Journal of Carcinogenesis
Covering Genesis to Therapeutics

Journal of Carcinogenesis, ISSN: 1477-3163
2025; Vol 24: Issue 3s, https://carcinogenesis.com/

Environment of Research among Indian Medical Undergraduates: A Systematic Review analyzing the Knowledge, Attitude and Practice

Ashwani Sharma[1]*, Prateek Shrivastava[2], Jubin Jakhar[3], Amrit Podder[1], Shivani Sharma[4], Jayballabh Kumar[5], Sumangala M Patil[6], Pramod S Dode[7], Harsh Singh[8]

[1]Assistant Professor, Department of Physiology, Teerthanker Mahaveer Medical College & Research Centre, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India

[2]Assistant Professor, Department of Anatomy, Teerthanker Mahaveer Medical College & Research Centre, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India

[3]Assistant Professor, Department of Anaesthesia, Teerthanker Mahaveer Medical College & Research Centre, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India

[4]Drug Safety Scientist-II, Qinecsa Solutions India Private Limited, Mysore, Karnataka, India

[5]Professor and Head, Department of Physiology, Teerthanker Mahaveer Medical College & Research Centre, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India

[6]Professor, Department of Physiology, Shri B M Patil Medical College, Hospital & Research Centre, Vijayapura, Karnataka, India

[7]Associate Professor, Department of Forensic Medicine & Toxicology, Teerthanker Mahaveer Medical College & Research Centre, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India

[8]Assistant Professor, Department of Forensic Medicine & Toxicology, Teerthanker Mahaveer Medical College & Research Centre, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India

***Corresponding Author**

Email Id: sharma.ashwani2k9@gmail.com , https://orcid.org/0009-0001-3628-9657

ABSTRACT

Background: Research competency is an essential skill for medical graduates in the 21st century. In India, while research is emphasized through the competency-based medical curriculum and initiatives such as the Short-Term Studentship (STS) program by the Indian Council of Medical Research (ICMR), limited systematic evidence exists regarding the knowledge, attitude, and practice (KAP) of research among undergraduate medical students. This systematic review aimed to critically synthesize published evidence on the knowledge, attitude, and practice of research among Indian medical undergraduates and to evaluate the challenges and enablers within their research environment.

Methods: A systematic literature search was conducted across PubMed, Scopus, Embase, and Google Scholar from January 2000 to June 2025. The review adhered to PRISMA guidelines. Studies included were cross-sectional surveys, qualitative studies, or mixed-methods designs assessing at least one domain of KAP among Indian medical undergraduates. Risk of bias was assessed using the Joanna Briggs Institute (JBI) checklist. Data were synthesized narratively due to heterogeneity in study outcomes.

Results: A total of 37 eligible studies involving 18,742 participants across India were included. The pooled findings revealed that knowledge of research methodology among undergraduates was generally poor, with only 28–42% demonstrating adequate understanding. Despite this, a majority (65–78%) expressed a positive attitude towards research and recognized its importance in professional development. Actual participation in research practice remained low, with <30% having undertaken structured research projects beyond mandatory curriculum requirements. Barriers identified included lack of mentorship, inadequate training, time constraints, and limited institutional support. Facilitators included supportive faculty, research workshops, financial incentives, and structured programs such as ICMR-STS.

Conclusion: Indian medical undergraduates demonstrate enthusiasm and positive attitudes toward research but are hindered by inadequate knowledge, skill gaps, and systemic barriers. Strengthening research training in the undergraduate

curriculum, expanding structured opportunities, and improving institutional mentorship are critical steps to foster a robust research culture in Indian medical education.

Keywords: Medical undergraduates, research environment, knowledge, attitude, practice, India, systematic review

How to Cite: Ashwani Sharma, Prateek Shrivastava, Jubin Jakhar, Amrit Podder, Shivani Sharma, Jayballabh Kumar, Sumangala M Patil, Pramod S Dode, Harsh Singh, (2025) Environment of Research among Indian Medical Undergraduates: A Systematic Review analyzing the Knowledge, Attitude and Practice, Journal of Carcinogenesis, Vol.24, No.3s, 192-198.

