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Original Research Article

Information-Seeking Behavior and PubMed Utilization among Undergraduate Medical Students: A Cross-Sectional Study

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Abstract

Background: Efficient retrieval of biomedical literature is an essential component of evidence-based medical practice. PubMed is one of the most widely used biomedical databases for accessing peer-reviewed scientific literature. However, the extent to which undergraduate medical students possess adequate knowledge and practical skills to effectively utilize PubMed remains variable.

Aim: To evaluate the knowledge, attitudes and practices related to PubMed literature searching among undergraduate medical students.

Objective: To evaluate awareness and understanding of PubMed, assess students' attitudes toward its academic utility, and analyze patterns of its practical use in medical education.

Methods: A cross-sectional questionnaire-based study was conducted among 200 undergraduate medical students, including final-year MBBS students and interns, at a tertiary care teaching hospital. A structured questionnaire assessing knowledge, attitude and practice regarding PubMed searching was distributed electronically using Google Forms. Data were analyzed using descriptive statistics and presented as frequencies and percentages.

Results: Among the participants, 62% reported awareness of PubMed as a biomedical literature database. Knowledge of advanced search tools such as Medical Subject Headings (MeSH), Boolean operators and clinical filters was limited. Nearly half of the students expressed positive attitudes toward the importance of literature searching in medical education, while a considerable proportion reported neutral confidence levels in using PubMed effectively.

Conclusion: Although awareness of PubMed exists among undergraduate medical students, gaps persist in knowledge depth and practical application of advanced search techniques. Structured training programs focusing on biomedical literature searching should be incorporated into undergraduate medical curricula to enhance research skills and support evidence-based clinical learning.

Keywords: PubMed, literature search, medical students, knowledge, attitudes, practices.

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Introduction

The rapid expansion of biomedical knowledge has made access to reliable scientific information a critical requirement for modern healthcare professionals. Evidence-based medicine (EBM) emphasizes the integration of the best available research evidence with clinical expertise and patient values in order to achieve optimal patient outcomes.

Consequently, medical students must develop the ability to identify, retrieve and critically evaluate relevant scientific literature. Biomedical literature databases play a central role in facilitating access to scientific information. Among these databases, PubMed is one of the most widely used platforms for retrieving biomedical research articles. Maintained by the National Center for Biotechnology Information (NCBI) under the U.S. National Library of Medicine, PubMed provides free access to millions of citations and abstracts from MEDLINE and other life-science journals.

In addition to simple keyword searching, PubMed incorporates several advanced search tools such as Boolean operators, Medical Subject Headings (MeSH), filters, field tags and Clinical Queries that help users refine search results and retrieve relevant information efficiently.

Early exposure to biomedical databases is important for medical students as it promotes independent learning and strengthens research skills. Access to scientific literature also enables students to remain updated with current developments in medical science and contributes to evidence-based clinical decision-making.

However, several studies have demonstrated that many medical students lack formal training in literature searching and frequently rely on general search engines instead of structured biomedical databases.

Limited knowledge of advanced search techniques may reduce the effectiveness of literature retrieval and hinder students' ability to critically evaluate available evidence. Awareness of features such as MeSH terminology, Boolean operators and search filters is essential for conducting precise and efficient literature searches.

Assessment of knowledge, attitudes and practices regarding PubMed usage among medical students provides valuable insight into existing gaps in research literacy. Identifying these gaps can help educators design targeted training programs aimed at improving literature searching skills and promoting evidence-based medical education.

Therefore, the present study was undertaken to evaluate the knowledge, attitudes and practices related to PubMed literature searching among undergraduate medical students at a tertiary care teaching hospital.

Aim: To evaluate the knowledge, attitudes and practices related to PubMed literature searching among undergraduate medical students.

Objectives:

- To evaluate the level of knowledge regarding PubMed among undergraduate medical students.
- To assess students' attitudes toward PubMed as a tool for academic and research purposes.
- To analyze the frequency, pattern, and effectiveness of PubMed usage in academic activities

Materials & Methods

Study Design: A cross-sectional, questionnaire-based study was conducted to assess the knowledge, attitudes, and practices related to PubMed literature searching.

