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## Assessment of perceptions, barriers and enablers towards uptake of research activities among undergraduate medical students: A mixed methods study

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### ABSTRACT

**Background.** Medical research, even though, an integral part of medical education, remains the most neglected domain in the medical curriculum in most medical colleges across India. Research, when introduced in the medical curriculum, gives an early opportunity to medical students to participate in it. We did a study to gain an insight into the perceptions of medical students and explored barriers and enablers towards uptake of research activities.

**Methods.** A mixed methods study was done over 9 months using a pre-tested semi-structured questionnaire and a focus group discussion among medical students. First, a quantitative survey was done using Google forms to assess

students perception and attitude towards research. This was followed by 2 focused group discussions to explore the barriers and enablers towards uptake of research activities. Descriptive analysis was done for quantitative data and manual thematic content analysis for qualitative data.

**Results.** A total of 350 participants responded to the survey out of which 168 (59.1%) were women. Most students (339; 96.9%) perceived research to be important. Also, 313 (89.4%) and 245 (70%) showed willingness to attend research methodology workshops and conduct research studies, respectively. A manual thematic content analysis of the focus group discussion revealed two main themes: (i) barriers to conduct of research and (ii) enablers towards uptake of research. The major barriers were lack of knowledge about conducting research and lack of time and financial constraints. The enablers were conduct of periodic research methodology workshops and adequate mentoring by faculty.

**Conclusion.** There is a gap in the existing knowledge and practice in undergraduate medical research. Our study ascertained potential barriers as well as enablers for enhancing research activities by medical students. Adequate institutional support including funding for research coupled with proper mentoring by faculty and family support is crucial to foster a positive research culture among undergraduate medical students.

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### INTRODUCTION

The goals prescribed for an Indian medical graduate (IMG) are that of a clinician, leader, communicator, lifelong learner,

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and professional by the Medical Council of India (MCI). In order to fulfil these goals, medical students have to be competent enough not only with regards to medical knowledge but also various procedural skills during the MBBS course. The medical graduates are expected to practice evidence-based medicine (EBM) which requires command over higher cognitive skills of assimilation and critical reasoning. Although, research is not one of the primary goals of an IMG, conduct of research activities is essential to inculcate higher cognitive skills of critical thinking, reasoning, analysis, evaluation and creation. EBM is a synthesis of evidence from the literature, clinical acumen of the physician and the patients' perspective.<sup>1</sup> In order to collate the evidence from scientific publications, the clinician has to have critical thinking and clinical reasoning skills which can be developed by active participation in doing research.

Medical students need to be sensitized about medical research in order to develop interest among them about research and its application in medical science. The students must understand the need of medical research and its utility in improving the quality of day-to-day clinical practice and how medical research is useful for the healthcare needs of the people. As students are naïve, they need training in basics of research and research methodology.<sup>2</sup>

Clinicians who are involved in clinical research as a part of their career are physician-scientists. It has been reported that there has been a steady decline in the number of physician scientists throughout the world over the decades; down from around 5% in the 1980s to less than 1.5% in 2011.<sup>3,4</sup> These physician-scientists are the need of the hour for innovation and advancing of medical science with translational research from bench to bedside especially with many emerging and re-emerging diseases cropping up across the globe. In order to develop research aptitude from a young age, it is necessary to integrate the research component in the undergraduate medical curriculum from the first year. We assessed medical undergraduates' perspectives and explored various barriers and enablers towards the uptake of research activities by them.

## METHODS

The study was a mixed methods study conducted over a period of 8 months from January to August 2021. The study population comprised of undergraduate medical students in the second year, final year Parts I and II, and Interns. In the first 3 months data collection was done using Google form (Quantitative phase). A pre-tested and validated semi-structured questionnaire was circulated to all the study participants to assess students' perception, attitude and practice about research activities. The initial part of the Google form was designed as informed consent explaining the study scope. The responses received within the timeframe of the quantitative phase were analysed.

In the next 5 months, two focused group discussions (FGDs) were conducted to explore the barriers and enablers towards research uptake among the students. We excluded first year students and those who did not give consent to participate in the study. The FGDs were done using a FGD guide with a group of 10 students each to explore the barriers and enablers for uptake of research activities. The first FGD

included final year students and interns while the second FGD included second year students.

### *Sample size*

The sample size estimated for the quantitative phase was 322. Assuming a 10% non-response rate, the final sample size was approximated to a minimum of 350.

Purposive sampling was used for the FGDs. Students were selected based on their willingness to participate.

### *Study variables*

Socio-demographic variables and parameters related to perception and attitude towards conduct of research activities were included (importance of research, research methodology, inclination towards research, conduct of short projects, presentation in conferences, publication, recognition by the institute for students pursuing research—monetary or any other, etc.)

