



Cross-sectional Study

The inclination of undergraduate students at King Edward Medical University towards research and its perceived barriers and facilitators; a cross-sectional study

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ABSTRACT

Introduction: Research participation by medical students in the early years of their medical studies can change their attitude towards research conduction in the years to come. To identify the shortcomings in our system, it is essential to determine the perception, tendencies, and knowledge of Pakistani medical students about the field of research.

Methods: This survey-based cross-sectional study was conducted at KING EDWARD MEDICAL UNIVERSITY, Lahore with 305 MBBS students. The relevant data for the study was collected in the shape of a pretested, semi-structured questionnaire assembled in the form of google form. The collected data was analyzed using SPSS (Statistical Package for Social Sciences) version 16.

Results: 36.7% of the final year students have conducted research, however, the percentage comes down to 0% and 10.6% for 1st and 2nd year respectively. 50.6% of the final year students claimed they had a good grip on the steps involved in the conduction of research while the percentage for 1st, 2nd, 3rd, and 4th year was 7.1%, 21.3%, 20.9%, and 51.2% respectively. More than 70% of the participants from each year considered research as an important help for critical thinking and improvement in patients' care.

Discussion: The reasons for the interest of the students in research as indicated by our study include improvement in the professional standards, help in becoming a better self-directed learner, and opportunities for team-based learning via research conduction. Academic overload, lack of structured research training, and difficulty in publishing are the biggest barriers to the conduction of research as recognized by our study.

Conclusion: Conduction of research seminars, organizing platforms for communication between students and teaching staff, restructuring of the medical curriculum, and providing students with the required technical staff can help us overcome these hurdles.

1. Introduction

The practice of evidence-based medicine lays the groundwork for achieving a higher cure rate of diseases by pointing out the treatment options with better efficiency and depreciating the clinical practices that have been proved to be less effective. [1] Evidence-based practice refers to treating a patient in the light of the most recent work done in the respective field. [2] The knowledge in the medical field is not absolute and is always subject to change as more and more studies come to the scene. [3] Hence, the conduction of medical research is pivotal to the advancement of scientific knowledge which helps us in developing better approaches to the treatment of an individual. [4] Despite the utmost importance of medical research in the field, the number of physicians involved in the conduction of research activities remains bleak. [3] A significant reason for this could be the lack of exposure medical students face to research activities in their undergraduate years.

This idea is reinforced by studies showing a higher tendency to conduct research activities by medical students who were involved in various research activities during their undergraduate years. [5] Hence, research participation by medical students in the early years of their medical studies can change their attitude towards research conduction in the years to come.

Although undergraduates are motivated for producing research articles, a lack of training, no encouragement from the present medical faculty, and the absence of policies encouraging research work in students prove to be a major hindrance for them. [6] The situation of research involvement in the region of south-east Asia is even grimmer. [4] In the past, large efforts have been directed toward narrowing this gap between the developed world and the third-world countries. [7] Despite this, Pakistan stands at a very dark place when it comes to research writing as the number of medical students oblivious to the concepts of research conduction is very high. [8] Even the most basic

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aspects of article writing like avoiding plagiarism are a major problem among Pakistani medical students.

Countries like Pakistan can learn a lot from the developed world about promoting research activities in their students like awarding degrees in the field of research writing as in the UK (Master of research, intercalated bachelor of science degree). [9] Medical curriculum should innovate the students to further the borders of medical practice which is only possible if the medical faculty is in continuous coordination with the student body. (10) In the developed world some colleges have even made it compulsory to conduct research activities.

To identify the shortcomings in our system, it is essential to determine the perception, tendencies, and knowledge of Pakistani medical students about the field of research. However, Pakistan lacks elaborate work done in this regard which makes it impossible to track any progress of the situation and implement effective policies to promote research writing in this region. This study is one of the first of its kind to explore research trends in Pakistan and identify any barriers undergraduate students face in the conduction of research.

