

# Research education in an undergraduate curriculum: Students perspective

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## ABSTRACT

**Objective:** This study aims to investigate the attitude and practice toward undergraduate research studies among medical students at Qassim University in Buraydah, Saudi Arabia.

**Methods:** An online cross-sectional survey developed based on previous studies. It was announced to all registered medical students who have active college's email ( $n = 448$ ) at Qassim University in Buraydah, Saudi Arabia during the academic year of 2016.

**Results:** The response rate was 56.6% ( $n = 252$ ). Less than half of the students have started their research projects (41.6%). Students complained about the lack of free time and the unavailability of a university hospital: 92.4% and 97.1%, respectively. One-third of students participated in extra-curriculum research, and female students were more involved. Only 15.2% have published their research and 26.7% have presented it in conferences. Male students have more journal publication in compared to their female collages while the females have presented their projects more often in conferences. To improve their curriculum vitae, 95.2% stated they are going to participate in extra-curriculum research in the future.

**Conclusions:** Students believe in the importance of research for improving their future work life. The main reason for not participating in research, beyond deficiency of research activities, is lack of free time. Students are unsatisfied with research skills gained through academic life, although their interest toward research increases and they plan on participating in future research.

**Keywords:** Research curriculum, research education, students, undergraduate research

## Introduction

Research skills are important for students to develop during the study and after graduation. Undergraduate research, also, has a good impact on the academic career.<sup>[1]</sup> Studies have demonstrated that undergraduate research experience helps raise enrollment in academic programs as well as expand postgraduate research work.<sup>[2]</sup> Other studies found that students who have published while enrolled in undergraduate studies are more likely to publish when they graduate.<sup>[3]</sup>

Recently, many universities worldwide have restructured their curriculum to introduce new strategies that enhance the student's ability to participate in undergraduate research activities either electively or as part of the curriculum.<sup>[4]</sup> They provide workshops on research and specific dedicate a students' section scientific publications,<sup>[4]</sup> giving the students several opportunities and experiences. In contrast, students in developing countries have limited chances for conducting

research very few institutions have included research skills as part of the curriculum.<sup>[5]</sup>

Most students believe in the positive impact of research and prefer to conduct research rather than participate in elective rotations.<sup>[6]</sup> Motivated by the need to publish,<sup>[5]</sup> since it allows them to play a role in improving health care. According to some students, the motivations for conducting their research are to enrich their knowledge and raise their chances at entering residency programs.<sup>[7]</sup>

Students face a lot of difficulties that hinder their quest for participating in research endeavors, such as lack of time and curriculum overload. A study conducted in 2014 at King Saud University among undergraduate students showed that more than half of respondents complained of the shortage of time.<sup>[8]</sup> Lack of research training<sup>[9]</sup> and professional supervisors<sup>[10]</sup> were considered two of the most important obstacles to conducting research.

Due to the importance of undergraduate research for the students, this study aims to determine the motives and obstacles facing undergraduate researchers by exploring the attitudes and practices of medical undergraduate students at Qassim University toward undergraduate research and identifying the level of research activity among them.

## Methods

A cross-sectional, online-based survey was conducted at Qassim University's College of Medicine. The study targeting all registered undergraduate Saudi students at the college and has active college's email (total of 448 students) the 2016 academic year. Qassim University's College of Medicine curriculum is including the research project as obligatory for all students at the end of the basic years of training. The ethical approval was obtained from the regional Research Ethics Committee in Qassim, Saudi Arabia (ethical approval number: 20170307).

Students were invited to participate in the study by filling out an online questionnaire sent to them through their college's e-mails. The questionnaire was built using the online tool SoGoSurvey.<sup>[11]</sup>

The questionnaire was developed based on questions collected from previous studies which focus on the attitudes and practices of undergraduate students toward research.<sup>[12,13]</sup> The questionnaire was formed to collect the following domains: Demographic data (nationality and gender), educational level (current level of study defined as either as a freshman for students in their 1<sup>st</sup> year or a non-freshman for those in their 2<sup>nd</sup> year or higher), and grade-point average (GPA) (students with GPAs of four or higher are considered high achievers and low achievers are defined as those with GPAs of <4). The questionnaire also assessed their practices, i.e., barriers faced when conducting research, attempts to write, and number of research studies that have been completed, publication, assessment of teamwork, and supervisors' guidance. A pilot test was conducted using 20 students who were not included in the study, and the study survey questions were slightly modified based on the pilot test results. Students were notified that participation in the study was voluntary, information collected from the survey would be used for research purposes only, and the anonymity of the respondents would be maintained. The questionnaire also stated that answering the questions would be considered as acceptance to participate in the study.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) program, version 22. Cross-tabulation and the Chi-square test of independence were applied to ascertain the difference in practice between distinct characteristics of the students.