Institutional Human Ethics Committee approval was obtained before the start of the study (IEC NO. 2020/628 dated 16.10.2020). Privacy and confidentiality of the study participants was maintained.

### *Statistical analysis*

*Quantitative:* Data entry was done in Microsoft Excel and data analysis was done using SPSS version 23. Descriptive statistics with frequency and percentages were calculated.

*Qualitative:* After obtaining informed consent from the participants of FGDs, the entire discussion was recorded in a mobile phone recorder and subsequently typed verbatim. Special attention was given towards the transcripts, as they were reviewed multiple times to gain an overall understanding. No attempt was made to paraphrase the recorded statements. This was followed by coding (marking the segments of data with symbols or different colours) of relevant text. These codes were grouped into categories, categories were merged to form themes, and the conclusion were drawn and reported. The content analysis was done by 2 researchers and any disagreement was resolved by dialogue. Participants in the FGD were coded as 1–10 for the first and 11–20 for the second and their statements were also coded and recorded separately for each FGD. The sentences in italics in the results are verbatim statements.

## RESULTS

### *Quantitative*

A total of 386 students completed the online questionnaire. There were 176 males (46%) and 210 females. There were 80 interns (21%), 93 third year Phase II (24%), 110 third year Phase I (28%), and 103 second year (27%) students. Almost all the participants considered research to be important (375; 97.2%).

Interns and final year Part II students had better knowledge about various aspects of research as compared to second year and final year Part I students. Few respondents were aware about the IMRaD method for writing a research project (Table I). Most participants had a positive attitude towards research irrespective of their year of study (Table II).

Most students who had done research projects were interns followed by the final year Part II students (Table III). None of the second year students had presented research in either oral

TABLE I. Participants who responded 'yes' to questions about research

Item	Second year (n=103)	Final year Part I (n=110)	Final year Part II (n=93)	Interns (n=80)
Do you know about research methodology?	53 (51.5)	74 (67.3)	45 (48.4)	51 (63.8)
Do you think carrying out literature search is an important aspect of research?	54 (52.4)	69 (62.7)	77 (82.8)	74 (92.5)
Are you aware about databases for literature search?	9 (8.7)	18 (16.4)	25 (26.9)	42 (52.5)
Do you think statistics is an important aspect of research?	69 (67)	76 (69.1)	87 (93.5)	80 (100)
Are you aware about statistical analysis methods for research projects?	25 (24.3)	45 (40.9)	37 (39.8)	44 (55)
Do you think writing a structured research manuscript is important?	49 (47.6)	60 (54.5)	48 (51.6)	55 (68.8)
Are you aware about IMRaD method of writing manuscript?	7 (6.8)	9 (8.2)	17 (18.3)	31 (38.8)

TABLE II. Participants who responded 'yes' to questions about their attitude towards research

Item	Second year (n=103)	Final year Part I (n=110)	Final year Part II (n=93)	Interns (n=80)
Are you willing to attend a research methodology workshop?	42 (40.8)	53 (48.2)	45 (48.4)	21 (26.3)
Are you interested in carrying out literature search for research projects?	8 (7.8)	21 (19.1)	15 (16.1)	12 (15)
Are you interested in carrying out statistical analysis for research projects?	7 (6.8)	12 (10.9)	13 (14)	7 (8.8)
Are you inclined towards conducting research?	41 (39.8)	32 (29)	22 (23.7)	28 (35)
Do you wish to do any research projects in future?	56 (54.4)	49 (44.5)	41 (44.1)	32 (40)
Do you wish to present your research findings in any conference in future?	34 (33)	41 (37.3)	29 (31.2)	27 (33.8)
Do you wish to publish your research projects in future?	25 (24.3)	27 (24.5)	10 (10.8)	16 (20)
Do you consider research as a prospective career option?	48 (46.6)	47 (42.7)	41 (44.1)	36 (45)

TABLE III. Participants who responded 'yes' to questions about practice of research

