RESEARCH ARTICLE

Confronting challenges: an inductive thematic analysis of barriers and solutions to undergraduate medical research in Pakistan

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Abstract

Objective: To qualitatively analyse the barriers in pursuing undergraduate research, and to propose solutions for the problems identified.

Method: The qualitative study was conducted from May to October 2021 after approval from the institutional ethics review board of the Dow University of Health Sciences, Karachi, and comprised undergraduate students of either gender at various public and private medical universities across Pakistan having some level of research experience and good communication skills. Data triangulation was employed to collect qualitative data through open-ended survey, face-to-face interviews and focus group discussions. Using the information of one method to inform the rest, linked trajectories were established that allowed validation of information at each level. Data was coded manually by two researchers independently. Data was subjected to inductive thematic analysis.

Results: Of the 33 subjects, 17(51.5%) were males, 17(51.5%) were from private medical colleges, 18(54.5%) were from Karachi, and 11(33.3%) were in the final year of medical school. Overall, 13(39.4%) students completed the open-ended survey, 6(18.2%) completed face-to-face interviews, and 14(42.4%) participated in focus group discussions. Thematic analysis showed that students were interested in research to improve their career prospects, but not all were passionate about it. Students were not satisfied with the quality of research being conducted in the country. Dearth of motivated faculty, unavailability of well-maintained and digitalised data registries, ineffective research methodology teaching and lack of access to medical journals and research software were the major barriers in undergraduate research. Time constraint was a projecting problem which challenged the students. Frequent research workshops and conferences, strong networking, reorienting curriculum to provide early exposure to research and student-led initiatives were suggested to improve undergraduate research in Pakistan.

Conclusion: Students' lack of initiative coupled with administrative and faculty-related issues pose a serious threat to the future of evidence-based medicine. Proposed solutions offer a ray of hope to the future of undergraduate research in Pakistan.

Key Words: Undergraduate medical education, Qualitative research, Focus groups, Interview, Pakistan.

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Introduction

In the rapidly evolving sphere of medicine, research is vital to make continuous advancements which would ultimately manifest in the best possible patient care[1]. To exercise evidence-based medicine, physicians should be aware of the latest developments in their practice and involve scientific knowledge via research in clinical decision-making[1,2]. Undergraduate research (UR) is the investigation of a specific theme within a field by undergraduate students that makes a unique contribution to the relevant discipline[3]. UR is essential because it equips students with the structure and opportunities to explore challenging questions, while simultaneously allowing them to develop their skills in order to become capable physicians[1-6].

With the shift in focus in medical education from learning facts written in textbooks to acquiring more practical skills, many students opt for UR either voluntarily, or as a mandatory course in their medical degree[6]. However, students in medical colleges in developing nations face multiple barriers in their pursuit of UR, either as a consequence of their limited understanding of the importance of research at undergraduate level, or due to the sheer lack of research opportunities at their disposal compared to students in more developed nations. This, in turn, becomes an issue of greater magnitude because the

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developed nations then yield a finite sample of physician-scientists[5-7].

In Pakistan, there is a stark difference in both the quality and quantity of UR in comparison to UR being done internationally[6].

The current study was planned to qualitatively analyse the barriers in pursuing UR, and to propose solutions for the problems identified.

Subjects and Methods

The qualitative study was conducted from May to October 2021 after approval from the institutional ethics review board of the Dow University of Health Sciences (DUHS), Karachi. The information collected at each step was analysed to develop, fine-tune and conduct the next stage of research. This assisted in validation and consolidation of the different perspectives of participants and aided in deeper understanding of the topic[8].

First, a literature search, using search engines, like Medline, PubMed and Google Scholar, was carried out to contextualise the reported questionnaires[9-13] and develop a locally informed open-ended survey on Google Forms which was e-mailed to the enrolled students after obtaining their informed consent.

