured, pre-validated questionnaires were designed separately for students and teachers to collect data.

To ensure content validity and relevance of study, we developed the questionnaires after a focused literature review and expert consultation. The instruments assessed all the required parameters of the study.

D. Data Collection Procedure

The Google Form questionnaires were created and distributed digitally through Official WhatsApp groups, a method shown to be effective for survey-based research among medical students and faculty [58]. To improve response rates and reduce selection bias, the investigators also personally visited classrooms and faculty offices to invite participation [59]. Data collection was conducted over a predefined study period.

E. Ethical Considerations

Participation was voluntary and anonymous; there were no identifiers used. The participants were made aware of the study aims and gave their consent electronically. The research adhered to the principles set forth by the Declaration of Helsinki [60].

F. Statistical Analysis

Microsoft Excel sheets were prepared for data scores for all the responses to all the questions in questioner. Data is then analyzed using appropriate statistical methods using online tools. The participants and their responses were described using descriptive statistics.

Chi-square test was done on categorical data (Yes or No), but in case of small sample size (less than five), Fisher's exact test was conducted. On Likert scale data, Likert scale scores were obtained, which were then analyzed by performing non-parametric Mann Whitney U test. All analyses were performed with p-value less than 0.05 for statistical significance level [61-63].

IV. RESULTS

TABLE I: COMPARISON OF FORMAL AI TRAINING AND ACCESS TO AI TOOLS

Variable	Group	Yes (%]	No (%]	Statistical Test	χ^2 value	p-value
Formal AI training	Students (n=156)	101 (64.7)	55 (35.3)	Fisher's Exact	—	<0.001*
	Teachers (n=115)	115 (100.0)	0 (0.0)			
Access to AI-based educational tools	Students (n=156)	151 (96.8)	5 (3.2)	Chi-square	24.22	<0.001*
	Teachers (n=115)	88 (76.5)	27 (23.5)			

Note: Values are expressed as a number (percentage). Chi-square test was used when expected cell counts were ≥ 5, and Fisher's Exact test when counts were < 5 (χ^2 not reported, shown as "—"). A p-value < 0.05 was considered statistically significant; * indicates significance.

TABLE II: PERCEPTIONS OF TRADITIONAL TEACHING METHODS AMONG STUDENTS AND TEACHERS

Variable	Group	Yes n (%)[1]	No n (%)[1]	Statistical Test	χ^2 value	p-value
Traditional lectures sufficient for learning	Students (n=156)	62 (39.7)	94 (60.3)	Chi-square	18.45	<0.001*
	Teachers (n=115)	92 (80.0)	23 (20.0)			
Textbooks preferred over digital tools	Students (n=156)	48 (30.8)	108 (69.2)	Chi-square	32.10	<0.001*
	Teachers (n=115)	101 (87.8)	14 (12.2)			
Face-to-face teaching essential for clinical skills	Students (n=156)	104 (66.7)	52 (33.3)	Fisher's Exact	—	<0.001*
	Teachers (n=115)	113 (98.3)	2 (1.7)			
Traditional methods ensure better conceptual clarity	Students (n=156)	71 (45.5)	85 (54.5)	Chi-square	21.76	<0.001*
	Teachers (n=115)	95 (82.6)	20 (17.4)			

Values are expressed as number (percentage). Chi-square test was used when expected cell counts were ≥ 5, and Fisher's Exact test when counts were < 5 (χ^2 not reported, shown as "—"). A p-value < 0.05 was considered statistically significant; * indicates significance.

TABLE III: SUMMARY OUTCOMES OF KAP STUDY USING MANN - WHITNEY U (STUDENTS VS TEACHERS)

Question	Students[2]	Teachers[2]	p-value	Interpretation
Knowledge of AI	Lower self-rating	Higher self-rating	< 0.001*	Significant difference
AI for difficult concepts	More useful	Less useful	< 0.001*	Significant difference
Load of study vs skills	Reduces burden	Harms skills	< 0.001*	Significant difference
Learning goals	Strongly supportive	Cautious	< 0.001*	Significant difference
Trust in AI	Higher trust	Lower trust	< 0.001*	Significant difference
AI vs textbooks	Prefer AI summaries	Strongly oppose	< 0.001*	Significant difference
New treatment source	AI-based	Expert-based	< 0.001*	Significant difference
Risk awareness	Under-recognized	High concern	< 0.001*	Significant difference
Clinical exposure	Compensatory	Harmful	< 0.001*	Significant difference
Learning efficiency	Improved	Skill concern	< 0.001*	Significant difference
Overall opinion	Highly positive	Guarded acceptance	< 0.001*	Significant difference