1. INTRODUCTION

Research is the cornerstone of evidence-based medicine, driving innovations in diagnosis, treatment, and health policy [1]. Globally, medical education has emphasized the integration of research competencies in undergraduate training to prepare physicians not only as clinicians but also as contributors to scientific knowledge [2]. In India, with its rapidly expanding medical education sector comprising more than 700 medical colleges and producing over 100,000 medical graduates annually [3], the role of undergraduate research has become increasingly relevant. The **National Medical Commission (NMC)** has incorporated elements of research and critical appraisal into the **Competency-Based Medical Education (CBME)** curriculum [4], while the **Indian Council of Medical Research (ICMR)** promotes undergraduate research through its **Short-Term Studentship (STS) program [5]**. Despite these initiatives, anecdotal reports and individual studies indicate significant variability in undergraduate engagement with research [6]. The **knowledge, attitude, and practice (KAP) framework** provides a structured lens to assess the research environment among medical undergraduates [1, 2]. Knowledge reflects the theoretical understanding of research methodology and biostatistics; attitude reflects perceptions of research as a career and its importance in clinical practice; and practice reflects actual involvement in research projects, publications, or presentations [2]. Previous reviews have either focused on faculty perspectives or broader South Asian contexts, but no systematic review has exclusively examined KAP regarding research among Indian undergraduates [1, 2, 3]. Understanding this triad is essential for policy formulation, curriculum strengthening, and aligning India's medical education with global standards [5, 6].

This systematic review aims to synthesize published evidence on the knowledge, attitude, and practice of research among Indian medical undergraduates and to analyze the enabling and limiting factors in their research environment.

2. METHODS

Study design: This systematic review was conducted in accordance with the **Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines**. The review protocol was prospectively designed, and all methodological steps were aligned with established recommendations for systematic reviews of observational studies.

Inclusion and Exclusion Criteria: Inclusion criteria of the current review consist of the studies conducted among **undergraduate medical students enrolled in Indian medical colleges**, studies assessing at least one of the domains of **knowledge, attitude, or practice (KAP) toward research**, study designs of **cross-sectional surveys, cohort studies, case–control studies, mixed-methods, or qualitative designs**, studies published in **English language** between **January 2000 and June 2025**, and articles available as **full text** in indexed or peer-reviewed journals. We excluded studies focusing exclusively on **postgraduate students, interns, or faculty**, Review articles, editorials, commentaries, letters, and conference abstracts without full text, studies conducted outside India or involving Indian students studying abroad, duplicate publications or studies with insufficient data on KAP outcomes.

Information sources and search strategy: A comprehensive search was performed across the following databases:

A. PubMed/MEDLINE
B. Scopus
C. Embase
D. **Google Scholar** (first 200 hits screened for relevance)

The search strategy combined **Medical Subject Headings (MeSH)** and free-text terms. The main search string applied to PubMed was "medical students" OR "medical undergraduates" OR "MBBS students" AND "research" OR "research training" OR "medical research" AND "knowledge" OR "attitude" OR "practice" OR "KAP" AND "India".
The search was adapted for other databases. References of included studies and relevant reviews were also hand-searched to identify additional eligible articles.

Study selection: All retrieved records were imported into **EndNote X9** for reference management, and duplicates were removed. Independent reviewers screened titles and abstracts. Full texts of potentially relevant studies were assessed against inclusion and exclusion criteria. Disagreements were resolved through discussion or by another reviewer. The study selection process was documented in a **PRISMA flow diagram**, showing the number of records identified, screened, assessed for eligibility, and finally included in the review.

Data extraction: A structured data extraction form was used to capture:

A. Author(s), year of publication, region, and study setting.
B. Study design and sample size.
C. Domains assessed: knowledge, attitude, practice.
D. Key findings (percentage of students with adequate knowledge, positive attitudes, or actual research participation).
E. Barriers and facilitators to research participation.

Data extraction was performed independently by two reviewers, and cross-checked for accuracy.
Risk of bias assessment: The Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Analytical Cross-Sectional Studies was used to assess methodological quality. For qualitative studies, the JBI Checklist for Qualitative Research was applied. Studies were categorized as low, moderate, or high risk of bias. Discrepancies in assessment were resolved by consensus.

Data synthesis: Given the heterogeneity in study methodologies, outcome measures, and reporting, a **meta-analysis was not feasible.** Instead, a **narrative synthesis** was performed, structured under three domains:

A. Knowledge of research methodology.
B. Attitude toward research.
C. Research practice (participation in projects, publications, presentations).

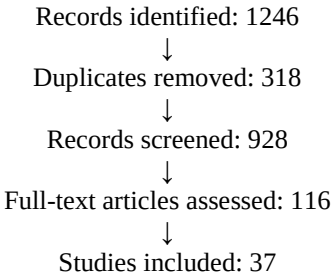
Additionally, a thematic synthesis of reported barriers and enablers of research engagement was conducted.