Second, a qualitative exploratory research was conducted using semi-structured in-depth interviews. Prompts for these interviews were developed with the help of literature review[9-12, 14] and results of the survey.

The first two stages were trajected to develop the interview guide for focus group discussions (FGDs) which comprised the third stage of data collection (Figure 1).

Undergraduate medical students across Pakistan were purposively selected, with some level of research experience and good communication skills[15] to ensure that the survey and discussions were informative. First year students, therefore, were excluded due to their limited exposure to medical school at the time of data collection. All the participating institutions were registered with the national regulatory authority.

Those who consented for FGDs were added to the WhatsApp group of their respective FGD to familiarise them with their group. Date and time were decided through mutual consensus. To keep the focus groups relatively homogenous in terms of research experience and exposure, students were divided into three groups based on their year in medical school. Representation of both genders, and public and private medical colleges from different cities was ensured in all FGDs. All the interviews and FGDs were recorded and transcribed verbatim. The final transcript notes were shared with the respective participants for validation.

Survey Questions

1. Demographic details
2. Details of research experience so far
3. Do you think research is important? Why?
4. What factors motivate/discourage you for research?
5. What research training/skills have you received or would like to receive?
6. Do you plan to pursue research as a career?

Interview Prompts

1. What does research mean to you?
2. What is the attitude of Pakistani undergraduate medical students towards research?
3. What is your opinion about the quality of research being done in Pakistan?
4. How supportive is the infrastructure of your university towards research?
5. What barriers do you face in conducting research?
6. What suggestions do you have to improve research in your university?

FGD Prompts

1. How has it been researching till now?
2. How do you compare international research with research being done in Pakistan?
3. What influences interest in research among students?
4. Are medical universities in Pakistan trying to develop research skills and relevant attributes in undergraduates?
5. What support do you expect from medical universities to conduct research?
6. What changes would you like to make to improve research in our universities?
7. What can medical students do on their own to improve research for themselves?

Figure-1: Questions/prompts for the survey, interviews and focus group discussions (FGDs).

In view of the scenario created by the prevalent coronavirus disease-2019 (COVID-19) pandemic and to facilitate diversity of opinion by participation of students from different cities of Pakistan, all the interviews and FGDs were conducted via video call on Zoom. Face-to-face interaction was ensured by keeping videos switched on throughout the sessions. All the participants who had initially consented, attended the interviews and FGDs.

Data collection and analysis occurred simultaneously, and data collection was stopped when saturation of responses was achieved. Inductive thematic approach was used to analyse the entire data[16]. Coding or indexing was done independently by two researchers. Disagreements were resolved through mutual discussions. Key findings were aggregated and analysed to develop the thematic areas.

Results

Of the 33 subjects, 17(51.5%) were males, 17(51.5%) were from private medical colleges, 18(54.5%) were from Karachi, and 11(33.3%) were in the final year of medical school (Table). Overall, 13(39.4%) students completed the open-ended survey, 6(18.2%) completed face-to-face interviews, and 14(42.4%) participated in FGDs.

Table: Demographic characteristics

Characteristics	Total n (%)	Survey	F2F Interviews	FGDs
Participants	33	13	6	14
Male/Female	17/16	5/8	3/3	9/5
Year at medical school				
2nd	8 (24.2)	2 (15.3)	1 (16.6)	5 (35.7)
3rd	6 (18.1)	3 (23.0)	1 (16.6)	2 (14.2)
4th	8 (24.2)	3 (23.0)	2 (33.3)	3 (21.4)
5th	11 (33.3)	5 (38.4)	2 (33.3)	4 (28.5)
Medical school				
Public	16 (48.4)	5 (38.4)	2 (33.3)	9 (64.2)
Private	17 (51.5)	9 (69.2)	4 (66.6)	5 (35.7)
City				
Karachi	18 (54.5)	8 (61.5)	2 (33.3)	7 (50.0)
Lahore	5 (15.1)	1 (7.6)	1 (16.6)	3 (21.4)
Quetta	2 (6.0)	1 (7.6)	0 (0.0)	1 (7.1)
Others	8 (24.2)	2 (15.3)	3 (50.0)	3 (21.4)

F2F: Face-to-face, FGD: Focus group discussion.

