E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/16.02.716

Research Article

A Cross-Sectional Study to Assess the Knowledge, Attitude, and Practice Regarding Artificial Intelligence Among Undergraduate Medical Students at a Medical College

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Received: 20.09.2026, Revised: 28.09.2026, Accepted: 04.10.2026

ABSTRACT

Background: Artificial intelligence (AI) is increasingly being integrated into medical education and healthcare. Medical students are expected to develop adequate knowledge and responsible practices regarding AI, but gaps in formal training and critical appraisal of AI-generated information remain. This study assessed the knowledge, attitude, and practice (KAP) regarding AI among undergraduate medical students.

Methods: A cross-sectional descriptive study was conducted among 150 undergraduate medical students at a government medical college in Badaun. Data were collected using a structured, self-administered questionnaire covering sociodemographic characteristics, knowledge, attitude, and practice related to AI. Descriptive statistics were used to summarize the findings, and associations and correlations between KAP domains were assessed using appropriate statistical tests. A p-value <0.05 was considered statistically significant.

Results: Among the 150 students, 72.0% reported previous exposure to AI, whereas only 20.7% had received formal AI training. The mean knowledge, attitude, and practice scores were 14.7 ± 3.8, 35.7 ± 5.1, and 13.8 ± 3.7, respectively. Overall, 50.7% of students had moderate knowledge, 33.3% had good knowledge, and 16.0% had poor knowledge. Most students demonstrated good awareness of the need for human oversight (91.3%), the possibility of inaccurate AI-generated information (87.3%), and AI applications in medical imaging (85.3%). A favorable attitude towards AI was observed, with 76.7% agreeing or strongly agreeing that AI could improve medical education. AI tools were used by 79.3% of students, primarily for academic learning (60.7%). However, only 22.7% always verified AI-generated information. Significant positive correlations were observed between knowledge and attitude ($r=0.38$, $p<0.001$), knowledge and practice ($r=0.46$, $p<0.001$), and attitude and practice ($r=0.41$, $p<0.001$). Furthermore, 82.7% of students supported the inclusion of formal AI education in the undergraduate medical curriculum.

Conclusion: Undergraduate medical students demonstrated moderate knowledge and practice and a generally favorable attitude towards AI. Despite substantial exposure and use of AI tools, formal training was limited and consistent verification of AI-generated information was inadequate. Structured AI education focusing on practical applications, critical appraisal, ethics, privacy, algorithmic bias, and responsible use should be considered in undergraduate medical education.

Keywords: Artificial Intelligence, Medical Students, Knowledge, Attitude, Practice, Medical Education, Generative AI, AI Literacy.

INTRODUCTION

Artificial intelligence (AI) is rapidly transforming healthcare and medical education by enabling computer systems to perform tasks such as learning, reasoning, pattern recognition, prediction, language processing, diagnosis, clinical decision support, medical imaging, personalized medicine, drug discovery, and

health-system management.[1-4] The World Health Organization (WHO) recognizes the potential of AI to improve healthcare and medical research while emphasizing safety, transparency, equity, privacy, accountability, and human oversight.[5,6] The emergence of generative AI and large language models such as ChatGPT has further expanded the use of AI in medical education through information retrieval, explanation of complex concepts, academic writing, summarization, personalized learning, and clinical simulation.[7-9] However, these technologies may also generate inaccurate or biased information, making critical appraisal and responsible use essential for future physicians.[10]

Medical education is therefore increasingly required to incorporate AI-related competencies, although evidence suggests that structured AI education and standardized curricula remain limited.[11-13] Studies among medical students have reported increasing awareness and use of AI tools for academic and clinical learning, but concerns regarding accuracy, privacy, plagiarism, ethics, and appropriate use remain.[14,15] A systematic review and meta-analysis found that although medical students generally demonstrated positive attitudes toward AI, their knowledge and preparedness were variable, highlighting the need for formal AI education.16 Similar studies from different countries have identified gaps in technical knowledge and limited formal training, while previous exposure and education were associated with greater AI literacy and readiness.[17-19] Indian studies have also reported generally positive attitudes toward AI among medical students, alongside concerns about confidentiality, reliability, doctor–patient relationships, and the need for structured AI education.[20-23] Furthermore, AI raises important ethical and professional issues, including algorithmic bias, misinformation, data privacy, academic integrity, and the need for human oversight.[24] Since knowledge, attitudes, and actual practices may influence how safely and effectively students use AI, assessing these domains together is important.[25]

MATERIAL AND METHODS

Study Design, Study Setting

A cross-sectional descriptive study will be conducted among undergraduate medical students of Government Medical College, Badaun, to assess the knowledge, attitude, and practice regarding artificial intelligence (AI) among undergraduate medical students.