3. RESULTS

Study selection: The initial search across PubMed, Scopus, Embase, and Google Scholar yielded **1,246 records**. After removal of duplicates (n=318), **928 records** remained for title and abstract screening. Of these, **812 were excluded** for irrelevance, leaving **116 full-text articles** assessed for eligibility. Finally, **37 studies** met the inclusion criteria and were included in this review.

Characteristics of the included studies: The 37 included studies were published between 2005 and 2025, covering diverse regions of India (North: 11 studies; South: 15 studies; West: 6 studies; East: 5 studies). The majority were cross-sectional surveys (32 studies), while 3 were mixed-methods and 2 were qualitative interviews. The total sample size across studies was 18,742 undergraduate medical students. Study sizes ranged from 72 participants to 1,876 participants. Most studies used self-administered structured questionnaires, while a few incorporated focus group discussions for qualitative insights.

Chart-1: PRISMA flowchart



Summary of findings:

A. Knowledge of Research [7, 8]
   a. Adequate knowledge of research methodology was reported in only 28–42% of undergraduates across studies.
   b. Common deficits included poor understanding of study design, biostatistics, hypothesis formulation, and ethical approval processes.
   c. Knowledge was significantly higher among students who had attended research methodology workshops or participated in the ICMR-STS program.
   d. Year of study influenced knowledge: final-year students generally scored better than pre-clinical students.

B. Attitude toward Research [7, 9]
   a. Despite limited knowledge, 65–78% of students expressed positive attitudes toward research.
   b. Students agreed that research:
      i. Enhances critical thinking and problem-solving.
      ii. Is essential for academic career progression.
      iii. Improves evidence-based clinical decision-making.
   c. Attitudinal positivity was highest among students with prior exposure to small research projects or supportive mentorship.
   d. A recurring theme was a strong willingness to learn research skills if opportunities were provided.

C. Research Practice [7, 10, 11]
   a. Actual participation in structured research projects was limited, with only 18–29% reporting involvement in any project.
   b. Among these, the majority were through ICMR-STS, institutional short-term projects, or compulsory curriculum-based assignments.
   c. Publication output was very low: less than 5% of undergraduates had published in peer-reviewed journals, and less than 10% had presented at conferences.
   d. Barriers included lack of dedicated time, inadequate institutional infrastructure, limited access to funding, and absence of research mentors.

Barriers to Research Participation: The most frequently reported barriers across studies included [12]:
   A. Time constraints due to heavy academic workload.
   B. Lack of training in research methodology and biostatistics.
   C. Inadequate mentorship or guidance from faculty.
   D. Limited institutional support and funding.
   E. Perception of research as stressful or of limited career benefit outside academia.

Facilitators and Enablers: Enablers that positively influenced student participation included [13]:
   A. Structured programs like ICMR-STS.
   B. Workshops and training sessions in research methodology.
   C. Faculty mentorship and encouragement.
   D. Opportunities for conference presentations and publications.
   E. Peer collaboration and research interest groups.

4. DISCUSSION

This systematic review synthesized evidence from **37 studies involving 18,742 medical undergraduates in India**, assessing their **knowledge, attitude, and practice (KAP)** toward research. The findings reveal a clear paradox: while students show **enthusiastic attitudes toward research**, actual **knowledge and participation levels remain low**. This mismatch underscores systemic barriers within Indian medical education that hinder translation of positive intent into effective practice [14, 15, 16].

Comparison with Indian findings: The majority of included studies reported that **less than 40%** of medical undergraduates had adequate knowledge of research methodology, echoing concerns raised in previous narrative reviews of Indian medical education. Common knowledge gaps included **study design, hypothesis formulation, statistical analysis, and ethics committee approval processes**. Despite this, more than **two-thirds of students** recognized the importance of research and expressed **positive attitudes**. However, participation in structured research projects remained below **30%**, and publication rates were negligible (<5%). These findings highlight a structural problem: although awareness exists, **the environment fails to provide sufficient training, mentorship, and time allocation** for students to engage in meaningful research [15, 17, 18].

Global Comparisons:[15, 19, 20]
China: Studies from Chinese medical universities demonstrate similar challenges, where students frequently report enthusiasm but face barriers of **limited mentorship, lack of incentives, and heavy curricula**. However, China has invested in **student-led research societies** and **integrated research electives** within undergraduate curricula, leading to relatively higher participation rates compared to India (35–45% vs. <30%).

United States: In contrast, US medical schools often mandate **scholarly projects** as graduation requirements. Structured mentorship, dedicated research blocks, and opportunities for publication are built into the curriculum. Surveys in the US report that more than **70% of medical undergraduates participate in research projects**, with up to **25% publishing**

before graduation. The culture of "early academic productivity" is normalized, unlike in India, where research is still perceived as optional.