The main themes emerging from the data, along with their subthemes, were noted (Figure 2).

As for the reasons to conduct research, students' opinion on motivating factors for research varied with their university and year at medical school. While students from clinical years generally recognised the importance of research in allowing physicians to practice evidence-based medicine, participants from a particular private sector university seemed more passionate for research as they saw it as a means of satisfying their innate curiosity. "*An intrinsic factor would be my constant want or need to just keep learning and keep growing*."

However, majority of the participants believed that undergraduates were drawn towards research to gain publications, which enhanced the chances of acceptance from reputable residency programmes abroad, opened better employment opportunities locally, and increased the possibility of an academic career. "*Students research to build*

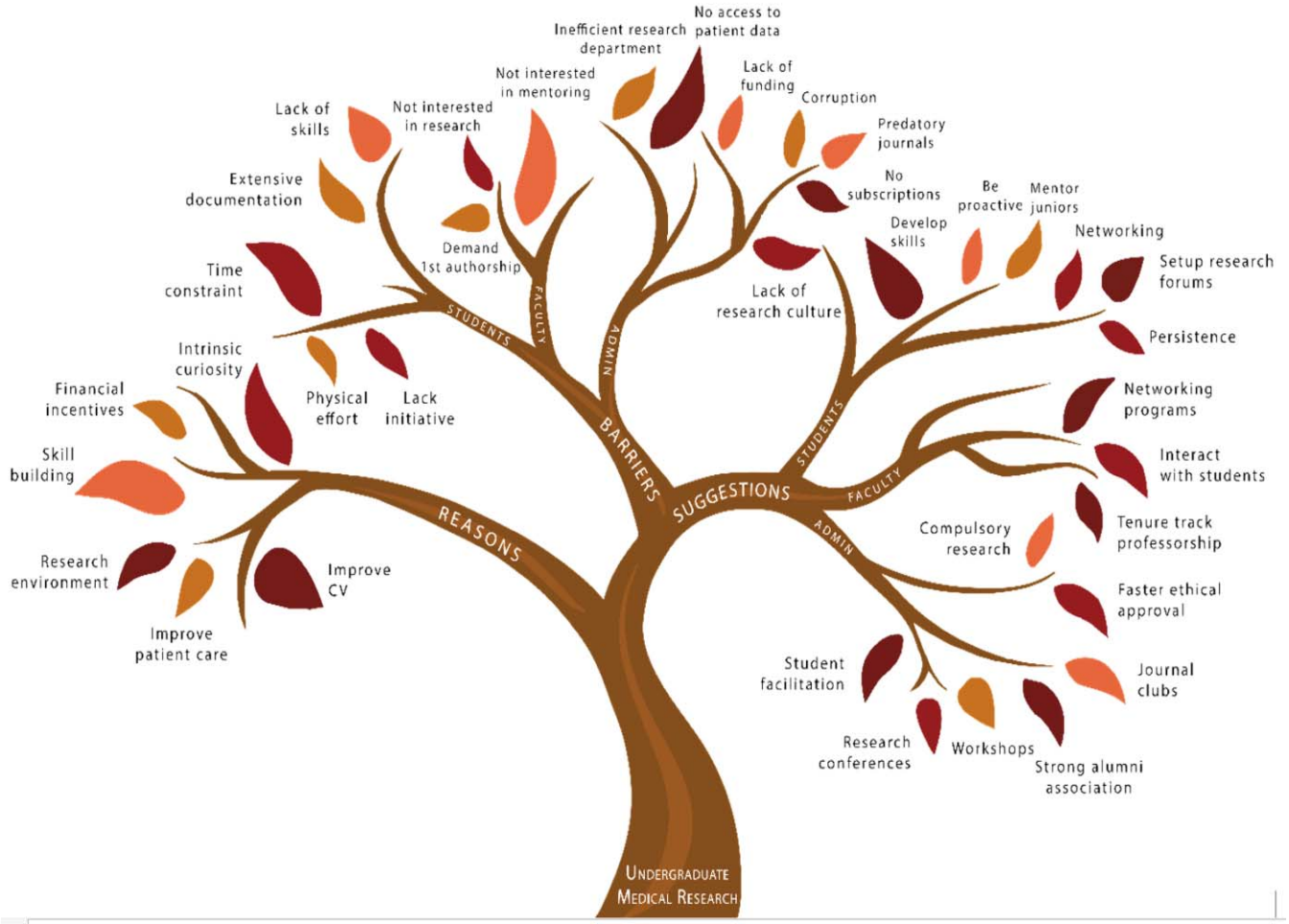

Figure-2: Themes and major subthemes identified in the study, with the size of the leaf indicating the magnitude of response in terms of frequency.

their CV even when they don't like doing it"

Talking of barriers to producing high quantity and quality research, some students described quality research as a research adding significant content to the existing pool of knowledge, while for others it was publication in high impact factor journals or having respectable number of citations. Nevertheless, a common view was that research in Pakistan was incompatible with majority of the global research in terms of quality. The reasons put forward were divided into 4 categories.

Administrative issues: All students from public, and most from private sector universities complained that their universities did not provide infrastructure conducive to research. Rarely were academic papers discussed in classroom settings and students studied their syllabi in a monotonous fashion. Research methodology curriculum was also taught without any practical demonstration. Even what was taught was considered inadequate to conduct research.

All these factors, along with scarcity of journal clubs, workshops and research conferences limited students' exposure to research and led to a poor research culture in the university.

Students narrated unpleasant experiences with faculty and found themselves on their own to seek their way in research. Some students empathised with their teachers, and blamed the university administration for not adequately incentivising mentorship. Quantity of research being given priority over quality for promotions, and lack of allotment of funds for UR deterred the faculty from providing mentorship. A student said: "*Without professional and financial incentives, passion cannot last long.*"