## Results

The survey was distributed to students at Qassim College of Medicine. Out of 448 students, 252 students voluntarily participated in this study (56.6%). More than half of the participants were female students. The highest response was from freshman students. Detailed descriptive statistics are provided in Table 1.

Table 1 shows the distribution of students according to their different characteristics.

### Attitude of students toward undergraduate research

Among the participants, 48 (19 %) answered that they did not understand what scientific research meant. This response mainly came from freshmen students ( $n = 25$ , 52.1%) ( $P < 0.001$ ). However, 56 (76.7%) of the freshmen students, in addition to 149 (83.2%) of the non-freshmen students responded that they believed in the importance of research for undergraduate students ( $P = 0.03$ ).

A majority of participants acknowledged the importance of research ( $n = 205$ , 81.35%); 153 (60.7%) recommended that research be mandatory in their undergraduate curriculum. Among those who said that research should be part of their curriculum, many of them preferred to start it early in their 1<sup>st</sup> or 2<sup>nd</sup> year of medical school ( $n = 48$ , 31.6% and  $n = 52$ , 34.2%, respectively).

A total of 203 (80.6%) agreed that research would improve their critical thinking and problem-solving ability. Furthermore, 201 (79.8%) concurred that doing research would improve their chance of selection in a residency program.

### Difficulties and barriers in undergraduate research

Less than half of the students have started their research projects ( $n = 105$ , 41.6%), almost all of them non-freshmen students ( $n = 101$ , 96.2%) and 62 (59%) of them female. Many participants who have begun their research have reported difficulties while completing their projects ( $n = 96$ , 91.4%);

**Table 1:** Students' characteristics

Gender	Number (%)
Male	122 (48.4)
Female	130 (51.6)
Year of medical school	
1 <sup>st</sup> year	73 (29.0)
2 <sup>nd</sup> year	28 (11.1)
3 <sup>rd</sup> year	60 (23.8)
4 <sup>th</sup> year	61 (24.2)
5 <sup>th</sup> year	30 (11.9)

however, 91 (94.8%) of them stated that they were planning to conduct further research projects in the future. Details of these difficulties are listed in Figure 1.

Figure 1 shows the distribution of different difficulties and barriers faced by the students during conducting research.

### Students' practice in undergraduate research

Among students who completed their research, 100 (95.2%) were unsatisfied with the research skills they had gained through their undergraduate education and expressed the need for more hands-on training to improve their skills, especially data entry and analysis. In addition, 50 students (47.6%) said that the research curriculum did not prepare them well for conducting research. There were some students who had not participated in writing their drafting research proposal ( $n = 10$ , 9.5%), writing a manuscript ( $n = 25$ , 23.8%), or taking part in data analysis ( $n = 21$ , 20%).

According to students, choice of supervisors depended on expertise related to how many research studies he had published ( $n = 72$ , 68.6%). A total of 65 students (61.9%) expressed their satisfaction with the time faculty devoted toward teaching them research skills and 35 (33.3%) participants rated the supervisory support as poor. Regarding

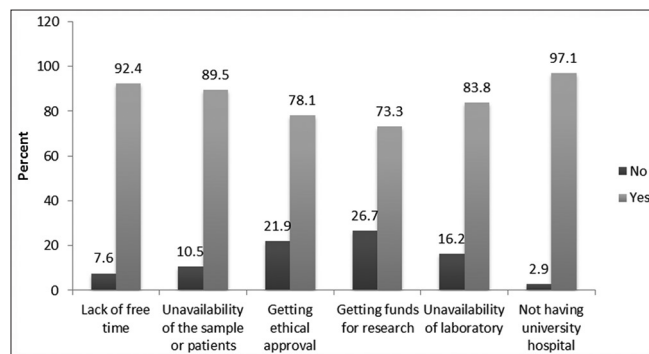


Figure 1: Difficulties faced by the students while conducting research

teamwork in research, 34 (32.4%) participants were satisfied by their teamwork experience; however, 84 (80%) said that the main drawback of teamwork was that all members of the team did not participate equally.