WHO and Global Standards: The **World Health Organization (WHO)** has emphasized the role of research training in building "clinician-scientists" capable of addressing local health challenges. Global trends indicate that **structured mentorship and protected time** are key enablers for research engagement. Compared to these standards, India lags behind in embedding research as a core competency in undergraduate medical education.

Barriers and Enablers in the Indian Context: This review identified consistent barriers [19, 20]:

A. Time constraints due to an overloaded curriculum.
B. Lack of mentorship, with faculty often overburdened by service and teaching commitments.
C. Inadequate training in research methodology and biostatistics.
D. Institutional barriers, including lack of funding and research infrastructure.
E. Perceptions of futility, with students viewing research as irrelevant to clinical practice unless pursuing academia.

Conversely, positive factors included [5, 7, 19, 21]:

A. ICMR-STS program, which was repeatedly cited as the most accessible and motivating platform for students.
B. Workshops and research methodology training sessions, which improved both knowledge and participation.
C. Supportive faculty mentors, who increased the likelihood of students publishing or presenting research.
D. Peer-led initiatives, such as student research societies, which fostered collaboration and continuity.

Policy implications: These findings have significant implications for medical education policy in India [5, 7, 20, 21]:

A. Integration into Curriculum: The National Medical Commission (NMC) introduced Competency-Based Medical Education (CBME) with components of research, but implementation remains inconsistent. Research should be formally assessed as part of the MBBS curriculum rather than remaining optional.
B. Strengthening National Programs: Expanding the ICMR-STS program and introducing similar schemes at state/university levels could democratize opportunities for students.
C. Capacity Building: Faculty development in research mentorship is critical. Training teachers in guiding undergraduate projects could bridge the current mentorship gap.
D. Protected Time: Allocation of dedicated research blocks or electives would allow meaningful student engagement without compromising academic schedules.
E. Link with NEP 2020: The National Education Policy (NEP) emphasizes research and innovation across higher education. Aligning undergraduate medical education with NEP's vision could enhance research culture in medical colleges.

Strengths of the review:

A. This is the first systematic review exclusively synthesizing evidence on research KAP among Indian medical undergraduates.
B. Included a large pooled sample (n=18,742) covering all regions of India.
C. Used robust methodology, including PRISMA guidelines and JBI appraisal tools.

Limitations of the review:

A. Most included studies were cross-sectional, limiting causal inference.
B. Variability in questionnaires and outcome definitions prevented meta-analysis.
C. Some regions of India (particularly the North-East) were underrepresented.
D. Publication bias may exist, as negative findings are less likely to be reported.

Future directions:

A. **National surveys** with standardized instruments are needed to generate comparable data.
B. **Longitudinal studies** assessing the impact of curricular reforms on student research outcomes.
C. **Interventional research** testing the effectiveness of structured mentorship, research electives, or incentive models.
D. Collaboration between **NMC, ICMR, and universities** to create a **national undergraduate research registry** could track participation and outcomes.

In summary, this review highlights that Indian medical undergraduates are **willing but underprepared** to engage in research. Their enthusiasm is undermined by systemic barriers, yet opportunities such as ICMR-STS demonstrate that targeted interventions can significantly improve participation. To cultivate a robust research culture in Indian medical education, **curricular integration, faculty mentorship, and institutional support** must be prioritized, aligning India's medical education with global standards.

5. CONCLUSION

This systematic review, encompassing 37 studies with over 18,000 participants, highlights a striking paradox within the environment of research among Indian medical undergraduates. While the majority of students exhibit a positive attitude toward research and recognize its value in professional and academic growth, only a minority demonstrate adequate knowledge of research methodology, and even fewer engage in actual research practice. Barriers such as time constraints, lack of mentorship, inadequate methodological training, and limited institutional support continue to suppress research engagement, whereas structured programs like ICMR-STS, supportive faculty guidance, and workshops act as strong enablers. Moving forward, fostering a vibrant research culture in Indian medical education requires a three-pronged approach such as Curricular Integration, Faculty and Institutional Support, National Policy Alignment. Such reforms would not only prepare undergraduates as future clinician-scientists but also contribute to India's broader vision of achieving self-reliance in medical research and innovation.

REFERENCES

[1] Glasziou P, Haynes B. The paths from research to improved health outcomes. Evid Based Med. 2005;10(2):39–41.

[2] Frenk J, Chen L, Bhutta ZA, Cohen J, Crisp N, Evans T, et al. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. Lancet. 2010;376(9756):1923–58.