Even if students rose above this lack of support, long processing period of obtaining ethical approval and lack of access to medical records due to improperly maintained data registries forced them to rely on conducting either small cross-sectional studies or writing review articles using data from studies performed abroad. Most students chose the latter, thereby reducing the utility of their efforts for their own community.

Faculty-related issues: Despite an understanding attitude towards their teachers among some students, most were not satisfied with the mentorship provided by them. With the exception of participants from two private-sector universities, students found faculty unwilling to guide undergraduate students which at times resulted in students deserting their projects midway. A second year medical student at a public-sector university said: "*You don't know where to start, what skill set you require, which softwares to learn. Students don't know how to select journal for their article and that is a big challenge they face. As a newbie, you can't be smart on your own. We need to get guidance.*"

Furthermore, students believed that the faculty members who took up research projects with students did so to increase the number of publications on their own CV. This attitude resulted in studies with poor design and methodology. Also, the students felt that the faculty took unfair advantage of their position as undergraduates could not obtain ethical approval on their own. This toxic research culture resulted in the essence of mentorship being lost. A third year student from a private-sector university said: "*If you make the wrong choice of the supervisor, then you are also going to suffer from that. Because I did end up going through the situation where the supervisors sometimes take advantage of the students to get their own research paper out of it, and you are kind of left in this position where you know there is nothing.*"

Students who had experienced mentorship under both foreign and local supervisors claimed that it was more difficult to approach their local teachers than reaching their foreign supervisors. "*It is easier to reach a professor in UC (University of California) Berkeley than to reach my professor in my department.*"

The lack of guidance left the students to online resources to work their way out. Rare number of students were able to get a kick-start in research either due to some personal acquaintances or they were lucky to get a good mentor.