2. Materials and methods

2.1. Ethical approval and registration

The study was approved by the Institutional Review Board of Ethical Committee of KEMU, Lahore before the circulation of the Performa and data collection. Reference number is 628/RC/KEMU. The study was fully compliant with the STROCSS 2021 criteria [11] and was registered on Research Registry. Registration Unique Identifying Number (UIN) is [researchregistry7976](https://www.researchregistry.com/record/7976).

3. Study sample

This survey-based cross-sectional study which aimed towards determining the attitudes of the undergraduate medical students towards the research activities was conducted at one of the most prestigious government medical universities in Pakistan, KING EDWARD MEDICAL UNIVERSITY, Lahore. The MBBS (Bachelor of Medicine and Bachelor of Surgery) studies cover a five-year course and each year has approximately 300 students enrolled at a single time. By assuming that at least half of the students from each year will volunteer to participate in the study, the sample size was calculated. Considering the confidence interval of 95% and adding 5% as a non-response error, the final sample size was calculated by the formula

$$x = Z(c/100)2r \tag{100-r}$$

$$n = N x / ((N-1)E^2 + x)$$

$$E = \text{Sqrt}[(N - n)x / n(N-1)]$$

where N is the population size, r is the fraction of responses that you are interested in, and Z(c/100) is the critical value for the confidence level c. And the sample size n and margin of error E.

The sample size came out to be 305 students. Only MBBS enrolled students were considered as part of the study. Students of all other courses were excluded. The study continued for three months from September to November 2021 until the completion of the article. The students were randomly approached through their emails and the same route was used to send the Performa in the form of google form. The first 61 responses from each academic year were included in the study. Participation in the study was purely voluntary. Written informed consent was obtained from the students willing to participate after mentioning the aims of the research and the confidentiality assurance for the participants at the start of the Performa. A pilot study of 10 medical students belonging to different academic years was conducted to ensure that the survey was easily accessible, and the language was appropriate and clear. These 10 medical students were excluded from

the final data.

4. Development of questionnaire

The relevant data for the study was collected in the shape of a pre-tested, semi-structured questionnaire assembled in the form of google form. It was developed by referencing the previously conducted similar research through an extensive literature study. The questions were easily understandable and were validated by internal and external content experts in physiology, community medicine, and medical education. They were organized into sections to collect information about the participant's demographics, their perceptions, barriers, facilitators, and limitations toward the undergraduate research. This information was obtained in the form of a Likert 5- point scale reduced to 3 points for convenience consisting of "yes", "no", and "maybe". The reliability of the questionnaire was assessed through Cronbach's Alpha.

5. Statistical analysis

The questionnaires with responses were subsequently collected and assessed for completion. Only the completed questionnaires were considered for further analysis. The collected data was analyzed using SPSS (Statistical Package for Social Sciences) version 16. The results obtained were expressed in percentages and proportions.

6. Results

This cross-sectional study recorded responses from 305 students of King Edward Medical University. The students belonged to different years of study, from 1st-year MBBS to 5th-year MBBS. The number of students participating from each year was similar, ranging from 57 to 65 (19.3%–21.3%) for each year. The questionnaire was designed to determine the prevalence, knowledge, perception, key barriers, and promoters of research among the students.

Table 1 shows the trend of research conduction among students belonging to different academic years at KEMU. The students were asked if they had conducted or published any research articles. The proportion of students who had previously conducted research increases dramatically as we move from junior classes to senior classes. 36.7% of the final year students have conducted research, however, the percentage comes down to 0% and 10.6% for 1st and 2nd year respectively. Only 8.9% of the final year students could publish their articles in a peer-reviewed journal.

Table 2 depicts the percentages of students of different academic years with correct knowledge of research subjects. The students were asked very basic questions about different steps in the conduction of research. 50.6% of the final year students claimed they had a good grip on the steps involved in the conduction of research while the percentage for 1st, 2nd, 3rd, and 4th year was 7.1%, 21.3%, 20.9%, and 51.2% respectively. Students of all academic years answered most of the

Table 1
Trend of research conduction.

