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## ORIGINAL ARTICLE

## CURRENT TRENDS IN UNDERGRADUATE MEDICAL AND DENTAL RESEARCH: A PICTURE FROM PAKISTAN

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**Background:** Initiatives taken over the last few years have led us to the day when most of the medical and dental institutions in the developed countries have established a strong research culture at undergraduate level but the situation is quite the contrary in Pakistan. This study was carried out to investigate the current trends in undergraduate medical and dental research and to highlight the research barriers. **Methods:** A cross-sectional study was conducted at six medical and dental colleges of Rawalpindi and Islamabad. A structured questionnaire was used to collect data from 300 students. Results were recorded as percentages. Findings of current survey were compared with those of already reported in literature using chi-square test. **Results:** Out of 300 students, 206 (68.7%) students had already participated in research as principal researcher, co-researcher or as a research volunteer. Internet was most effective method of publicity of research opportunities reported by 74% of students. Only 36.7% students reported the presence of student research office at their institute. Accessibility to medical and dental journals and availability of research funds were reported by 77.2% and 13.4% of students, respectively. Lack of funding and academic overload were two main research barriers reported by 92.6% and 91.9% of students, respectively. **Conclusion:** The fraction of medical and dental students who are confident that they can plan, conduct and write a research study has increased over last four years. There is an improvement in the availability of research promoting activities but the number of research barriers is still high.

**Keywords:** Biomedical research, Undergraduate, Medical, Education

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## INTRODUCTION

Research in medical profession is of great importance because of the direct impact it has on the health of the population.<sup>1</sup> Medical science is a constantly evolving subject. This fact has led to the large scale acceptance of the concept of evidence based medicine. Medical research, no matter at which level, is eventually going to affect the quality of care provided to the patients.<sup>2,3</sup> This is why, now we witness that efforts are being made to strengthen the culture of undergraduate medical and dental research at the institutional level.

Undergraduate research in medical profession can inculcate the skills of critical thinking, reasoning and having a positive mind-set towards research from the start of the medical career.<sup>4</sup> Those undergraduate students who actively take part in research are more likely to follow the notion of evidence based medicine and choose research based programs in their post-graduation.<sup>5,6</sup> In addition, research at undergraduate level helps in promotion of rational decision making in medical profession rather than rote memorization of old and, sometimes, obsolete concepts.<sup>7</sup>

Initiatives taken over the last few years have led us to a day when most of the medical and dental institutions in developed countries have established a strong research culture even at undergraduate level.<sup>8</sup> Even in Pakistan we have witnessed a boost in the

research activities at post-graduate level over the last two decades.<sup>9</sup> Almost all medical and dental post-graduation programs, including clinical specialties, have inculcated a mandatory research component, but no significant initiatives are being taken for the promotion of medical and dental research at the undergraduate level.<sup>10</sup>

Multiple factors play role in establishing a healthy research environment for undergraduate students at an institution. Faculty and administration of an institute play the key role in this regard.<sup>11</sup> Where faculty members provide adequate mentorship, administration helps by providing facilities like research labs, up-to-date libraries and access to medical journals. Moreover, it is the responsibility of the organization to improvise funds for different research activities. An undergraduate student research office can be of great help in organizing different conferences and seminars, arranging meetings with senior faculty members and researchers, facilitating the students in planning conducting and writing a research paper and keeping the track of all the research activities being carried out at the institution.<sup>2</sup>

According to previous studies carried out in Pakistan, undergraduate medical and dental students acknowledge the need of research at undergraduate level and they want to take part in different research activities.<sup>12</sup> However, a large number of barriers like

poor knowledge of research methodology, lack of funds and inadequate support from faculty and administration have a strong negative impact on the research productivity of undergraduate students.<sup>11</sup>

In Pakistan, medical and dental schools offer a 5 year programme of Bachelors of Medicine and Bachelors of Surgery (MBBS) and a 4 years programme of Bachelors of Dental Surgery (BDS). Clinical training gradually increases as the year's progress and is at its peak during last two years of the respective programmes. The students of last two years are expected to have more research experience during due to their longer stay at the institute and more exposure to research as compared to those who are in the beginning of their medical or dental education. Islamabad and Rawalpindi are two big cities that have more than six different medical and dental institutions recognized by Pakistan Medical and Dental Council (PMDC).