Student-related issues: Deficient interest of the authorities in UR research translated into lack of seriousness and initiative from students. Also, as research was not embedded in their curriculum from the beginning, they found it difficult to take time out for research with their demanding studies. Undertaking a research project in the 4th year is a mandatory part of coursework in most universities. However, in the words of a 3rd year student, "*Because many people don't know where to start from, they really kind of just have to wait till the 4th year and then they kind of get guidance and by then it is sort of too late for them.*"

Adding to the struggle of the few research enthusiasts was the non-serious attitude of their peers. Working in groups where other students were not as devoted or interested resulted in projects being discontinued midway or producing work of marginal quality.

Holding their own community accountable, the participants acknowledged that research was a long process and students would require to develop patience and persistence to sail through.

Other issues: "*Pakistan has only a handful of indexed medical journals, which coupled with the emphasis on research for promotions has produced a*

favourable environment for predatory journals which publish flawed research in exchange for monetary compensation."

The participants stated that government organisations were responsible for maintaining quality check and balance on medical colleges. They mentioned that unethical practices regarding research continued even though there were policies concerning these matters.

Focus areas of improvement: Participants believed that the university administration held the primary responsibility for establishing a conducive environment for research. Students suggested holding frequent research workshops and conferences to develop skill and interest within the students. These platforms could provide opportunity to URs to share their results and learn from the feedback of experts. These assemblies could also offer excellent networking opportunities to the young researchers. Strengthening students' connection with alumni placed locally and abroad could further improve research opportunities for students.

Research electives and attendance concession to students involved in active projects could further facilitate them.

"They have a decent plan on paper, it is just the execution that fails miserably. In my opinion, they simply need to give it more importance and facilitate students who show an interest."

The students acknowledged that the research culture could not flourish without the support of their teachers. They craved for opportunities to interact with senior researchers in a semi-formal environment. The students expected the faculty to consider them beginners, and mentor them accordingly, while also respecting their autonomy in projects. They once again placed the responsibility on administration for incentivising mentorship for faculty. Financial enticements and tenure track professorship where quantity of published papers becomes the criteria could provide tangible incentives. Furthermore, dedicated researchers alongside clinicians as decision-makers could help improve policies. The students also suggested shifting ethical review process online to save time and improve efficiency.

Apart from a conducive administrative framework, the students suggested reorienting the curriculum to provide research exposure from initial years. Students said that universities fail to inspire students towards research because it is not given priority in the programme, endangering the future of evidence-based medicine. Students suggested teaching proposal writing in the first year and keeping synopsis submission a mandatory element of the course by the end of the year. The students wanted research methodology curriculum to expose them to a wide variety of study types. Statistics was highlighted as a subject that could be taught in more detail along with the relevant software and practical application using real world datasets.

Even though the policies mentioned above could result in greater interest and exposure, the students should recognise the realities of their system and learn to work their way around the limitations. Keeping the university administration in the loop, student-led societies could create platforms where senior students could mentor their juniors by sharing their research, experience and advice. The participants advised the students to learn on their own and use all available online resources and read scientific literature as regular practice. Special emphasis was laid on learning data analysis and practising good oral and written communication skills. Learning the dynamics of a good mentor-mentee relationship was another point emphasised. "*The ability to find good mentors and the ability to understand why they are even considering those people as their mentors. And then what to expect from those mentors."* Through networking with researchers across the globe using social media, students should learn from systems with bigger and better dynamics to the healthcare field.

Discussion

The current study reported an in-depth insight into the factors posing hindrance to research in medical undergraduates and their ideas on how this process can be improved to facilitate students interested in research. To the best of our knowledge, the current qualitative study is the first on the topic which includes participants from multiple public and private medical universities across different cities of Pakistan. Using inductive thematic analysis, the study was able to get a breath of ideas which accurately represented students' viewpoints without influencing it towards certain outcomes. The study is also unique in not only assessing barriers to conducting research among undergraduates, but to also have evaluated the factors deterring quality research and suggests solutions for the identified issues.