Study Population

The study population will comprise undergraduate medical students enrolled in the medical college during the study period.

Study Participants

Undergraduate medical students who meet the eligibility criteria and provide informed consent will be included in the study.

Inclusion Criteria

1. Undergraduate medical students enrolled at the selected medical college.
2. Students who are willing to participate in the study.
3. Students who provide informed consent.

Exclusion Criteria

1. Students who are absent on the day of data collection.
2. Students who do not provide informed consent.
3. Incomplete questionnaires will be excluded from the final analysis, as per the predefined criteria

Study Tool

Data will be collected using a structured, self-administered questionnaire developed after reviewing relevant published literature and previously validated instruments related to AI knowledge, attitude, readiness, and use among medical students.

The questionnaire will consist of the following sections:

Section I: Sociodemographic and Academic Characteristics

- Age
- Gender
- Year of study
- Previous exposure to AI
- Previous formal training in AI
- Access to AI-based tools

Section II: Knowledge Regarding AI

This section will assess students' understanding of basic AI concepts, applications in healthcare, generative AI, large language models, advantages, limitations, ethical issues, data privacy, and reliability of AI-generated

information.

Section III: Attitude Towards AI

Students' attitudes toward the use of AI in medical education and healthcare will be assessed using statements based on a Likert scale, ranging from strongly agree to strongly disagree.

Section IV: Practice Regarding AI

This section will assess students' actual use of AI tools, including frequency and purpose of use, commonly used applications, academic and clinical learning activities, verification of AI-generated information, and awareness of responsible use.

Validity and Reliability of the Tool

The questionnaire will be reviewed by experts from relevant fields such as medical education, community medicine, clinical disciplines, and/or health informatics to establish content validity. A pilot study will be conducted among a small group of students who will not be included in the final study sample. Necessary modifications will be made based on the findings of the pilot study. The reliability of the questionnaire will be assessed using an appropriate statistical method, such as Cronbach's alpha, for the relevant scale items.

Data Collection Procedure

After obtaining permission from the concerned authorities, eligible students will be approached and informed about the purpose and procedure of the study. Written informed consent will be obtained from each participant before data collection. Participants will be instructed to provide responses independently and honestly. No, personally identifiable information will be collected. Completed questionnaires will be checked for completeness before data entry and analysis.

Study Variables

The major outcome variables will be:

- Knowledge regarding AI
- Attitude towards AI
- Practice regarding AI

Other variables will include age, gender, year of study, previous exposure to AI, formal AI training, and frequency of AI use.

Data Analysis

The collected data will be entered into Microsoft Excel and analyzed using [SPSS version 26.0 Descriptive statistics such as frequency, percentage, mean, and standard deviation will be used as appropriate. The association between knowledge, attitude, practice, and selected sociodemographic or academic variables will be assessed using appropriate statistical tests such as the Chi-square test/Fisher's exact test, as applicable. For continuous variables, appropriate tests such as the independent t-test or ANOVA will be used depending on the distribution and number of groups. A p-value <0.05 will be considered statistically significant.

Expected Outcome

The study will provide information regarding the existing level of knowledge, attitudes, and practices related to AI among undergraduate medical students and will help identify areas where structured AI-related education and training may be required.

Table 1. Distribution of Study Participants According to Sociodemographic and Academic Characteristics (N=150)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	≤20	42	28.0
	21–22	71	47.3
	≥23	37	24.7
Gender	Male	82	54.7
	Female	68	45.3
Year of study	1st year	38	25.3
	2nd year	39	26.0
	3rd year	37	24.7
	4th year	36	24.0
Previous exposure to AI	Yes	108	72.0

	No	42	28.0
Previous formal AI training	Yes	31	20.7
	No	119	79.3

Among the 150 participants, 71 (47.3%) were aged 21–22 years. Males constituted 54.7% of the participants. The distribution across the four years of undergraduate medical education was relatively similar. Previous exposure to AI was reported by 72.0% of students, whereas only 20.7% had received formal AI-related training.