Study period: The study was carried out over one month (January 2026)

Study center: The study was conducted among undergraduate medical students at Andhra Medical College, Visakhapatnam.

Study population: Undergraduate medical students, including final-year MBBS students and interns, enrolled at Andhra Medical College, Visakhapatnam.

Sample Size: 200.

Sample size calculation: A convenience sampling method was used to recruit participants based on their availability during the study period.

Inclusion Criteria:

- Undergraduate medical students who were present during the period of data collection.
- Students who provided informed consent and were willing to participate in the study

Exclusion Criteria:

- Undergraduate medical students who were absent during the study period.
- Students who did not provide informed consent to participate in the study.

Study Tools:

Questionnaire: A pre-structured and validated questionnaire was used to assess the knowledge, attitudes, and practices related to PubMed literature searching. The questionnaire consisted of three sections

- Knowledge regarding PubMed and its features
- Attitudes toward PubMed as a tool for academic research
- Practices related to the use of PubMed for medical literature searching

Methodology: Prior approval was obtained from the Institutional Ethics Committee of Andhra Medical College, Visakhapatnam, (Ethics Committee Registration No. EC/NEW/INST/2021/AP/0028) before initiating the study. Written informed consent was obtained from all participants. Students fulfilling the inclusion and exclusion criteria were enrolled in the study.

A pre-structured, validated questionnaire was developed by the investigator to assess the knowledge, attitude, and practice regarding PubMed literature searching. An orientation session on literature searching was conducted prior to questionnaire distribution to ensure baseline awareness among participants. One week following the orientation, the questionnaire was distributed using Google Forms, and the survey link was shared through the official WhatsApp group of the

students. Google Forms was chosen as the mode of data collection due to its convenience, confidentiality, and efficiency in collecting responses remotely. All responses were collected electronically through the Google Forms platform.

Statistical Analysis: Data were analyzed using Microsoft Excel. Descriptive statistics were expressed as frequencies and percentages. No inferential statistics were applied.

Result

Basic demographic information: A total of 200 undergraduate medical students participated in the study. Among them, 51.5% were male and 48.5% were female, indicating an almost equal gender distribution.

With respect to academic year, the majority of participants were final-year MBBS students (80%), while 20% were interns, reflecting greater participation from senior undergraduate students.

Table 1: Demographic characteristics of study participants (n = 200)

Variable	Category	Percentage (%)
Gender	Male	51.5
	Female	48.5
Academic year	Final year MBBS	80
	Internship	20

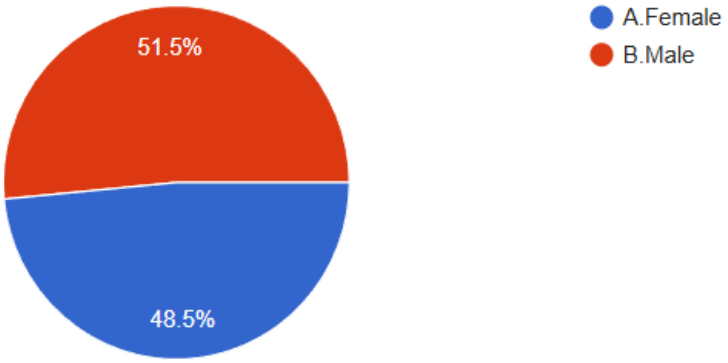

Figure 1: Gender distribution of study participants.

Assessment of Knowledge: The level of knowledge regarding PubMed literature searching among undergraduate medical students was assessed using structured questions, as summarized in Table 2.

Overall awareness of PubMed as a biomedical literature database was moderate. Sixty-two percent (62%) of students reported being aware of PubMed, while 38% indicated no awareness, highlighting a substantial proportion of students who remain unfamiliar with this essential research resource.

With respect to the stage at which students became aware of literature databases such as PubMed, 65% reported gaining awareness during their MBBS course, whereas 13.5% were aware before joining MBBS. However, 21.5% of participants were unsure about when they were first introduced to PubMed, suggesting inconsistent and informal exposure to literature searching during medical training.