The research boost has already hit the undergraduate medical education system of Pakistan and rapid change in the research situation is expected. A study<sup>13</sup> was conducted by principal investigator in 2009 to assess the research activities and to highlight the barriers faced by medical and dental students in conducting a research study. The present study was carried out in concordance with the former study to find out the current trends in undergraduate medical and dental research and to compare it with the findings already reported in literature.

## MATERIAL AND METHODS

A cross sectional study was conducted in the last quarter of 2013 following the same research protocol and settings as in the former study conducted by the authors.<sup>13</sup> A survey was conducted amongst the students of third and final professional year of B.D.S. and fourth and final professional year of M.B.B.S. Student of six medical and/or dental colleges in Rawalpindi and Islamabad recognized by Pakistan Medical and Dental Council (PM&DC) were included in this survey.

A sample size of 291 subjects was required to fulfill the objectives of our study at a 95% confidence level. This sample size was calculated assuming a 50% prevalence of research knowledge, 5% bond-on error, and 10% non-response rate. Data were collected from 300 students selected under the non-probability, convenience sampling technique. Since research infrastructure, availability of research opportunities and frequency of research barriers vary from institute to institute, equal representation of each institute was ensured by recruiting same number of students from each institute.

The questionnaire was personally distributed by the members of the study group in all the settings and consent was obtained. The students returned the questionnaires on the same day. After completion of the

questionnaire a visual examination was carried out to minimize the risk of unintentionally missed data or corrupt entries. The privacy of students and institutions was ensured.

Our data collection instrument was a structured, self-administered and pre-tested questionnaire. Same questionnaire was used by the principal investigator in the previous study and was found to be appropriate in ascertaining our objectives.<sup>13</sup>

The questionnaire was divided into four sections that comprised of questions pertaining to awareness and orientation of the students towards research, different methods of publicity of research opportunities, assessment of facilities, evaluation of research promoting activities and estimation of research barriers. The demographic details of subjects included gender, name of institute, clinical year and programme, i.e., B.D.S. or M.B.B.S. The questionnaire had 52 responses in total. Out of which 20 were simple questions and 32 were just selection of different choices. All the questions were to be answered in either a "Yes" or a "No".

The data collected from this survey was recorded and analysed in SPSS-20. Descriptive statistics were performed for mean values and proportions. Chi-square test was applied to compare the results of this survey with those of already published in literature.<sup>13</sup> Results were recorded as frequencies. For all purposes, a *p*-value of <0.05 was considered as the criteria of significance.

## RESULTS

Out of 300 students included in this survey, 103 students (34.3%) were male and 197 (65.7%) were female. Two out of the six institutes included in our study were from government sector and remaining four were from private sector.

This study shows that 68.7% of students had already participated in research as principal researcher, co-researcher or as a research volunteer. Eighty eight point one percent of students agreed that there is a need of research at undergraduate level. The percentage of students claiming that they know how to plan and conduct a research study and how to write an article were 59.2% and 46.7%, respectively. Only 17.7% students claimed that they know the procedure of publication of scientific articles (Figure 1). The gender-based differences in research awareness and orientation are presented in Table-1.

Internet and interpersonal communication, indicated by 74.0% and 57.3% of participants respectively, were among top two methods of publicity of research opportunities. The comparison of reported frequency of different methods of publicity of research in 2009 and 2013 is shown in figure-2.

Students' access to different research

promoting activities has increased significantly over the last four years. Our results depict that 84.6% of the students have access to workshops and symposiums, and 79.3% to conferences and seminars. However, only 39.6% students reported that they have opportunity to meet with researchers and scholars. Table-2 summarizes the comparison of research promoting activities reported in 2009 and 2013.

‘Lack of funding’ and ‘academic overload’ was two barriers reported by more than 90% of students. The other barriers to undergraduate research were following with the descending order of their reported frequency: lack of orientation 89.7%; lack of time 87.0%; lack of interest on students’ part 83.0%; insufficient knowledge about writing and publishing 66.0%; lack of supervision 63.3%; insufficient knowledge about planning and conducting a research 59.1%; and lack of facilities 47.3%. The detailed comparison of percentages for ‘Barriers Faced’ reported in year 2009 and 2013 is provided in Table-3.