Alpha = 0.845	1 ST year	2nd year	3rd year	4th year	5th year	
Have you ever participated in academic research projects?	14.3% 85.7%	25.5% 74.5%	23.3% 76.7%	50.4% 49.6%	67.1% 32.9%	YES NO
Have you ever conducted research?	0% 100.0%	2.6% 97.4%	4.3% 95.7%	28.9% 71.1%	36.7% 63.3%	YES NO
Have you published any research papers as the first author in a peer-reviewed journal?	0% 100%	0% 100%	0% 100.0%	5.8% 94.2%	8.9% 91.1%	YES NO

Table 2
Knowledge of undergraduate students about research conduction.

Alpha = 0.845	1 ST year	2nd year	3rd year	4th year	5th year	
Do you know the procedure for conducting sound research?	7.1% 92.9%	21.3% 78.7%	20.9% 79.1%	51.2% 48.8%	50.6% 49.4%	YES NO
Hypothesis testing is the key concept of which of the following type of research?	35.7% 64.3%	17.0% 83.0%	18.6% 81.4%	35.5% 64.5%	41.8% 58.2%	Quantitative Qualitative
Statistical methods are used in the data analysis in which type of research?	64.3% 41.7%	83.0% 17.0%	79.1% 20.9%	89.3% 10.7%	91.1% 8.9%	Quantitative Qualitative
Ethical approval is not mandatory before the start of any research	13.8% 86.2%	29.8% 70.2%	11.6% 88.4%	7.4% 92.6%	12.7% 87.3%	YES NO
IEC stands for "institutional ethical committee"	57.1% 42.9%	63.8% 36.2%	74.4% 25.6%	90.9% 9.1%	74.7% 25.3%	YES NO

questions correctly except for first-year students. Only 41.8 of the final year students accurately answered hypothesis as the key concept of quantitative research while 58.2% of final year, 64.5% of 4th year, 81.4% of 3rd year, 83% of 2nd and 64.3% of 1st-year students considered it as a part of qualitative research/91.1% of the final year students accurately identified quantitative research to be the one in which statistical analysis is to be while the percentages gradually declined to 89.3%, 79.1%, 83%, and 64.3% respectively while moving from 4th to 1st year. The question about the ethical approval for a research initiation was falsely answered by the majority of the students irrespective of their grade.

Table 3
Perception of undergraduates about research conduction.

Alpha = 0.845	1 ST year	2nd year	3rd year	4th year	5th year	
Do you think research helps in promoting critical thinking?	0% 100.0%	12.8% 83.0%	11.6% 81.4%	5.0% 92.6%	15.2% 81.0%	MAYBE YES
Do you think research helps in the Improvement of patient care?	14.3% 7.1% 78.6%	21.3% 8.5% 70.2%	20.9% 4.7% 74.4%	16.5% 5.0% 78.5%	12.7% 3.8% 83.5%	MAYBE NO YES
Do you think research helps in promotion and obtaining scholarships?	28.6% 21.4% 50.0%	42.6% 6.4% 51.1%	27.9% 4.7% 67.4%	29.8% 6.6% 63.6%	26.6% 10.1% 63.3%	MAYBE NO YES
Do you think research helps in changing health policies?	14.3% 7.1% 78.6%	31.9% 8.5% 59.6%	23.3% 9.3% 67.4%	10.7% 5.0% 84.3%	8.9% 7.6% 83.5%	MAYBE NO YES
Do you think research has future career options?	38.7% 7.1% 54.1%	33.4% 6.0% 58.6%	25.6% 7.0% 67.4%	17.4% 3.3% 79.3%	16.5% 7.6% 75.9%	MAYBE NO YES

Table 3 shows the perception of research by students and its role in their academic lives. To understand the attitude of students toward research, they were asked about the contributions of research to their medical careers. A majority of students throughout different academic years have a positive attitude towards research. More than 70% of the participants from each year considered research as an important help for critical thinking and improvement in patients' care. However, a significant proportion of the students expressed their doubts about the future options residing in the research by marking the option 'MAYBE'. It was highest in 1st year coming out to be 35.7% and then gradually decreasing to 23.4% for 2nd year, 25.6% for 3rd year, 17.4% for 4th year and 16.5% of final-year students. The same trends were seen when asked about research as a source of promotion and scholarships.