Regarding the primary source of learning about PubMed, seniors were the most frequently cited source (36%), followed by peer groups (23.5%) and faculty members (21.5%). Online resources accounted for 19% of awareness. This pattern indicates that learning about PubMed largely occurs through informal channels rather than structured academic instruction.

Knowledge of specific PubMed components was variable. Half of the students (50.5%) were aware that PubMed and PubMed Central (PMC) are different platforms, while 49.5% were unaware of this distinction, reflecting limited understanding of PubMed's structure and associated resources.

Assessment of familiarity with Medical Subject Headings (MeSH) revealed significant knowledge gaps. Only 21% of students correctly identified MeSH as "Medical Subject Headings." A considerable proportion selected incorrect options, with 38% choosing "Medical Science Headings," while 20.5% selected "Meta-analysis & Science Headings" and another 20.5% reported being unsure. These findings indicate limited awareness of controlled vocabulary tools essential for effective literature searching.

Table 2: Knowledge of PubMed literature search among undergraduates

Question	Option	Response (%)
Are you aware of PubMed as a biomedical literature database?	A. Yes	62%
	B. No	38%
At what stage did you become aware of literature databases such as PubMed?	A. Before joining MBBS	13.5%
	B. During MBBS	65%
	C. Not Sure	21.5%
Primary source of learning about PubMed	A. Faculties	21.5%
	B. Seniors	36%
	C. Peer	23.5%
	D. online resources	19%
Are you aware that PubMed and PubMed Central (PMC) are different platforms?	A. Yes	50.5%
	B. No	49.5%
What is the full form of MeSH?	A. Medical Science Headings	38%
	B. Medical Subject Headings (Correct)	21%
	C. Meta-analysis & Science Headings	20.5%
	D. Not sure	20.5%