Likert-scale responses were compared between students and teachers using the Mann–Whitney U test due to ordinal data and non-normal distribution. A p-value < 0.05 was considered statistically significant. * indicates statistical significance.

A total of 271 participants (156 students and 115 teachers) were included in the final analysis. All submitted responses for google form were screened for completeness. Only those responses that met the inclusion criteria were selected for statistical evaluation.

A statistically significant association was observed between participant group and formal training in artificial intelligence, with all teachers (100%) reporting formal AI training compared to 64.7% of students ($p < 0.001$, Fisher's Exact test). Access to AI-based educational tools was significantly higher among students (96.8%) than teachers (76.5%) ($\chi^2 = 24.22$, $p < 0.001$). In contrast, no significant difference was found between students and teachers regarding the perceived reliability of AI in unexpected clinical situations ($p = 0.702$), with both groups expressing low confidence in AI performance under such conditions.

Teachers reported significantly higher rates of formal AI training, whereas students reported significantly greater access to AI tools. Both differences were statistically significant with large effect sizes (Table 1).

80.0% of teachers supported traditional teaching (lectures) compared to 39.7% of students. Teachers demonstrated significantly greater support for traditional teaching methods ($p < 0.001$). Only 30.8% students support using textbooks, whereas 87.8% teachers preferred use of textbooks for reference. Only 66.7% students valuing face-to-face teaching whereas 98.3% teachers supported face-to-face teaching.82.6% vs 45.5% supporting traditional methods in conceptual clarity of the subjects. All differences were statistically significant ($\chi^2 = 18.45–32.10$; $p < 0.001$), indicating a clear divergence in educational preferences between students and teachers (Table 2).

The generational and role-based differences influencing AI adoption were observed in Table 3 by comparing KAP scores between students and teachers.

V. Discussion

The present study provides a comprehensive comparison of medical students' and teachers' perceptions, attitudes, and practices related to artificial intelligence in medical education. The following nested doughnut chart represents the details of the comparison. (Figure 1)All evaluated domains were observed to show a consistent pattern of divergence. All students indicating greater eagerness and dependency on AI, while teachers were focused on caution, ethical responsibility, and preservation of clinical skills. Teachers have exposure to curriculum development, research, and policy discussions, which acts as an important reason they also have higher self-rated AI knowledge. This also assist them in greater conceptual understanding of the AI. Teachers' higher self-rated AI knowledge aligns with prior studies as well [6,14,19]. According to previous studies teachers were concerned about excessive reliance on AI tools for eductinal purpose [8,14,29]. Overuse may result in to hampered professional judgment and unreliable practical skills [8,14,29]. Students rely on these systems for understanding difficult topics as well as exam preparation [1,3,6,16]. However, teachers remain cautious about their use in clinical analysis [8,14,29]. These systems are not fully developed to interpret complex or changing medical situations in real life events[8,14,29]. In clinical settings, outcomes can be unpredictable by AI and often require human judgment and experience. Teachers recognize that AI may not handle these situations well in most of the previous studies [22,25,30]. The present study demonstrates significant divergence between students and teachers regarding AI's impact on study burden and clinical skills [7,11,12], whereas faculties are concerned that AI may reduce hands-on training and affect professional identity [15,21,32]. Emerging evidence demonstrates that higher students [MD] show more confidence in generative AI outputs [3,11,52]. In contrast to these finding students from our study showed more trust on the teachers' explanation for the difference in opinion whereas teachers are more cautious, reflecting well-documented concerns about AI errors, bias, and unclear responsibility for mistakes. [22,34,49]. Choosing AI summaries over textbooks is observed among students aligns with a global shift toward rapid, technology-assisted learning, as reported in recent review articles [2,24,27]. In contrast to this trend, teachers are concerned about superficial learning and diminished critical reading skills [28,35]. While the involvement of AI in clinical exposure was checked students believed that AI could compensate for limited clinical exposure whereas teachers believed it is harmful to experiential learning [18,26,47]. Teachers' heightened perception of risk associated with AI-based therapy information further aligns with concerns about medico-legal accountability and patient safety [22,25,34].