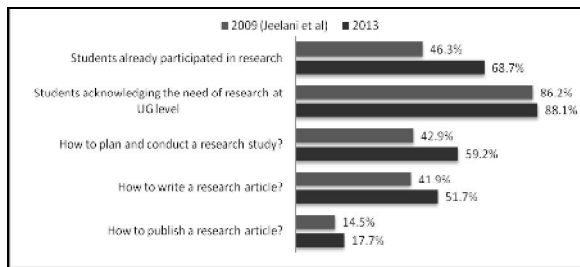


Figure-1: Student's awareness and knowledge about research: comparison between 2009<sup>13</sup> and 2013

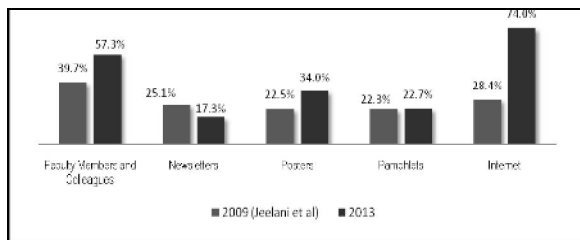


Figure-2: Comparison of reported usefulness of different methods of publicity of research opportunities in 2009<sup>13</sup> and 2013

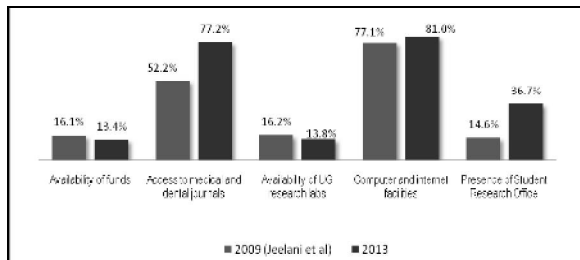


Figure-3: Comparison of reported accessibility to different research facilities in 2009<sup>13</sup> and 2013

Table-1: Comparison of research awareness and knowledge between the male and female students

Research Awareness and Knowledge	Males	female	p-value
Students already participated in research	72.8%	63.5%	<0.001**
Students acknowledging the need of research at UG level	86.4%	88.8%	0.210
How to plan and conduct a research study?	55.3%	61.4%	0.008*
How to write a research article?	44.6%	55.3%	<0.001**
How to publish a research article?	18.4%	17.2%	0.672

\*p< 0.05; \*\*p< 0.001

Table-2: Comparison of reported accessibility to different research promoting activities in 2009 and 2013

Research Promoting Activities	2009 <sup>13</sup>	2013	p-value
Workshops and symposiums	46.4%	84.6%	<0.001**
Conferences / Seminars	52.1%	79.3%	<0.001**
Meetings with academics / researchers / scholars	23.9%	39.6%	<0.001**
Research roundtables and discussions with faculty	28.9%	25.6%	0.359
Student research orientation day	14.4%	7.8%	0.006*

\*p<0.05; \*\*p<0.001

Table-3: Comparison of reported percentages for different barriers to publishing in 2009 and 2013

Barriers to Undergraduate Research	2009 <sup>13</sup>	2013	p-value
Lack of funding	86.9%	92.6%	<0.001**
Academic overload	89.6%	91.5%	0.071
Lack of orientation	81.2%	89.7%	<0.001**
Lack of time	81.8%	87.0%	0.004*
Lack of interest	64.3%	83.0%	<0.001**
Insufficient knowledge about writing and publishing	79.0%	66.0%	<0.001**
Lack of supervision	83.0%	63.3%	<0.001**
Insufficient knowledge about planning & conducting	83.2%	59.1%	<0.001**
Lack of facilities (Research labs/Internet/Libraries)	79.0%	47.3%	<0.001**

\*p< 0.05; \*\*p< 0.001

## DISCUSSION

The countries of subcontinent, considered among the third world countries, lack behind in terms of scientific development and medical research. Fortunately, a positive change has been noticed in undergraduate research culture over last few years.<sup>7</sup> We decided to conduct this study to assess the magnitude as well as the pace of these initiatives and to highlight the areas requiring improvement.

Research awareness and knowledge are two factors that closely related to the engagement of medical students in research activities. It is a well-acknowledged fact that students in Pakistan now understand the importance of undergraduate research in medical and dental profession.<sup>13</sup> This increase in awareness came along with a significant boost in the students' understanding of research methodology.<sup>12</sup> This change can be primarily associated with the

increasing number of students who have already participated in research in one way or the other.