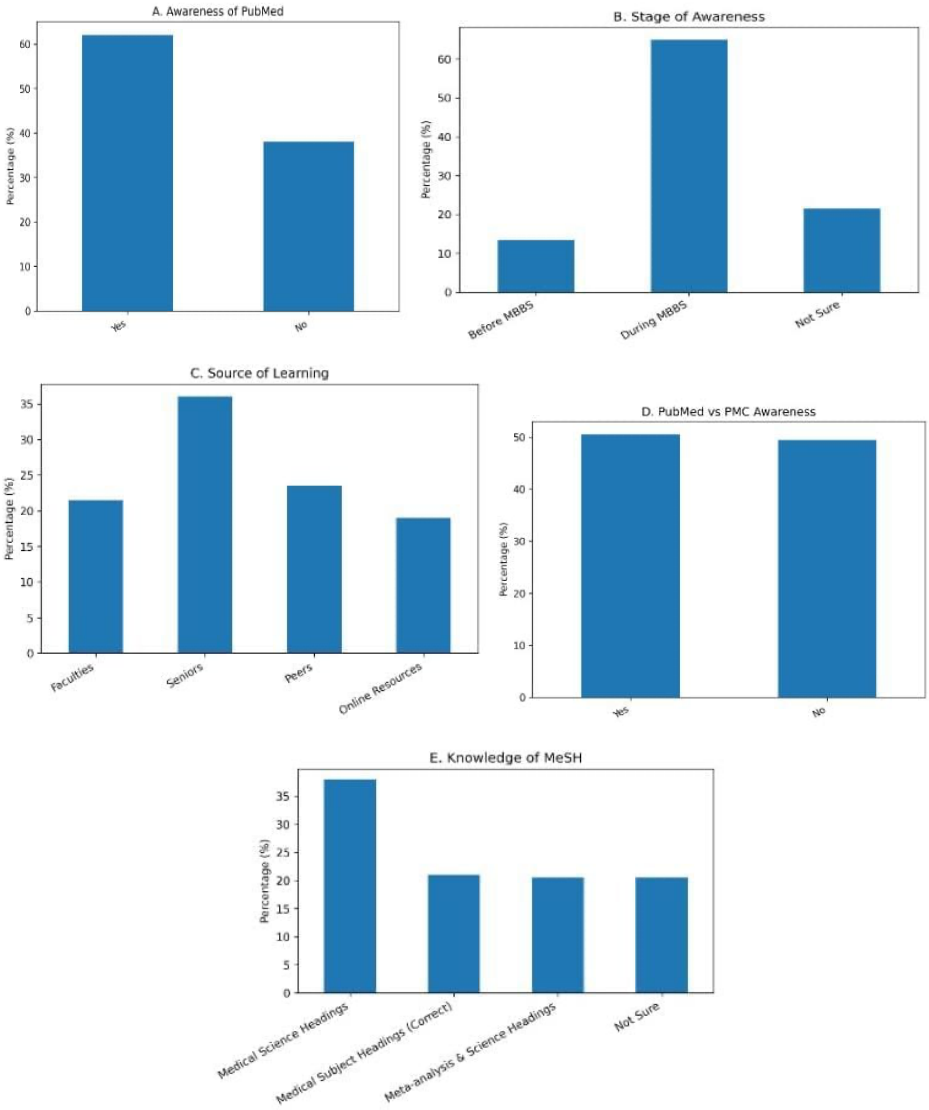

Figure 2: Knowledge of PubMed literature searching among undergraduate medical students

Assessment of attitude: The attitude of undergraduate medical students toward PubMed literature searching was assessed using structured questions, as shown in Table 3. Overall, students demonstrated a favourable attitude toward the importance of literature searching, although confidence in using PubMed effectively was moderate.

Regarding the perceived importance of PubMed for evidence-based medical learning, 48% of students expressed a positive attitude, with 15.5% strongly agreeing and 32.5% agreeing that PubMed searching is essential. However, a substantial proportion of students (43%) reported a neutral attitude, while 9% expressed disagreement (5% disagree and 4% strongly disagree), indicating uncertainty or lack of clarity regarding its role in medical education. Assessment of self-reported confidence in PubMed searching revealed that only 38.5% of students felt confident, with 12.5% reporting very high confidence and 26% reporting moderate confidence. More than half of the respondents (53.5%) expressed a neutral level of confidence, while 8% reported low confidence, suggesting limited practical exposure and skill development in literature searching.

When asked about the need for formal training in PubMed searching techniques, 46.5% of students expressed willingness to attend training sessions, while 27.5% were unsure and 26% were not interested. The relatively high proportion of students favouring formal training reflects recognition of existing skill gaps and a positive inclination toward structured learning opportunities.

Overall, the findings indicate that while undergraduate medical students generally acknowledge the importance of PubMed in evidence-based learning, limited confidence and a high proportion of neutral responses highlight the need for systematic training to translate positive attitudes into effective practice.

Table 3: Attitude of PubMed literature search among undergraduates

Question	Option A	Option B	Option C	Option D	Option E
Do you feel that PubMed searching is essential for evidence-based medical learning?	Strongly Agree (15.5%)	Agree (32.5%)	Neutral (43%)	Disagree (5%)	Strongly Disagree (4%)
How confident are you in your ability to search literature on PubMed?	Very Confident (12.5%)	Moderately Confident (26%)	Neutral (53.5%)	Slightly Confident (6%)	Not Confident (2%)
Would you like formal training sessions on PubMed searching techniques?	Yes (46.5%)	No (26%)	Not sure (27.5%)	–	–