Overall, the results of our study match with that of global studies. Students view AI as a powerful tool. They agree that AI can change learning in positive ways. Teachers agree that AI can be helpful but they are concerned about the outcomes of use of AI in medical education as it is concerned to humans directly and if it is not properly guided or regulated. [13,29,45] (Figure 2) Compared to studies from high-income countries reporting higher faculty acceptance, the cautious stance observed in this study may reflect infrastructural, regulatory, and ethical considerations relevant to low- and middle-income settings [17,33].

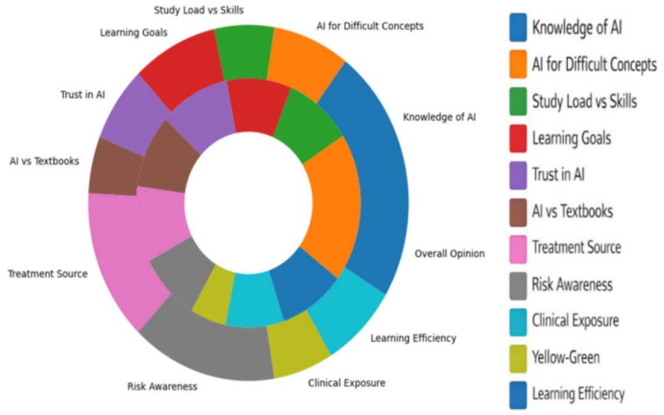

Figure 1: Nested doughnut chart illustrating differences between students [inner ring] and teachers [outer ring] regarding perceptions of artificial intelligence in education. All comparisons were statistically significant ($p < 0.001$)

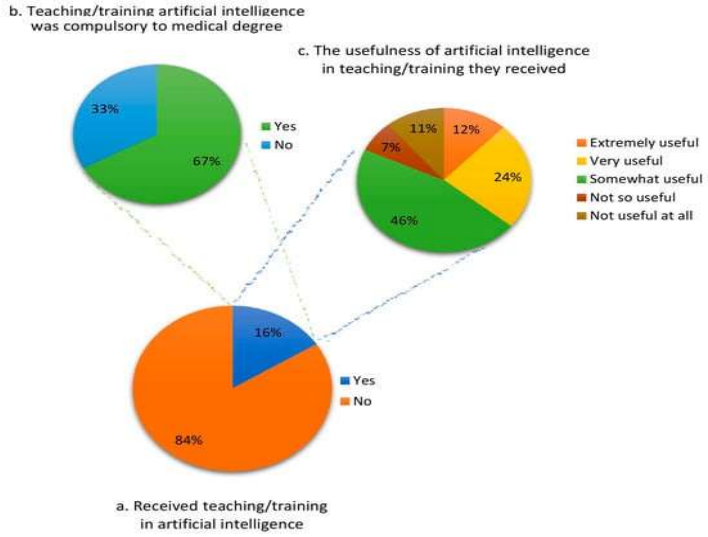

Figure 2: Overall Perception of Artificial Intelligence in Medical Education

VI. Conclusion

The current study highlights distinct role-based and generational disparities in the use of cutting-edge digital tools in medical education. The KAP analysis revealed distinct age and role-based disparities in the application of state-of-the-art digital tools in medical education. Both groups continued to have access to tools, but the official education of the students differed. According to the KAP results, teachers' and students' categorical responses differ significantly, indicating both general trends in AI adoption and distinct educational preferences.The learners group was receptive to the usage of AI since it made their duties easier, but teachers were more worried about its impact on ethical issues and decision-making. This demonstrates how the structured educational experiences of the two groups are obviously different.The results of this study reveal the crucial need for focused training in the medical field for both students and instructors. Training should enhance learning, critical analysis, and safe use of AI in medical education.

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