[3] National Medical Commission. Annual Report 2023. New Delhi: NMC; 2024.

[4] India Today. NMC releases new Competency-Based medical education guidelines for 2024. published 2 Sep 2024. URL: NMC releases new Competency-Based medical education guidelines for 2024 - India Today

[5] Indian Council of Medical Research (ICMR). Short-Term Studentship (STS) Program – Objective & details. URL: Short Term Studentship (STS) | India Science, Technology & Innovation - ISTI Portal

[6] Times of India. 7 research opportunities you shouldn't miss in medical college. published 14 Jun 2025. Includes note on variability in engagement. URL: 7 research opportunities you shouldn't miss in medical college - The Times of India

[7] Rajan B, Joseph A, Prakash AK, Puzhikunnathu VK. Knowledge, attitude, practices, and perceived barriers towards research among undergraduate medical students in a teaching hospital: A cross-sectional study. JMSR. 2025; 13(1):76-82.

[8] DebBarma A, Mahanta P, Thakuria D. Undergraduate medical students' knowledge about principles of research methodology. International Journal of Health Research and Medico Legal Practice. 2018 Jul 10;4(2):22.

[9] DevavratG Harshe, Abraham D. A study of attitudes of teaching faculty and postgraduate residents at a tertiary care teaching hospital toward biostatistics. Muller Journal of Medical Sciences and Research. 2017 Jan 1;8(1):10–14.

[10] Sidhu TK, Mahajan R, Malhotra VM, Mehra S, Singh G, Singh H, et al. Adapting a Longitudinal Structured Program to Enhance Research Skills in Undergraduate Medical Students: A Key Advancement in Competency-Based Medical Education. International Journal of Applied & Basic Medical Research. 2024 Oct;14(4):239–45.

[11] Krovvidi S, Korrapati R, Vattikonda A, Thota A, Vattikonda S. Awareness and practice of research-oriented medical education among undergraduate students of Andhra Pradesh: A cross-sectional study. Journal of Dr YSR University of Health Sciences. 2024 Jul 1;13(3):261–5.

[12] Pratt B, Seshadri T, Srinivas PN. Overcoming structural barriers to sharing power with communities in global health research priority-setting: Lessons from the Participation for Local Action project in Karnataka, India. Glob Public Health. 2022 Dec;17(12):3334-3352.

[13] Tandon N, Yadav SS. Contributions of Indian Council of Medical Research (ICMR) in the area of Medicinal plants/Traditional medicine. J Ethnopharmacol. 2017 Feb 2;197:39-45.

[14] Singh S K, Mishra S, Khokhar A, Bharti A, Sharma M. Knowledge, attitude and practice towards scientific research among undergraduate students of a medical college in Delhi. International Journal Of Community Medicine And Public Health. 2020;7(12):4905–4909.

[15] Sivakumar A, Nagendran M. Knowledge, attitude and practices towards research among undergraduate medical students in a teaching hospital, Trichy. International Journal Of Community Medicine And Public Health. 2022;9(2): 849–852

[16] Jha A, Shah MR, Goyal R, Dhamnetiya D, Bharatwal AA, Jha RP, et al. Research involvement of medical students in a medical school of India: exploring knowledge, attitude, practices, and perceived barriers. 2024 May 20;

[17] Baladaniya M. Comprehensive Approach to Workplace Injury Prevention: Strategies and Technological Solutions. Journal of Physical Medicine Rehabilitation Studies & Reports. 2024 Apr 30;1–7.

[18] Kanani J, Sheikh MI. Temporal patterns of suicide attempts in India: A Comprehensive analysis by time of day, week, and hour, stratified by age, sex, and marital status, and examining suicidal methods distribution. Brain Behavior and Immunity Integrative. 2024 Jul;7:100072.

[19] Meda VSA, Firdaus A, Pradeep A, Kaur H, Patel N, Vasavada AM. Aptitude for Research Among Medical Students in India: Identifying the Challenges. Cureus. 2024 Sep 7;16(9):e68885
[20] Abusamak M, AlQato S, Alrfooh HH, Altheeb R, Bazbaz L, Suleiman R, Almansi A, Karajeh A, Alkhalaileh A, Al-Amer R. Knowledge, attitudes, practices and barriers of medical research among undergraduate medical students in Jordan: a cross-sectional survey. BMC Med Educ. 2024 Jan 4;24(1):23.
[21] Garg R, Goyal S, Singh K. Lack of Research Amongst Undergraduate Medical Students in India: It's time to Act and Act Now. Indian Pediatr. 2017 May 15;54(5):357-360.