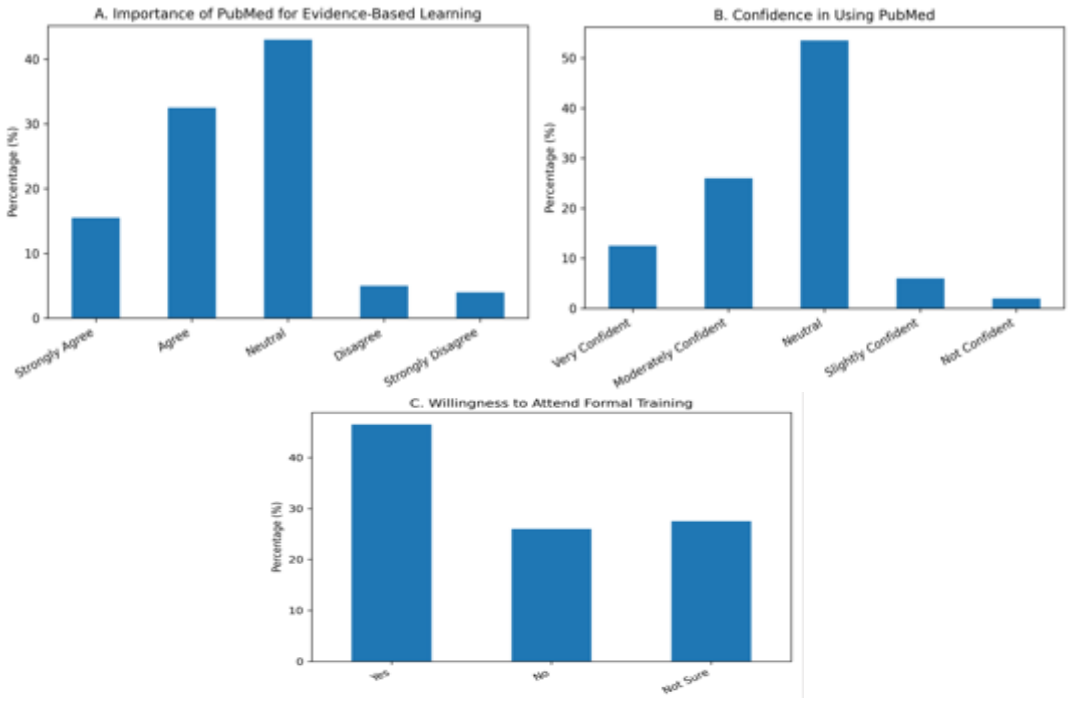

Figure 3: Attitude toward PubMed literature searching among undergraduate medical students

Assessment of practice: The practice of PubMed literature searching among undergraduate medical students was evaluated using structured questions, as presented in Table 4. The findings indicate variable and suboptimal use of PubMed and its advanced features.

Regarding the search approaches used on PubMed, 35.5% of students reported using the advanced search builder, while 29.5% relied on filters such as article type or publication date. Simple keyword searching was used by 24% of participants, whereas only 11% reported using Medical Subject Headings (MeSH). This suggested that although some students use advanced features, reliance on structured vocabulary remains limited. In terms of refining search results, MeSH terms were used by 43% of students, followed by filters (34%) and sorting results by relevance (25%). However, fewer students utilized Boolean operators (11.5%) and field tags (10%), indicating limited application of advanced search strategies that improve precision and efficiency.

Assessment of the use of PubMed's "Clinical Queries" tool revealed that 46.5% of students had used this feature, while 53.5% had never used it, highlighting under use of a key evidence-based filtering tool.

With respect to managing retrieved articles, 30% of students relied on manual note-taking, 29.5% used reference management software such as Mendeley, EndNote, or Zotero, and 22.5% used the PubMed save feature. However, 18% of participants reported not saving articles at all, reflecting inadequate organization of retrieved literature.

When students were asked about the influence of PubMed searches on their academic or clinical learning, 47.5% expressed a neutral opinion. Nevertheless, 47.5% reported a positive influence, with 16.5% strongly agreeing and 31% agreeing that PubMed searches impacted their learning. Only a small proportion expressed disagreement (5% combined). This indicated moderate perceived academic value but limited integration into routine learning.

Overall, these findings demonstrated that while undergraduate medical students engage with PubMed to some extent, consistent and effective use of advanced search tools and evidence-based features remains inadequate, highlighting the need for structured training and guided practice.