One-third ( $n = 35$ ) of participants has participated in extracurricular research projects and 46 (43.8%) were involved in research projects where the primary investigator was a faculty member. In both extracurricular and faculty research, the students with high academic achievements were more likely to participate [Table 2].

Table 2 shows the distribution of students according to their academic achievements in relation to their practices in research.

Only 28 (26.7%) participating students have presented their research in a scientific conference and freshmen students accounted for 3 (10.7%) of them ( $P = 0.026$ ). A small number of participants have published their curriculum research in scientific journals ( $n = 16$ , 15.2%). The minority of respondents have published their extracurricular research in scientific journals ( $n = 10$ , 9.5%). Almost all of the students ( $n = 100$ , 95.2%) stated that they were planning to participate in research projects in the future to improve their research skills and curriculum vitae. When comparing the students according to their academic achievements, low-achiever students were more likely to present their projects at conferences ( $P = 0.21$ ) and to publish their projects in journals ( $P = 0.086$ ) [Table 2].

Although female students have demonstrated better research practice as they conducted extracurricular research more often and tended to present at conferences more often, male students had more journal publications (not statistically significant) [Table 3].

Table 3 shows the distribution of students according to their gender in relation to their practices in research.

Table 2: Difference in students' practices according to their academic achievement

Practice	High achievers $n=48$ (%)	Low achievers $n=57$ (%)	P value
Participate in extracurricular research $n$ (%)			
Yes	21 (60)	14 (40)	0.038
No	27 (38.6)	43 (61.4)	
Conference presentation $n$ (%)			
Yes	10 (35.7)	18 (64.3)	0.21
No	38 (49.4)	39 (50.6)	
Journal publication $n$ (%)			
Yes	2 (20)	8 (80)	0.086
No	46 (48.4)	49 (51.6)	
Involved in faculty research project $n$ (%)			
Yes	25 (54.3)	21 (45.7)	0.117
No	23 (39)	36 (61)	

**Table 3:** Difference in students' practices according to their gender

Practice	Male n=43 (%)	Female n=62 (%)	P value
Participate in extracurricular research n (%)			
Yes	16 (45.7)	19 (54.3)	0.483
No	27 (38.6)	43 (61.4)	
Conference presentation n (%)			
Yes	11 (39.3)	17 (60.7)	0.834
No	32 (41.6)	45 (58.4)	
Journal publication n (%)			
Yes	6 (60)	4 (40)	0.198
No	37 (38.9)	58 (61.1)	
Involved in faculty research project n (%)			
Yes	15 (32.6)	31 (67.4)	0.125
No	28 (47.5)	31 (52.5)	

## Discussion

The result of this study has shown that freshmen were not well educated about scientific research, although most of them acknowledged its importance for undergraduate students. In general, students' attitudes toward undergraduate research were encouraging, as most of them recommended that it needs to be mandatory in the curriculum, and preferred to establish research skills earlier in their career. Students' awareness regarding the importance of research might because they attend orientation sessions for research inside or outside the college. Furthermore, most of the students thought that conducting research would improve their critical thinking as well as their opportunity to get selected in a residency program. The same attitude appeared to be common among Saudi students, especially after new guidelines were introduced by the Saudi Commission for Health Specialties.<sup>[14]</sup> A study conducted at King Abdulaziz University Hospital found that the major motivation for undergraduate students was a selection in training programs, reflected in 90%.<sup>[9]</sup>