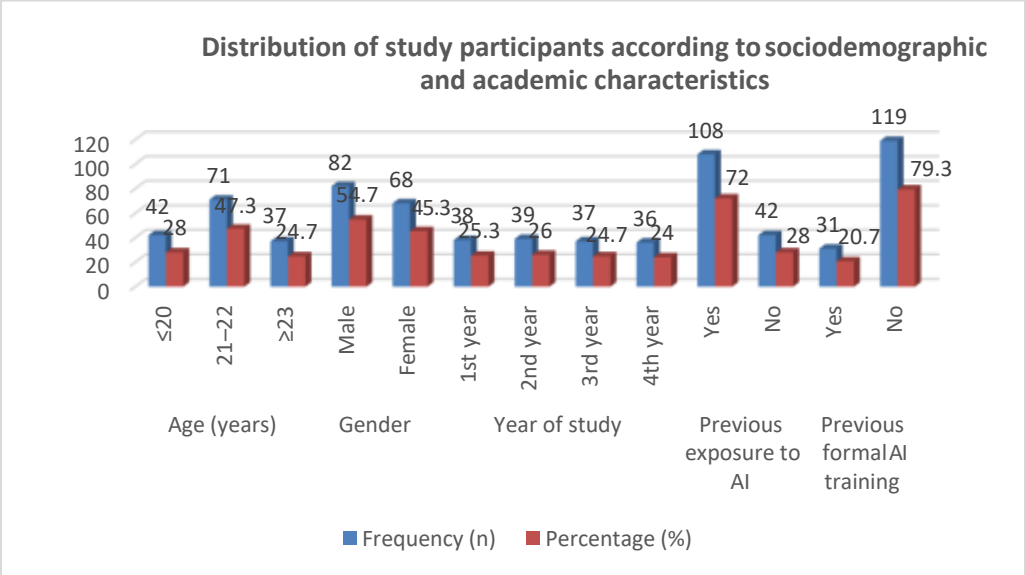


Fig: 1 Graphical Represents Distribution of Study Participants According to Sociodemographic and Academic Characteristics

Table: 2 Mean KAP Scores Regarding AI Among Undergraduate Medical Students (N=150)

KAP domain	Mean ± SD	Minimum–Maximum
Knowledge score	14.7 ± 3.8	6–20
Attitude score	35.7 ± 5.1	22–45
Practice score	13.8 ± 3.7	6–20

The mean knowledge score was 14.7 ± 3.8, the mean attitude score was 35.7 ± 5.1, and the mean practice score was 13.8 ± 3.7. Overall, the students demonstrated moderate knowledge and practice, with a generally favorable attitude towards AI.

Table: 3 Distribution of Students According to Knowledge Regarding Artificial Intelligence (N=150)

Knowledge item	Correct response (N) (%)	Incorrect/Don't know (N) (%)
Knowledge of the basic concept of AI	126 (84.0)	24 (16.0)
Knowledge of machine learning	98 (65.3)	52 (34.7)
Knowledge of deep learning	82 (54.7)	68 (45.3)
Knowledge of generative AI	119 (79.3)	31 (20.7)
Knowledge of large language models	101 (67.3)	49 (32.7)

Knowledge of AI applications in medical imaging	128 (85.3)	22 (14.7)
Knowledge of AI applications in clinical decision support	113 (75.3)	37 (24.7)
Awareness that AI-generated information may be inaccurate	131 (87.3)	19 (12.7)
Awareness of patient-data privacy concerns	124 (82.7)	26 (17.3)
Awareness of algorithmic bias	91 (60.7)	59 (39.3)
Awareness of the need for human oversight	137 (91.3)	13 (8.7)

Most students demonstrated good understanding of basic AI concepts (84.0%), medical imaging applications (85.3%), and the need for human oversight (91.3%). Awareness of AI-generated inaccuracies (87.3%) and data privacy (82.7%) was also high. However, knowledge of deep learning (54.7%) and algorithmic bias (60.7%) was comparatively lower, indicating areas requiring further education.

