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Research Article

**PERCEIVED BARRIERS TOWARDS PARTICIPATION IN
UNDERGRADUATE RESEARCH ACTIVITIES AMONG MEDICAL
STUDENTS AT AL IMAM MUHAMMAD BIN SAUD UNIVERSITY-
COLLEGE OF MEDICINE: A SAUDI ARABIAN ISLAMIC UNIVERSITY
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Abstract:

Background: Research is known to be one of the fundamental tools in developing science especially in medicine. Therefore, conducting research at undergraduate level is significantly important. It is also of interest to investigate if their barriers and motivations towards participation in research activities are significantly different across students' characteristics at Imam University—College of medicine, Saudi Arabia.

Methods: An online, anonymous, cross-sectional, self-rating survey was conducted. The aim of this study is to identify barriers and motivations towards participation in undergraduate research activities was performed to determine if there is a significant difference in barriers and motivations towards participation in undergraduate research activities across females and males students' characteristics.

Results: One-hundred and twenty-four students (n=124/280) participated in the survey with a 44.3% response rate. The top three barriers toward participation in undergraduate research activities were "lack of support" with mean score of 3.97, "lack of on-campus basic science research laboratories" (3.82), and "lack of effective Undergraduate Research Committee" (3.81). Statistically significant differences of means were identified by academic year regarding experience of previous bad research (1st vs 2nd year: 2.72 vs. 3.38, p = 0.003) and hatred towards scientific complexity of research (1st vs 2nd year: 2.84 vs. 3.71, p < 0.001). In terms of motivation, the most important attribute that drives students to participate in research activities is to facilitate entry into competitive residency training programs, particularly among female students that scored this attribute significantly higher than the male students. (female vs. male: 4.27 vs. 3.70, p = 0.001)

Conclusion: The results were similar to local and western studies. Students show very high motivation to participate in undergraduate activities particularly to facilitate entry into competitive residency training programs. Research committees should consider these barriers and perform significant solutions.

Keywords: Independent sample t-test, Medical students, Research, Al Imam Muhammad Bin Saud University, Saudi Arabia

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INTRODUCTION:**BACKGROUND:**

This paper highlights the importance of the research in an undergraduate level course at Imam University—College of medicine, Saudi Arabia. It underscores how the undergraduate level students would benefit from the research activities and also identifies the challenges and barriers towards the participation of students in such medical research activities.

Benefits of participation of students in research

The classroom and curriculum based studies are never sufficient to hone the skills of the medical students in the rapidly changing field of medicine. Any syllabus, howsoever well designed it may be is insufficient unless it is complemented with some research to give the student the much needed practical experience. The students would know how the medicines, treatment methods and therapies were discovered and developed. Active participation in the research would give them a chance to review medical literature from the top journals, opportunity to attend conferences and talks and would give them the food for thought. Unless they know and appreciate the discoveries and development of the modern day medicine, they can't be motivated to undertake medical research in their own careers.

They would develop tolerance to obstacles, they would learn to work both in team and independently, would understand how the knowledge is constructed and would gain the interest, courage and self-confidence to take the research work as a career. They would learn how every claim in research requires supporting data and arguments, how scientists understand the problem and work towards its solution. They would learn lab techniques, skills like interpretation of results and would be able to analyse clinical data. This would enable them to integrate theory and practice and will enable them to have a clarification of career path.

Barriers of student participation in research**activities**

There are several impediments that can be identified for less student's participation in the research activities at the undergraduate level. They are cultural, behavioural and technical too. First of all, Imam University in Saudi Arabia is still emerging in the research arena and needs a lot of resources and motivation to get going with the research in the field.