Table 4: Practice of PubMed Literature Searching Among Undergraduate Medical Students

Question	Option A	Option B	Option C	Option D	Option E
Which search approach do you most commonly use in PubMed?	Simple keyword search (24%)	Advanced search builder (35.5%)	Filters (29.5%)	MeSH terms (11%)	–
Which methods do you use to refine search results? (Multiple responses allowed)	Boolean operators (11.5%)	Filters (article type/date) (34%)	MeSH terms (43%)	Sorting by relevance (25%)	Field tags (10%)
Have you ever used PubMed's "Clinical Queries" tool?	Yes (46.5%)	No (53.5%)	–	–	–
How do you usually save or manage relevant articles?	PubMed save feature (22.5%)	Reference managers (Mendeley/EndNote/Zotero) (29.5%)	Manual notes (30%)	I do not save articles (18%)	–
Do you think PubMed searches influence your academic or clinical learning?	Strongly Agree (16.5%)	Agree (31%)	Neutral (47.5%)	Disagree (4.5%)	Strongly Disagree (0.5%)

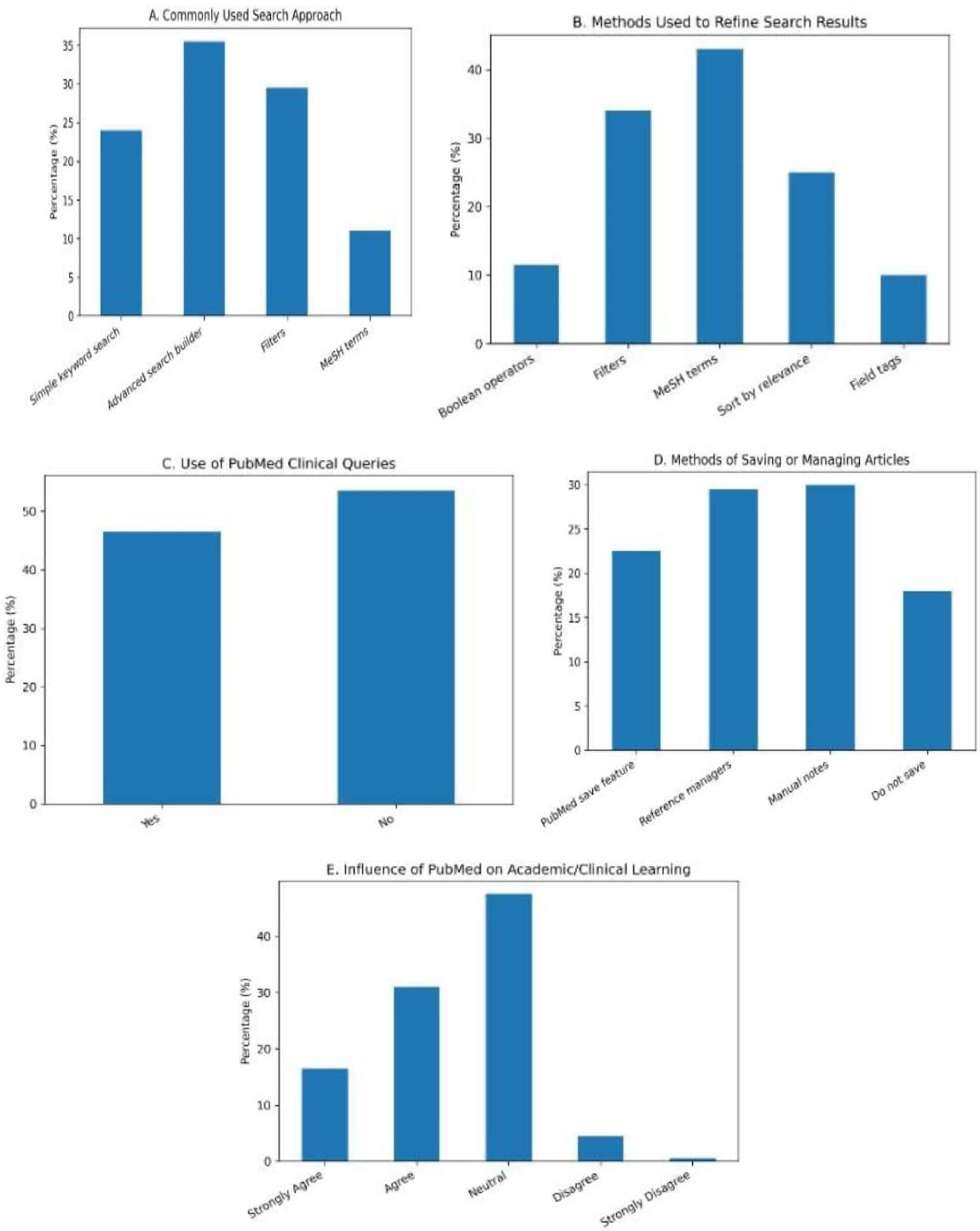

Figure 4: Practice of PubMed literature searching among undergraduate medical students

Discussion

The present cross-sectional study assessed the knowledge, attitudes and practices related to PubMed literature searching among undergraduate medical students. The findings revealed moderate awareness of PubMed but limited familiarity with advanced search tools and strategies. In the knowledge domain, slightly more than half of the students reported awareness of PubMed as a biomedical literature database. However, detailed understanding of its technical components such as Medical Subject Headings (MeSH) and Boolean operators was limited. This suggests that although students may have heard about PubMed, many lack the necessary training to use it effectively for academic or research purposes.

Similar findings have been reported in previous studies evaluating biomedical database literacy among medical students. Kumar et al. reported that awareness of PubMed was relatively high among

students, but detailed knowledge regarding search strategies remained insufficient. Likewise, systematic reviews examining literature searching skills among healthcare professionals have emphasized the importance of structured training in improving information-retrieval competency. Attitudinal assessment in the present study indicated that many students recognize the importance of literature searching in medical education. Evidence-based medicine requires clinicians to access and interpret research findings to support clinical decision-making. Therefore, positive attitudes toward literature searching represent an encouraging finding. However, many participants reported neutral levels of confidence in their ability to search PubMed effectively, indicating a gap between awareness and practical competence. Similar trends have been reported in studies conducted among medical undergraduates in various institutions, highlighting inadequate exposure to structured research training during early medical education.