Table: 4 Overall Knowledge Level Regarding AI Among Study Participants (N=150)

Knowledge level	Frequency (N)	Percentage (%)
Poor	24	16.0
Moderate	76	50.7
Good	50	33.3
Total	**150**	**100.0**

The majority of students (50.7%) had moderate knowledge regarding AI, while 33.3% had good knowledge and 16.0% had poor knowledge.

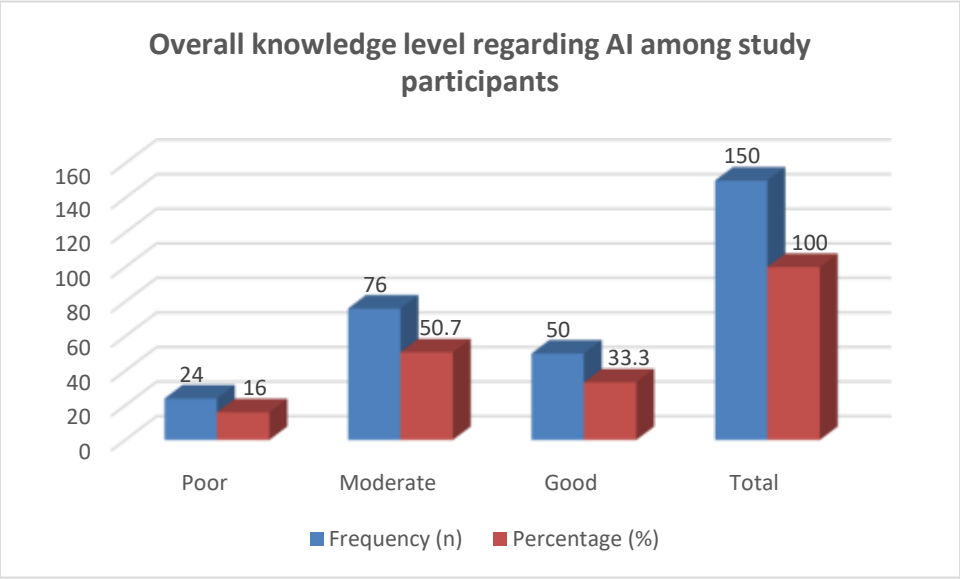


Fig: 2 Graphical Represents Overall Knowledge Level Regarding AI Among Study Participants.

Table: 5 Attitude of Students Towards Artificial Intelligence in Medical Education and Healthcare (N=150)

Statement	Strongly agree n (%)	Agree n (%)	Neutral (N) (%)	Disagree n (%)

AI can improve the quality of medical education	48 (32.0)	67 (44.7)	20 (13.3)	11 (7.3)
AI can help students learn complex medical concepts	53 (35.3)	69 (46.0)	17 (11.3)	8 (5.3)
AI can assist doctors in clinical decision-making	42 (28.0)	61 (40.7)	25 (16.7)	17 (11.3)
AI should be incorporated into the medical curriculum	51 (34.0)	62 (41.3)	21 (14.0)	12 (8.0)
AI may improve efficiency in healthcare	49 (32.7)	70 (46.7)	19 (12.7)	9 (6.0)
AI may pose risks to patient privacy	45 (30.0)	64 (42.7)	24 (16.0)	13 (8.7)
AI-generated information should be verified before use	76 (50.7)	60 (40.0)	8 (5.3)	4 (2.7)
AI should not replace human clinical judgment	71 (47.3)	58 (38.7)	11 (7.3)	7 (4.7)

Overall, students showed a favorable attitude towards AI. The majority agreed or strongly agreed that AI can improve medical education (76.7%), help in learning complex concepts (81.3%), and improve healthcare efficiency (79.4%). Most students also believed that AI-generated information should be verified before use (90.7%) and that AI should not replace human clinical judgment (86.0%).

Table: 6 Practice of AI Use Among Study Participants (N=150)

Practice variable	Category	Frequency (N)	Percentage (%)
Use of AI tools	Yes	119	79.3
	No	31	20.7
Frequency of AI use	Daily	31	20.7
	Several times/week	48	32.0
	Occasionally	40	26.7
	Never	31	20.7
Main purpose of AI use*	Academic learning	91	60.7
	Information searching	76	50.7
	Summarization	69	46.0
	Writing assistance	58	38.7
	Clinical learning	42	28.0

	Other	16	10.7
Verification of AI-generated information	Always	34	22.7
	Often	47	31.3
	Sometimes	38	25.3
	Rarely	20	13.3
	Never	11	7.3

Most students (79.3%) reported using AI tools, with 32.0% using them several times per week. Academic learning was the most common purpose (60.7%). Only 22.7% always verified AI-generated information, while 20.6% rarely or never verified it.