1. The curriculum is often designed to not leave much time for the students to take interest and participate in the research activities. The syllabus, practical, exams and vacation should be so planned to give students enough time to do research as well, even better if a small part of the grade is based on the research component as well.
2. Eminent faculty and research mentors should be there in the college staff who can supervise and assist students with identification of research area, problem statement formulation, literature review and experiments related hurdles. Lack of faculties who have themselves done research is a big problem.
3. The colleges lack a designated undergraduate research committee to oversee, assist and promote research. This should be established to help students.
4. Colleges often lack state of the art labs and equipment to support research. No research can happen if the equipment are absent. Lack of funds to buy medical equipment is a deal breaker for research students.
5. Often, students are not supported and motivated to undertake research at undergraduate level. Sessions should be organised to address lack of student and faculty interest in the research activities.
6. Given the cultural and ethnic background of the college students, students are not able to find same sex partners in the research and college also takes no steps to resolve this.

7. Students are often not given credited authorship in few cases, which spreads the message that research is unworthy of the credit and benefits. This is also a spoiler.
8. Lack of good peer review of the papers and lack of opportunities of presentations in the reputed scientific journals is also a major issue why students don't take interest in research.
9. Research is not given importance in clinical careers is also why students are not inclined towards it. Research is not sufficiently incentivised to motivate the upcoming students.
10. Also, the colleges lack the collaboration with other reputed research institutes of national and international eminence to facilitate research. They also lack the research stipends and fellowships to motivate students. Visiting faculties and industry leaders in medical research will motivate students to engage into research but the lack of it makes research difficult.
11. Finding the right team members and the bad past experiences related to it play a role as well.
12. In few cases, fear of sexual harassment is also a reason girl don't think of coming into research.
13. Enough scientific journals, other supporting ecosystem like enlightened and reputed faculty and cooperative lab boys and non-prioritization of research by college administration are the major factors responsible for not enough undergraduate students taking up research.
14. The coursework lacks the research courses that could motivate students to get involved in research.
15. Lack of role models in the clinical research at the undergraduate and post graduate level is also responsible for less students coming forward to do research.

There are several number of studies which comprehensively explored the barriers towards participation in undergraduate research activities in other Saudi Arabian universities, namely Abu-Zaid, et al. (2014), Alamodi, et al. (2014), and Kharraz, et al. (2016). A review of literature showed that there were no data related to barriers and motivations of medical students at Al Imam Muhammad Bin Saud University. Therefore, the objective of this study is to assess further characteristics of this issue at Imam University.

SUBJECT AND METHODS:

The study took place at Al Imam Muhammad Bin Saud University-College of Medicine, Saudi Arabia. It was a cross sectional survey among medical students. The questionnaire was distributed to 280 registered medical students at the college and less than half were participated in this study. More precisely, there were 124 out of 280 students who participated, filled, and returned the study questionnaire, showing a response rate of 44.3%. Participation in this study survey was completely voluntary, and full confidentiality and anonymity were maintained at all times, with no identifying information being recorded in the survey results.

DATA COLLECTION:

The questionnaire consists of three main parts. The first part documented the demographic data of the participants such as gender, academic year, academic performance, and involvement in previous research activities at the college. Questions in the second part pertained to assessing students' barriers toward research activities. The final part addressed questions related to their motivation when participating in research activities.

Students' barriers and motivations in research activities were assessed using Likert response scale from 1 to 5 ((1= totally disagree; 2= disagree; 3= neutral; 4= agree; 5= totally agree). The barrier section consists of 18 statements and motivation section consists of 17 statements.

STATISTICAL ANALYSIS:

IBM SPSS version 20 statistical software (IBM, Armonk, NY) was used to carry out the analysis throughout this study. Exploratory data analysis was first examined to get insight into the data by calculating summary statistics (such as mean and standard deviation) and also display them with bar charts. Independent sample t-test was performed to determine if there is a significant difference in barriers and motivations towards participation in research activities across academic year, academic performance, gender, and participation in previous research activities. Test statistic with p-value less than 0.05 considered a statistically different. All the mean values are represented as mean (SD).

RESULTS:

Demographic Profile

Figure 1 illustrates demographic information of the participants. Of the 124 students participated in the study, 64 were males (52%) and 60 were females

(48%). Majority were in their first year (55%) and the remaining 45% were in their second year. Approximately 6 in 10 students have high academic

performance, GPA > 3.75/5.0. More than half ever participated in previous research activities at the college.