Item	Second year (n=103)	Final year Part I (n=110)	Final year Part II (n=93)	Interns (n=80)
Have you attended any research methodology workshop?	22 (21.4)	47 (42.7)	39 (41.9)	34 (42.5)
Have you ever done any research project?	13 (12.6)	31 (28.2)	23 (24.7)	29 (36.3)
Have you done an ICMR STS project?	6 (5.8)	12 (10.9)	18 (19.4)	29 (36.3)
Have you done any university sponsored project?	7 (6.8)	19 (17.3)	5 (5.4)	—
Have you ever done any poster presentation in conferences? (n=96)	—	11 (10)	14 (15.1)	16 (20)
Have you ever done any oral presentation in conferences? (n=96)	—	5 (4.5)	9 (9.7)	15 (18.8)
Have you published any research article in scientific journal? (n=96)	1 (1)	2 (1.8)	7 (7.5)	10 (12.5)
Did you apply for funding from the university for your research project? (n=31)	7 (6.8)	14 (12.7)	4 (4.3)	—
Did you receive any funding from the university for your research project? (n=31)	5 (4.9)	10 (9.1)	2 (2.1)	—
Have you received any recognition from Institute/University for pursuing research? (n=96)	13 (12.6)	12 (10.9)	11 (11.8)	15 (18.8)

ICMR STS Indian Council of Medical Research Short term studentship

or poster format in any conference. Among the 20 published research articles by the participants, 10 were by interns.

#### Focus group discussions

The barriers and enablers highlighted by participants were also analyzed based on their exposure to research. It was observed that most of the barriers highlighted by the students who had exposure to research were related to practical challenges faced by them during the conduct of the research projects—difficulty in writing research proposals and reports, inadequate knowledge of research methodology, transportation issues, inappropriate mentoring, etc. In contrast, participants who had not done research highlighted other aspects such as lack of interest or motivation, lack of confidence, poor rapport with faculty guide and language barriers (Tables IV and V).

#### DISCUSSION

Our study included 386 students for the quantitative phase.

The profile of our participants were similar to those in studies done in Puducherry, Karnataka, etc.<sup>6,7</sup> On the contrary, studies conducted in Pakistan and Saudi Arabia had more male as compared to female students.<sup>8,9</sup> These variations may be due to socio-cultural differences across various countries.

We observed that more than half the participants were aware about research methodology. A study done in Chennai, reported that less than half the students had proper knowledge about sampling methods, ethical issues, research protocol, and statistical analysis. Only about 20% knew about PubMed.<sup>10</sup> Another study from India, reported better overall knowledge about research among almost 60% participants.<sup>11</sup> In a study from southern India, almost 80% of final year students had knowledge about research methodology.<sup>12</sup> In contrast, we observed that among final year students only 48.4% and 39.8% had knowledge about research methodology and statistical analysis. This may be because of the shift from conventional teaching–learning to online teaching–learning platform due to the Covid-19

TABLE IV. Coding process: Barriers and enablers to research uptake

Category	Code
<i>Theme: Barriers to research uptake</i>	
Teaching and training in research	Lack of awareness Lack of knowledge about research methodology Lack of workshops/continuing medical education programmes Writing research proposals/manuscripts
Logistics	Inadequate/quality of clinical material Inadequate resources Monetary constraints Transportation issues
Institution related	Inadequate mentorship Lack of funding/incentives Inadequate institutional support
Student related	Lack of interest/motivation Language barrier Time constraints Lack of confidence/shy/reserved nature No rewards/recognition/incentives Lack of family support Selection of topic based on student's interest Multiple approvals needed from higher authorities Funding for student projects including ICMR rejected projects Communication skills workshops Earmarked time slots for research activity—once a week Student research conferences Adequate mentorship by faculty Adequate recognition for student researchers Creating research conducive environment Team based research projects Shadowing of researchers Rapport with faculty mentors Incentivizing/Rewarding student researchers

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pandemic during the study period and the main focus being on academic aspects as opposed to research.

We found that interns and final year part II students had better knowledge about various aspects of research as compared to second year and final year part I students. Similar results were obtained in studies done in America and Saudi Arabia.<sup>13,14</sup> This may be due to the fact that research workshops for MBBS students are conducted mainly after the first year and the students tend to be involved in carrying out research projects in the second and final years. There was also a study which showed decreasing knowledge levels with enhancing academic year.<sup>11</sup> This may be because an increasing load of course material in the latter part of the course.

We also found that 161 (41.7%) participants were willing and interested in attending research methodology workshops. A study among Egyptian medical students also reported a positive attitude towards research.<sup>15</sup> Another study reported an increase in the attitude score of the students with advancing academic years.<sup>11</sup> The reason for this could be better rapport with faculty in the later academic years than in the initial years and thus more encouragement and motivation for the students. A study from Pakistan found that almost one-third of their students believed that research was a good career option for them.<sup>8</sup> Similar findings have also been documented by other studies as well.<sup>16,17</sup>