The pressure of completing the overwhelming medical syllabus in the allotted five years has pushed research down in the priority list of medical curricula. Time constraint has been globally reported by medical students as a major barrier towards conducting research[13,17-19]. Nevertheless, some universities have been able to fit meaningful research projects within their curricula, proving that the problem can be creatively overcome[20-22].

The current results revealed that the majority of medical

students in the country are not interested in research. Despite the claim of improvement in UR over the last decade in Pakistan[23], sufficient local data backs the finding[11,12,24]. Internal motivation has been found to strongly influence research involvement[25]. Timely measures to foster research interest in students from early years can help improve the prospects of evidence-based medicine.

The participants believed that the local students are deprived of effective research mentorship, while supervisors abroad are more approachable. However, interestingly, foreign students also present lack of support and mentorship as a significant hurdle in the way of UR[1,17]. Faculty needs to consider the students a valuable resource who deserve investment of their time. Simultaneously, incentivising mentoring programmes conducted by teachers will promote teaching culture in universities.

In contrast to international findings, none of the participants in the current study, or earlier studies conducted in Pakistan[6,26] reported to be motivated towards research due to inspiration from a role model[1, 13]. This might be due to lack of exposure to the work done by physician-scientists. More researchers in the workforce along with greater interaction with undergraduates can help foster motivation as well as aid in providing more opportunities for students.

Students' negative research experiences were related to their hesitance in volunteering for future projects[27], an observation similar to that of the current study. Extended time required to obtain ethical approval, expense of laboratory-based projects, and lack of research opportunities for undergraduates were identified as hurdles in the way of research in consistence with the reported studies[17, 20, 28].

An audit of the 'Student's Corner' of the Journal of Pakistan Medical Association (JPMA) showed that 75% of the articles were contributed by students of the Aga Khan University (AKU)[29]. This agrees with the finding that participants from the AKU were more satisfied with the situation of research in their institution and identified lesser barriers in their way of conducting research. Other institutions could use similar strategies to improve their research outlook.

The current participants suggested starting projects in the early years at medical school. They argued that it would not only avoid time constraint problems that are compounded in clinical years, but would also increase motivation among students. This finding agrees with an established educational strategy of "learning by doing" which focusses on an active learning approach[30]. Literature agrees with the suggestion of the participants, that effective research workshops and reasonable interaction of students with researchers is a successful way to inspire them for research[13, 20, 31].

The current study identified some issues bothering the students which do not seem common to the rest of the world. Our participants highlighted that local universities do not provide their students subscription to research software. The Higher Education Commission (HEC) and the Pakistan Medical Commission (PMC) need to address this problem, as search of literature does not present it as a global impediment faced by undergraduates. Lack of access to databases has, however, been reported by students of other developing countries as well[32]. Dearth of indexed local journals and faculty claiming first authorship in their students' projects have cultivated a toxic research culture in Pakistan.

Although every individual medical school provides its own unique flavour of research experiences available to the students, the themes and subthemes that materialised from the data are in many ways relevant to medical students from other developing nations. Therefore, the findings presented are relevant and transferrable to a broader international setting.

However, the current study had its limitations, as its small sample size would not allow generalisability of the findings even with data triangulation. Since the quality of the data depended upon the experience of the participants, institutions where we could not contact students with exposure to research were not included. This limited the sample to only high-merit institutions where research is given relatively more priority, but it allowed us to gather rich data from in-depth conversations. National surveys should be planned to validate the current findings.

Conclusion

Students' lack of initiative coupled with administrative, and faculty-related issues pose a serious threat to the future of evidence-based medicine. Providing more platforms to undergraduates to present their research and support of university faculty can produce a conducive environment for research. Taking note of the outlined barriers and proposed solutions will offer a ray of hope to the future of UR in Pakistan.

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