Inadequate research training at undergraduate and postgraduate level was regarded as one of the main reasons of poor research productivity of trainees in Pakistan.<sup>9</sup> Fortunately, over the last few years we have noticed an improved curriculum of undergraduate medical and dental education with increased component of research methodology. The subject of community dentistry has been introduced in the third year of undergraduate dental education that also deals with different aspects of research methodology.<sup>14</sup>

A large number of workshops on topics like research methodology and biostatistics, medical writing, and grand proposal writing are being organized in different cities of Pakistan.<sup>15</sup> Even mega events, like IADSR 2012 conference 'Fundamentals of Conducting and Reporting Research', are also emphasizing on this aspect of medical education in which our country has been lacking since many years. Efforts taken at the government, institution and faculty levels have led us to the day when more than 50% of the undergraduate medical students in Rawalpindi and Islamabad are confident that they can plan and conduct a research study and write a research article.

In this era of digitalization, publicity of research opportunities through internet and interpersonal communications is considered most efficient. Present study reports the major transition in communication of research opportunities with internet being reported by three fourth of participants in 2013 as compared to only one fourth in 2009 as a tool of research promotion.<sup>13</sup> Communication taking place through emails and social media must also be considered in this regard since web based recruiting for health research is now becoming a trend.<sup>16</sup> The second best rated method of publicity of research opportunities was interpersonal communication with colleagues and faculty members while print media was serving least in this regard.

The culture of symposia and conferences is rapidly developing in Pakistan. The frequency of medical and dental research gatherings in twin cities has increased to at least twice over the last four years. Students' participation in such gathering acts as a big motivational factor.<sup>17</sup> A large number of students are now participating in these events in the form of oral or poster presentations.<sup>15</sup> These interactive scientific events incite the sense of competition among young researchers and provide them with an excellent opportunity to present their work. Moreover, such events help in building confidence and offering the experience of a formal scientific meeting environment to the medical students.<sup>18</sup>

The overall number of graduates opting for research based programs is also increasing.<sup>9</sup> This trend of getting involved in research among faculty members casts a positive influence on the students. This way, the combined efforts of students and faculty, supplemented by the keen efforts of the administration, can result in the development of a healthy research culture at an institute.

Lack of funding and academic overload are the two biggest barriers to undergraduate research since last four years. Lack of funding was reported as a barrier by 86.9% and 92.6% students in 2009 and 2013, respectively.<sup>13</sup> Unfortunately, it appears that very little is being done to promote the research funding of undergraduate students. The academic and clinical obligations of medical and dental students are also on hike and most of their time is spent in fulfilling clinical requirements, completing laboratory work or securing quality grades in their academics. Adequate mentorship from faculty and their understanding of students' academic schedules can facilitate them in pursuing both academic and research activities simultaneously. Provision of funds and research infrastructure by administration is imperative in order to improve research culture at undergraduate level. The situation has deteriorated in this regard over the last four years with the percentage of students reporting availability of research funds decreasing from 16.1% in 2009 to only 13.4% in 2013.<sup>13</sup>

The number of students reporting the presence of a student research office has increased to 36.7% from 14.6% in 2009, but almost two third of medical and dental students are still deprived of this facility.<sup>13</sup> Establishing an undergraduate student research office should be considered the first step towards a healthy research culture at any institute. An undergraduate student research office not only helps in organizing and channelizing different research activities but can also perform well for the motivation of young researchers.<sup>2</sup> Though situation is improving in terms of students' participation in research and availability of different research promoting activities, more efforts are required of the concerned authorities to eliminate these barriers to medical and dental research at undergraduate level.

This study has certain strengths that include: a large sample size, equal representation of medical and dental students and of all six medical and dental institutes, use of a pretested questionnaire, and one to one interaction between the research investigators and study participants during data collection. This study does not provide much information about the productivity of medical and dental students in terms of research publications and the quality of research work being done at the undergraduate level. Moreover, the non-purposive convenience sampling

technique used in this study has certain limitations. Stratified randomized sampling, though difficult to employ due to the variations in the academic schedules and vacation policies among different institutes, could have enhanced the quality of the data and thus the authenticity of the results.

## CONCLUSIONS

The fraction of those medical and dental students who are confident that they can plan, conduct and write a research study has increased over the last four years in six different institutes of Rawalpindi and Islamabad.

The number of students involved in research activities is increasing while internet has emerged as the most effective mean of publicity of research opportunities.

There is significant improvement in the availability of research promoting activities over last four years but the number of students who faced different barriers in conducting a research study is still high.

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