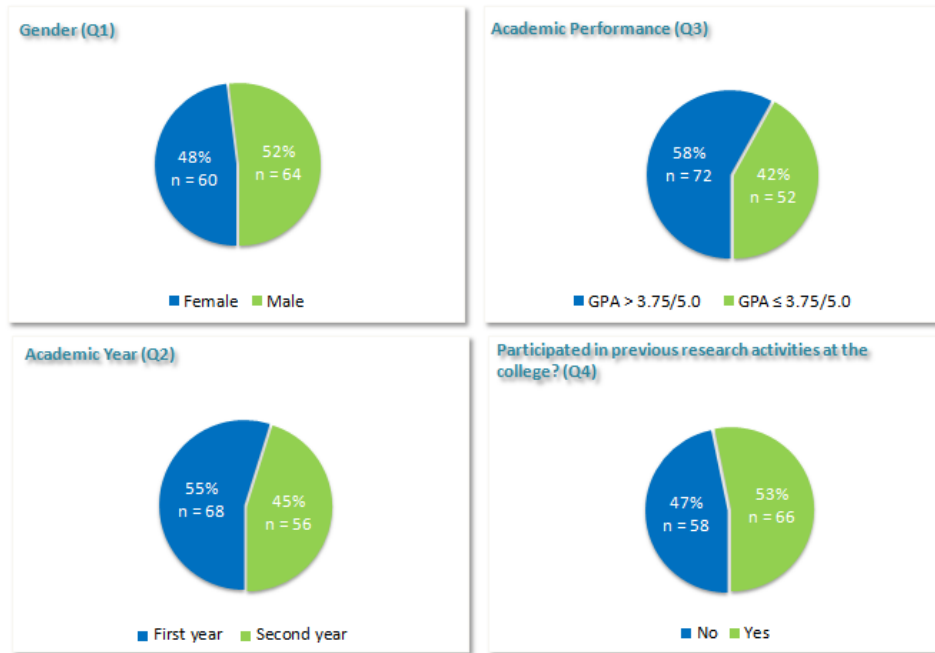


Figure 1. Demographic Profile

Barriers towards participation in research activities

Participants were asked to rate 18 statements related to barriers towards participation in research activities on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Figure 2 indicates that

lack of support (Q5_7) was the number one barrier to participate in research activities with mean score of 3.97. The second and third barriers were lack of on-campus basic science research laboratories (Q5_5) and lack of effective Undergraduate Research Committee (Q5_4).