Only 96 (24.9%) of our respondents had ever done a

research project and only 20 of them (20.8%) had published the research. In a study done in Chennai, almost similar results were obtained with about 35% participants who had done a research project and less than a quarter had published an article, and only 28% had presented a paper. However, majority of the participants had attended research methodology workshops.<sup>10</sup> This shows that even though students have a positive attitude towards research, there is a gap between doing research and presenting or publishing it. There is a need to hand hold student researchers through the various stages of conducting research till its publication in a peer reviewed journal. Another study from Syria found that most students wrote case reports.<sup>5</sup> This practice may be due to lack of guidance on writing a research paper or a possible publication bias for authors from less renowned institutions.<sup>18</sup>

We identified various barriers to uptake of research activities through FGDs. The major barriers identified were lack of awareness, lack of time, lack of workshops and conferences related to student research and logistic issues. Similar responses have been documented in other quantitative surveys.<sup>19–21</sup> Few studies have reported the lack of research curriculum and lack of mentorship as other important barriers.<sup>16,20,22–26</sup>

Other studies have reported financial constraints and lack of incentives as major barriers for students to do research.<sup>22,23,27–30</sup> Many students have also highlighted lack of funding for their research by their own institutes as a barrier.<sup>29–33</sup>



TABLE V. Verbatim statements of participants in the focus group discussions (FGDs)

Code	Verbatim statement
<i>Theme: Barriers to research uptake</i>	
<i>Teaching and training in research</i>	
Lack of awareness about research	Participant #3 (4): <i>Lack of importance of conducting a research project. Our main source of information is textbooks but what the students don't know is that there are research publications in journals which they can refer to gain more knowledge. Since we don't know and we don't have that kind of exposure, students are unaware about importance of conducting a research project by themselves hence they don't think and don't come up with research projects.</i>
Writing research proposals/manuscripts	Participant #5 (6): <i>It might be a minor point but needs to be mentioned here that the way you write your research paper matters, the layout of it matters...so even if your topic and methods are good and your results are solid but if your presentation is more of a layman, it is bound to get rejected at a later stage.</i>
<i>Logistics</i>	
Inadequate resources	Participant #8 (14): <i>When I go to hospital to gather data for my research work, there may not be availability of resources like patients for data collection. Also, there is lack of other proper resources here.</i>
Monetary constraints	Participant #6 (8): <i>Financial crunch if it is there it automatically restricts the amount of topics you can choose to research on for example when I wanted to do my ICMR project on stem cells I wasn't allowed to do so due to more cost involved in it.</i>
<i>Institution related</i>	
Inadequate mentorship	Participant #12 (6): <i>Certain students feel that interaction with faculty, they feel little uncomfortable talking to the faculties about their research ideas.</i>
Lack of funding/incentives	Participant #15 (3): <i>I feel as UG students we don't have money to spend on research work so we need some monetary incentives. If given students can take up some research projects.</i>
<i>Student related</i>	
Time constraints	Participant #3 (28): <i>For us UGs, we have college from 8.30–4, in that we have to attend classes and if we are in research, we have to go and do data collection the same time...so we will miss academics.</i>
<i>Theme: Enablers to research uptake</i>	
<i>Institution related</i>	
Periodic sensitization sessions and workshops	Participant #18 (26): <i>Emphasis on the importance of research should be done on a regular basis at least weekly so that students who are reserved also come up with research ideas. Also workshops on research methodology can be conducted exclusively for us so that we can clear our doubts as well.</i>
Earmarked time for research activity	Participant #10 (51): <i>Research work should be a part of our curriculum and be a part of our study but it is not so in our education system...so that children who find problem with time management do not feel so and study and research work should go hand in hand...So we don't feel that our academic time is being wasted by our research work.</i>
<i>Student related</i>	
Shadowing of researchers	Participant #7 (61): <i>They can shadow researchers maybe a professor who is doing some research or a postgraduate student and then get to learn and see about the practical aspects of research and the whole process of research.</i>

The numbers in parenthesis indicate the statement number as coded in the FGDs

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We also explored enablers for the uptake of research. These included the conduct of regular workshops on research methodology, funding for student research projects with special emphasis on projects rejected by ICMR, exclusive time for research work, etc. There are few studies which have explored the enabling factors with regards to uptake of research activities by undergraduate students. An editorial highlighted many areas including funding for student research projects, student mentorship, recognition of student researchers, research methodology workshops for students as well as mentors, provision of mandatory research project for each MBBS student, etc. Another article emphasized the need to integrate training in formal research into the medical curriculum to provide diverse research opportunities of a high quality.<sup>34,35</sup>

### Limitations

Our single centre study cannot be generalized.

### Conclusion

Our study revealed the existing knowledge and practice gap in undergraduate medical research. We also ascertained potential barriers as well as enablers for enhancing research activities by medical students. Adequate institutional support

including funding for research coupled with proper mentoring by faculty and family support is crucial to foster a positive research culture among undergraduate medical students.

*Conflicts of interest.* None declared

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