The practice component of the present study revealed variability in the methods used by students to search PubMed. Some participants reported using advanced search tools and filters, whereas fewer students regularly utilized MeSH terms or Boolean operators to refine their search queries. These findings suggest that although students occasionally access PubMed, they may not fully utilize its advanced search capabilities. Another important observation was the variation in methods used by students to organize and manage retrieved articles. While some students reported using reference management software such as Mendeley or EndNote, others relied on manual note-taking or did not save retrieved articles at all. Proper management of scientific literature is essential for conducting research, preparing manuscripts and supporting evidence-based learning.

Overall, the findings of this study emphasize the need for structured educational interventions aimed at improving literature searching skills among medical students. Incorporating workshops or training sessions on PubMed searching, MeSH usage and reference management tools during undergraduate medical education may significantly improve students' research competency.

Limitations of the study: This study had certain limitations. It was conducted at a single institution using convenience sampling, which may limit generalizability. Responses were self-reported and may be subject to reporting bias. Additionally, the short duration of the study may not fully capture long-term patterns of PubMed usage among students.

Overall Interpretation: Taken together, the findings reveal a clear disconnect between awareness, attitude, and effective practice. While students recognize the importance of literature searching, gaps in knowledge and skills limit meaningful use of PubMed. These observations are consistent with previous studies emphasizing that formal training, early exposure, and repeated hands-on practice are essential for developing competence in evidence-based information retrieval. [3,5]

Conclusion

The present study demonstrates that although undergraduate medical students exhibit moderate awareness of PubMed and generally acknowledge its importance in academic learning, significant gaps remain in knowledge depth and practical application of advanced search techniques. Limited familiarity with structured search strategies such as MeSH terms and Boolean operators indicates a need for targeted training in literature searching.

Integrating formal instruction on biomedical databases and evidence-based medicine into undergraduate medical curricula may significantly enhance students' research skills and improve their ability to retrieve and interpret scientific evidence. Early development of such competencies is essential for preparing future physicians to practice evidence-based medicine effectively.

Declaration by Authors

Ethical Approval: Approved

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