Table 4 demonstrates different factors that motivate students to conduct research articles. More than 70% of the students considered research as evidence-based learning and a contributor to the medical field. On the other hand, less than 50% of the students irrespective of their years of education plan to or have already conducted research because it promotes critical thinking by exposure to real-life complex situations. Approximately, 20% of the students from each grade were doubtful and answered as 'MAYBE' when asked to consider research as an opportunity for team-based and self-directed learning.

Table 5 shows different barriers that students face in the smooth conduction of research. Academic overload, lack of structured research training, and difficulty in publishing were the biggest barriers to the conduction of research as identified by almost 80% of the participants from all grades. However, a comparable number of students considered lack of financial and technical support as a barrier while the same

Table 4
Facilitators of research conduction.

Alpha=0.845	1st year	2nd year	3rd year	4th year	5th year	
You did or plan to research because it contributes towards the innovation of the medical field	83.5%	80.2%	88.4%	83.5%	80.9%	YES
	2.2%	7.8%	0%	7.1%	3.8%	NO
	14.3%	12.0%	11.6%	9.4%	15.3%	MAYBE
You did or plan to do research because it improves professional standards as clinicians	57.1%	72.3%	76.7%	76.9%	73.4%	YES
	14.3%	8.5%	4.7%	5.0%	2.5%	NO
	28.6%	19.1%	18.6%	18.2%	24.1%	MAYBE
You did or plan to do research because it is a tool for evidence-based practice	84.7%	86.6%	84.1%	80.2%	83.2%	YES
	11.1%	4.4%	3.7%	7.4%	3.1%	NO
	4.2%	9.0%	12.3%	12.4%	13.7%	MAYBE
You did or plan to do research because it helps to be a self-directed learner	71.4%	74.5%	72.1%	69.4%	70.9%	YES
	14.3%	6.4%	7.0%	7.4%	6.3%	NO
	14.3%	19.1%	20.9%	23.1%	22.8%	MAYBE
You did or plan to do research because it provides an opportunity for team-based learning	92.9%	66.0%	88.4%	77.7%	75.9%	YES
	4.9%	4.2%	0%	6.6%	7.6%	NO
	4.2%	29.8%	11.6%	10.7%	16.5%	MAYBE
You did or plan to do research because it promotes critical thinking by exposure to complex real-life situations	45.4%	48.9%	46.6%	47.7%	48.9%	YES
	25.5%	20.3%	34.2%	41.3%	30.2%	NO
	29.1%	30.8%	19.2%	21%	20.9%	MAYBE

Table 5
Barriers to research conduction.