In general, the percentage of students practicing undergraduate research was reassuring, since nearly half of total participants (105 out of 252) had started their research projects. An expected direct relationship has been shown between students' practices and their academic year, which is probably due to the cumulative knowledge from their curriculum. Along the same lines, a cross-sectional survey-based study was conducted among 154 medical students from King Saud bin Abdulaziz University for Health Sciences, which found that students' satisfaction levels in relation to the medical research program significantly fluctuated between 3.9% and 16.2% in their 2<sup>nd</sup> year and 9.7–21.4% in their 3<sup>rd</sup> year.<sup>[8]</sup> Nonetheless, most of the students have faced difficulties while conducting

their projects (91.4%), mainly: Unavailability of a university hospital, lack of free time, and unavailability of research subjects, and patients or laboratory. These results were in concordance with another Saudi survey-based study, conducted among 233 medical students from Taibah University, which found that students main barriers to conducting research were mainly lack of time (89.5%), work-related stress (83.2%), and lack of supervisors (73.3%).<sup>[15]</sup> Different views were reported in international studies; Griffin's study, for example, reported that the unavailability of research opportunities was the main drawback when conducting and publishing research for students from seven medical schools in the UK.<sup>[16]</sup> From the various results, it is apparent that there is an urgent need for faculty and administrators from the college research center to address and solve these barriers by providing access to the facilities for students.

A minimal percentage of students had not been involved in research proposal writing (9.5%), manuscript writing (23.8%), or even shared in data analysis (20%). Even so, students welcomed hands-on training, especially data entry and analysis and this reflected the interests of medical students at Qassim University. From the students' points of view, the research curriculum alone did not seem to be enough, according to 47.6%, to prepare them to conduct research. Fang and Meyer studied intensive research-training programs which, supported by experience, were effective in advancing students toward solving scientific issues and building future scientist-physicians.<sup>[17]</sup> This would also help increase knowledge on health-care research, and support academic positions.<sup>[17,18]</sup>

Almost all of the students showed a positive view of research and were planning to conduct research projects to improve their curriculum vitae (95.2%). Students were not only interested solely in curricular research but also in extracurricular research, which was reflected by one-third of the students. Therefore, 43.8% of them participated in faculty research projects, they tried to judge their supervisors through their number of publications, and mostly depended on this factor when they selected their supervisors (68.6%). Unfortunately, due to the shortage of research supervisors and supervisors' free hours which caused delays in supervisors' responses, one-third of students rated their supervisor support as poor. Neither of these drawbacks was limited to Qassim College of Medicine. In 1994, Goodman reported similar cases demonstrating that demotivation of the students and poor student-supervisor relationships were the main barriers for completing research projects.<sup>[19]</sup>

A minority of students had participated in research presentations at medical conferences (26.7%), and freshmen accounted for 10.7% ( $P = 0.026$ ). Limited publication activity was described by all students who had started their curriculum research, in that only 15.2% had published it in scientific journals. Unexpectedly, low achievers were significantly more intent on presenting at conferences and publishing their projects

in journals in comparison with high achievers whose main concerns were their studies.

Research dissemination among undergraduate students in this study showed some gender difference. Female students were more interested to participate and involved in research activities. However, male students had more journal publication comparing to their female colleges that may be explained by that the female students were trying to be involved in many projects and they do not concentrate in a project until it gets published. Another reason for low publication rate among female students is that they participated more in faculty research projects which are usually big studies and takes a longer time to be published.

The study was subjected to some limitation as the study was targeting only one college and one research curriculum. That's might affect the generalization of the results due to different college environment and teaching strategies. In addition, online questionnaire limited the study subject's participation because not all the students are using the e-mail address regularly and they can miss the survey.

This study sheds light on students' perspective toward undergraduate research at Qassim University. Although the students' practice was not as hoped, their knowledge and attitude were promising. To improve students' research practices, we recommend allocating faculty time for providing research support to students as well as develop research focused curricula. We hope that the findings of the study along with recommendations would foster the curriculum development at Qassim College of Medicine and other universities that are working to improve and strengthen students' research activities.

## Conclusion

Students acknowledge and believe in the importance of research for improving their future by increasing their chance in the residency program. Moreover, students recommended that research be mandatory during the early years of medical school. From the students' points of view, the main reasons for lack of research activities were the unavailability of a university hospital, lack of free time, and insufficient supervisory support.

Students were dissatisfied with research skills which they have gained through academic life, although their interest toward research has increased and they have planned to participate in further research in the future to improve research skills and curriculum vitae.

Students had inadequate research practice during their undergraduate studies as a minority of students had journal publications and conference presentations. Although female students were more involved in extracurricular projects, they were less likely to publish them. Unexpectedly, students with lower academic achievements experienced better

research dissemination (journal publications and conference presentations) than high achievers.

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