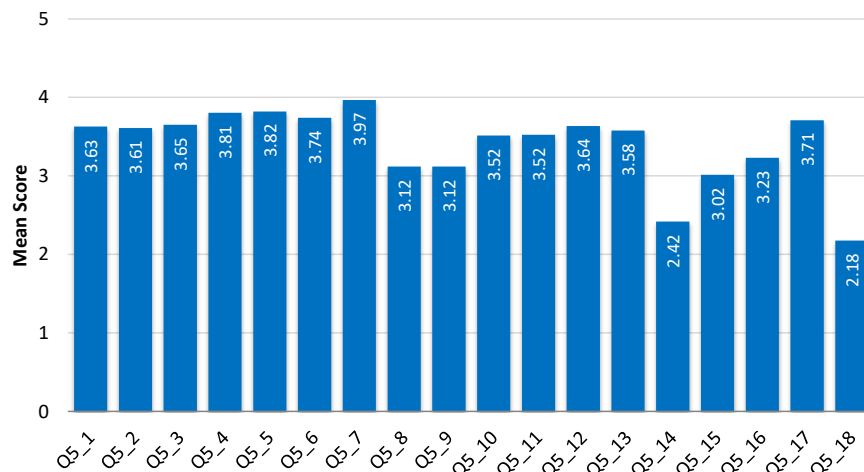


Figure 2. Mean score of barriers towards participation in research activities

Table 1 summarizes the results of independent sample t-test to see if there is any significant difference in barriers towards participation in research activities across demographic variables. In terms of academic years, two statements were found to be significantly different between first and second year students, i.e. "I had previous bad research experience(s) with projects/mentors/co-authors" and "I hate the scientific complexity of the research". The results indicate that the second year students were more likely than the first year students to agree strongly on barriers about experiences of previous bad research (first vs. second year: 2.72 vs. 3.38, $p = 0.003$) and hatred towards scientific complexity of research (first vs. second year: 2.82 vs. 3.71, $p < 0.001$).

In terms of academic performance, two statements were also found to be significantly different between students with low and high GPA score, i.e. "Lack of finding same gender research mentor" and "Research is not important for clinical research". Students with low academic performance were more likely to agree that research is not important for clinical careers (low vs. high GPA: 2.71 vs. 2.21, $p = 0.029$) and less likely to agree about lack of finding same-gender research mentor (low vs. high GPA: 3.50 vs. 2.85, $p = 0.001$).

In terms of gender, four statements were found to be significantly different between male and female students, i.e. "I had previous bad research experience(s) with projects/mentors/co-authors", "I hate the scientific complexity of the research", "I am afraid from sexual harassment in research environment", and "Lack of support to participate in research activities". Male students are more likely to have previous bad research experiences (male vs. female: 3.23 vs. 2.78, $p = 0.044$) and hate the scientific complexity of research (male vs. female: 3.61 vs. 2.83, $p < 0.001$) than female students. In addition, male students appeared to be more afraid from sexual harassment in research environments than female students (male vs. female: 2.56 vs. 1.77, $p = 0.001$). Female students tend to agree strongly than male students on lacking to have support to participate in research activities (male vs. female: 3.78 vs. 4.17, $p = 0.032$).

In terms of participation in previous research activities, two statements were found to be significantly different between those who ever participated and those who didn't, i.e. "Lack of formal research courses in curriculum" (yes vs. no: 3.41 vs. 3.84, $p = 0.026$) and "Research is not important for clinical careers" (yes vs. no: 2.64 vs. 2.17, $p = 0.042$).

Table 1. Mean score of barriers towards participation in research activities by demographic variables

Question	Item	Total	Academic Year			Academic Performance			Gender			Participation in previous research activities		
			First Year	Second Year	P-value	GPA ≤ 3.75/5	GPA > 3.75/5	P-value	Male	Female	P-value	Yes	No	P-value
Q5_1	Lack of time	3.63 (1.13)	3.71 (1.07)	3.54 (1.21)	0.406	3.83 (1.04)	3.49 (1.17)	0.097	3.58 (1.17)	3.68 (1.1)	0.606	3.74 (1.11)	3.50 (1.14)	0.235
Q5_2	Lack of formal research courses in curriculum	3.61 (1.09)	3.68 (1.11)	3.54 (1.08)	0.478	3.77 (0.88)	3.50 (1.22)	0.178	3.48 (0.99)	3.75 (1.19)	0.178	3.41 (1.14)	3.84 (1.01)	0.026*
Q5_3	Lack of research mentors	3.65 (1.16)	3.66 (1.22)	3.64 (1.10)	0.929	3.58 (1.11)	3.71 (1.2)	0.537	3.47 (1.1)	3.85 (1.2)	0.068	3.59 (1.2)	3.72 (1.12)	0.526
Q5_4	Lack of effective Undergraduate Research Committee	3.81 (0.95)	3.76 (1.02)	3.86 (0.86)	0.592	3.87 (0.84)	3.76 (1.03)	0.560	3.73 (0.88)	3.88 (1.03)	0.386	3.74 (1.01)	3.88 (0.88)	0.426
Q5_5	Lack of on-campus basic science research laboratories	3.82 (1.09)	3.81 (1.15)	3.84 (1.02)	0.878	3.81 (1.05)	3.83 (1.13)	0.898	3.66 (1.00)	4.00 (1.16)	0.079	3.80 (1.13)	3.84 (1.06)	0.832
Q5_6	Lack of funds to conduct research projects	3.74 (1.03)	3.71 (1.02)	3.79 (1.06)	0.671	3.83 (0.96)	3.68 (1.09)	0.439	3.63 (0.92)	3.87 (1.14)	0.195	3.59 (1.08)	3.91 (0.96)	0.083
Q5_7	Lack of support to participate in research activities	3.97 (1.00)	3.9 (1.04)	4.05 (0.96)	0.390	3.96 (0.97)	3.97 (1.03)	0.954	3.78 (1.02)	4.17 (0.96)	0.032*	3.91 (1.03)	4.03 (0.97)	0.490
Q5_8	Lack of interest in research	3.12 (1.3)	3.04 (1.39)	3.21 (1.19)	0.470	3.17 (1.20)	3.08 (1.37)	0.706	3.19 (1.15)	3.05 (1.44)	0.558	3.23 (1.29)	3.00 (1.31)	0.333