Alpha = 0.845	1 ST year	2nd year	3rd year	4th year	5th year	
Lack of awareness in basic research skills	85.7%	66.0%	81.4%	91.7%	86.1%	YES
	12.2%	19.1%	7.0%	2.5%	5.1%	NO
	2.1%	14.9%	11.6%	5.8%	8.9%	MAYBE
Lack of structured research training	78.6%	63.8%	86.0%	84.3%	87.3%	YES
	7.1%	17.0%	2.3%	5.0%	2.5%	NO
	14.3%	19.1%	11.6%	10.7%	10.1%	MAYBE
Lack of statistical support	71.4%	79.6%	72.1%	76.9%	82.3%	YES
	14.3%	7.0%	9.3%	6.5%	7.6%	NO
	14.3%	13.4%	18.6%	16.5%	10.1%	MAYBE
lack of mentorship and teamwork	71.4%	68.1%	74.4%	65.3%	81.0%	YES
	21.4%	12.8%	4.7%	19.8%	6.3%	NO
	7.1%	19.1%	20.9%	14.9%	12.7%	MAYBE
lack of financial support	40.3%	43.3%	31.9%	31.2%	45.8%	YES
	45.4%	45.4%	40.2%	48.1%	46.5%	NO
	14.3%	11.3%	27.9%	20.7%	7.7%	MAYBE
Technical and logistic support like computer and internet	40.0%	36.2%	29.5%	38.8%	33.0%	YES
	32.9%	42.6%	42.6%	44.7%	48.0%	NO
	7.1%	21.3%	27.9%	16.5%	19.0%	MAYBE
lack of opportunities to present research	85.7%	61.7%	74.4%	57.9%	69.6%	YES
	11.2%	25.5%	4.7%	24.0%	15.2%	NO
	3.1%	12.8%	20.9%	18.2%	15.2%	MAYBE
lack of opportunities to publish research	78.6%	81.0%	82.1%	83.3%	84.4%	YES
	14.3%	14.3%	7.1%	8.2%	10.5%	NO
	7.1%	4.7%	10.8%	8.5%	5.1%	MAYBE
lack of acknowledgment of contributions	78.6%	55.3%	65.1%	66.1%	72.2%	YES
	7.1%	23.4%	4.7%	16.5%	19.0%	NO
	14.3%	21.3%	30.2%	17.4%	8.9%	MAYBE
academic overload	88.2%	76.0%	80.4%	82.1%	84.8%	YES
	8.3%	15.5%	5.3%	8.3%	10.1%	NO
	3.5%	8.5%	16.3%	9.6%	5.1%	MAYBE

proportion of students did not. 53.2% of the final year students identified barriers as the research not being part of the curriculum and so did 41.35 of 4th year, 58.1% of 3rd year, 59.6% of 2nd year, and 64.3% of 1st-year students. Lack of motivation and interest was ruled out as an important barrier by the majority of the students voting against it. Other important barriers to research are a lack of acknowledgment, mentorship, opportunities for presentation, and statistical support for research.

7. Discussion

This study assessed 305 voluntarily participating medical students who belonged to different academic years of study at King Edward Medical University. They were evaluated in terms of their knowledge and perceptions about research and were also asked to identify any experienced barriers or promoters in the conduction of the research. There was no significant gender bias observed in the data collected. The involvement of medical students in research, their training and mentorship for smooth conduction of research, and their problems along with solutions especially in Pakistan have not been adequately addressed by an appropriate number of studies [12]. This study serves an important purpose of highlighting the issue of highly reduced participation in research conduction by the undergraduate medical student of Pakistan alongside its causative factors.

According to the data collected, about two-thirds of the final year students at King Edward Medical University had either conducted some research on their own or as a part of a group project during their medical education. However, the proportion decreases as we move from senior to junior years such that only about 3% of the second-year students and none of the first-year students had ever conducted research. The condition became more disappointing when the matter of publication was considered with only 9% of the final year students getting their articles published as first authors in peer-reviewed journals. The reason behind it lies in the lack of education and training about research in the initial years of study which results in the ignorance and oblivion of the students

to the research and its importance. The majority of the students in senior years had adequate knowledge about the basics of research to which the junior year students were quite oblivious. The results are in accordance with two research conducted under similar circumstances one in Malaysia [13] and the other in Pakistan [14]. This calls for a need to restructure the medical curriculum and start educating the medical students in their early years about the basics of research and its importance so that they are better able to participate and contribute to the research well in time during their academic years. This measure has been supported by a qualitative study that proved a positive change in the student's perceptions after undertaking a research course study [15]. Mandatory participation of the students as part of their examination system has also brought about positive results [16].