Table:7 Relationship Between Knowledge and Practice of AI Among Students (N=150)

Knowledge level	AI user (N) (%)	Non-user (N) (%)	Total
Poor	13 (54.2)	11 (45.8)	24
Moderate	58 (76.3)	18 (23.7)	76
Good	48 (96.0)	2 (4.0)	50
Total	**119 (79.3)**	**31 (20.7)**	**150**

AI use increased with higher knowledge levels, from 54.2% among students with poor knowledge to 96.0% among those with good knowledge. This indicates a significant positive association between knowledge level and AI use.

Table: 8 Correlation Between Knowledge, Attitude and Practice Scores (N=150)

Variables	Correlation coefficient (r)	p-value
Knowledge and attitude	0.38	<0.001
Knowledge and practice	0.46	<0.001
Attitude and practice	0.41	<0.001

There was a statistically significant positive correlation between knowledge and attitude ($r=0.38$, $p<0.001$), knowledge and practice ($r=0.46$, $p<0.001$), and attitude and practice ($r=0.41$, $p<0.001$) among the students.

Table: 9 Students' Perceived Need for Formal AI Education (N=150)

Response	Frequency (N)	Percentage (%)
Strongly agree	61	40.7
Agree	63	42.0
Neutral	16	10.7
Disagree	7	4.7
Strongly disagree	3	2.0
Total	150	100.0

The majority of students (82.7%) agreed or strongly agreed that formal AI education should be included in the undergraduate medical curriculum, while 6.7% disagreed or strongly disagreed.

DISCUSSION

The present cross-sectional study assessed the knowledge, attitude, and practice regarding artificial intelligence (AI) among 150 undergraduate medical students. The findings showed that 50.7% of students had moderate knowledge, 33.3% had good knowledge, and 16.0% had poor knowledge regarding AI. Knowledge was relatively high regarding basic AI concepts, medical imaging applications, AI-generated information inaccuracies, patient-data privacy, and the need for human oversight, whereas knowledge of deep learning and algorithmic bias was comparatively lower. Overall, students demonstrated a favorable attitude towards AI, with most agreeing that AI could improve medical education, facilitate learning of complex medical concepts, and improve healthcare efficiency. A large majority also believed that AI-generated information should be verified before use and that AI should not replace human clinical judgment. AI use was common, with 79.3% of students reporting the use of AI tools, mainly for academic learning, information searching, summarization, and writing assistance. However, only 22.7% reported always verifying AI-generated information, highlighting the need for greater emphasis on critical appraisal and responsible AI use. Although 72.0% of students had previous exposure to AI, only 20.7% had received formal AI training. Higher knowledge levels were associated with greater AI use, and significant positive correlations were observed between knowledge and attitude, knowledge and practice, and attitude and practice. Furthermore, 82.7% of students agreed or strongly agreed that formal AI education should be incorporated into the undergraduate medical curriculum. Overall, the findings indicate that medical students have increasing exposure to AI and generally favorable attitudes towards its use, but gaps remain in technical knowledge, formal training, and consistent verification of AI-generated information, emphasizing the need for structured

AI education in undergraduate medical training.

CONCLUSION

The present study concluded that undergraduate medical students had moderate knowledge and practice regarding artificial intelligence, along with a generally favorable attitude towards its use in medical education and healthcare. Although most students had prior exposure to AI and reported using AI tools, formal AI training was limited. Students demonstrated good awareness of important issues such as the possibility of inaccurate AI-generated information, patient-data privacy, and the need for human oversight, while knowledge of deep learning and algorithmic bias was comparatively lower. A significant positive relationship was observed between knowledge, attitude, and practice. The majority of students supported the inclusion of formal AI education in the undergraduate medical curriculum. The findings highlight the need for structured and competency-based AI education focusing on practical applications, critical appraisal of AI-generated information, ethical considerations, data privacy, algorithmic bias, and responsible use of AI in medical practice.

Conflict of Interest: The authors declare that they have no conflicts of interest.

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