The majority of the medical students regardless of their year of study had a positive perception of research realizing its contributions in the medical fields similar to that seen in research conducted in Saudi Arabia [17]. They believe it's important for enhancing critical thinking and formulating health policies which eventually led to making well-appreciated improvements in both educational and practical fields. Purushottam A Giri et al. stated that 91.4% of the students believed that patient outcome improves with continued medical research [18]. Comparable results were obtained by another study despite a moderate level of knowledge in undergraduate participants [19]. However, less than half of the students didn't see it as a future career option or as a means to attain scholarships.

Innovation in the medical field by research and its crucial importance in evidence-based learning turned out to be the most important motivations for the students to conduct research. These results are consistent with another study conducted in Colombia in 2017 [14]. Other reasons for the interest of the students in research as indicated by our study include improvement in the professional standards, help in becoming a better self-directed learner, and opportunities for team-based learning via research conduction. Similar interests have been well highlighted by various studies [6,20].

Academic overload, lack of structured research training, and difficulty in publishing are the biggest barriers to the conduction of research as recognized by our study. Other important barriers to research such as lack of acknowledgment, mentorship, opportunities for presentation, and statistical support for research were identified in a considerable proportion in our study and have also been brought to light previously by a Saudi Arabian study [21]. Lack of both technical and financial support and motivation were also faced by the participants as recognized by another Indian study [22]. Most of the students believe that there is a lack of awareness of basic research concepts among students. Hence, a better and more practical approach should be taken while teaching research to medical students as most of the students also think that the research training is not properly structured. Data evaluation and analysis is an integral part of quantitative research which requires a certain amount of skill in statistical analysis. However, neither do medical students receive any statistics training nor is there any statistical support staff available for this purpose. This problem can be overcome by proper mentorship, but most medical students experience a lack of supervision and mentorship while conducting a research project [23].

8. Practical applications

Good programs, as well as exclusive training, can motivate students not only to opt for research but also create an inclination to choose it as a career. This calls for a need to educate the medical students in their early years about the subject of research by the restructuring of medical curricula. There should be an implementation of good policies to counteract the barriers that are identified in this study. The policy-makers should allocate some budget and funds for this so that it can be promoted. Moreover, supervisors should be encouraged to mentor undergraduate students. Moreover, there is a need for more student-

friendly journals so that undergraduate students can publish their work.

9. Limitations

Our study includes undergraduate medical students from one government medical university only. The inclusion of other private and government medical universities from across Pakistan can give us a better understanding of research trends in Pakistan's medical universities. It will also help us in identifying research barriers faced by students at other medical universities so that more refined policies can be implemented for the promotion of research conduction in Pakistan.

10. Conclusion

According to the study, the students exhibit a very positive attitude towards research conduction which shows students are highly motivated to participate in such projects. However, the proportion of students participating in research-based projects is very low. The study outlines several major factors contributing to these results. These barriers include lack of mentorship, outdated medical curriculum structure, lack of statistical support staff, and lack of awareness about research. Conduction of research seminars, organizing platforms for communication between students and teaching staff, restructuring of the medical curriculum, and providing students with the required technical staff can help us overcome these hurdles.

Ethical approval

The study was approved by the Institutional Review Board of Ethical Committee of KEMU, Lahore before the circulation of the Performa and data collection. Reference number is 628/RC/KEMU.

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Author contributions

TF conceived the idea. TF, ZA, FY and QM were involved in data collection, data analysis and interpretation. All authors were involved in writing the final draft and all the authors approve the final version of the manuscript.

Consent

Written informed consent was obtained from the participants before the start of the study.

Registration of research studies

- 1 Name of the registry: Research Registry.
2. Unique Identifying number or registration ID: researchregistry7976
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): <https://www.researchregistry.com/browse-the-registry/#home/registrationdetails/629c7547c5978d0021f5ce73/>

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Provenance and peer review

Not commissioned, externally peer reviewed.

Declaration of competing interest

The authors declare no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2022.104502>.

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