Question	Item	Total	Academic Year			Academic Performance			Gender			Participation in previous research activities		
			First Year	Second Year	P-value	GPA <= 3.75/5	GPA > 3.75/5	P-value	Male	Female	P-value	Yes	No	P-value
Q5_9	Lack of finding same-gender research mentor	3.12 (1.14)	3.1 (1.2)	3.14 (1.07)	0.847	3.50 (1.06)	2.85 (1.12)	0.001*	3.17 (0.95)	3.07 (1.31)	0.609	3.17 (1.09)	3.07 (1.2)	0.635
Q5_10	Lack of "credited authorship" when I participate in research projects	3.52 (0.91)	3.5 (0.94)	3.54 (0.87)	0.828	3.60 (0.87)	3.46 (0.93)	0.405	3.42 (0.81)	3.62 (0.99)	0.233	3.55 (0.98)	3.48 (0.82)	0.702
Q5_11	Lack of research publishing in peer-reviewed journals	3.52 (0.94)	3.43 (0.97)	3.64 (0.90)	0.204	3.65 (1.01)	3.43 (0.89)	0.193	3.41 (0.92)	3.65 (0.95)	0.150	3.50 (0.98)	3.55 (0.90)	0.761
Q5_12	Lack of research presentation in local/international scientific conferences	3.64 (1.01)	3.66 (1.00)	3.61 (1.02)	0.765	3.79 (0.96)	3.53 (1.03)	0.156	3.53 (1.05)	3.75 (0.95)	0.228	3.56 (0.96)	3.72 (1.06)	0.369
Q5_13	Lack of effective team work with research mentors and/or co-authors	3.58 (0.99)	3.49 (1.04)	3.7 (0.91)	0.238	3.60 (1.01)	3.57 (0.98)	0.883	3.61 (1.00)	3.55 (0.98)	0.740	3.59 (0.94)	3.57 (1.04)	0.902
Q5_14	Research is NOT important for clinical careers	2.42 (1.27)	2.22 (1.27)	2.66 (1.24)	0.054	2.71 (1.21)	2.21 (1.28)	0.029*	2.61 (1.22)	2.22 (1.30)	0.085	2.64 (1.32)	2.17 (1.17)	0.042*
Q5_15	I had previous bad research experience(s) with projects/mentors/co-authors	3.02 (1.25)	2.72 (1.24)	3.38 (1.17)	0.003*	3.04 (1.28)	3.00 (1.23)	0.866	3.23 (1.15)	2.78 (1.32)	.044*	3.21 (1.22)	2.79 (1.25)	0.062
Q5_16	I hate the scientific complexity of research	3.23 (1.26)	2.84 (1.24)	3.71 (1.11)	<0.001*	3.25 (1.28)	3.22 (1.25)	0.904	3.61 (1.12)	2.83 (1.28)	<0.001*	3.09 (1.27)	3.40 (1.23)	0.178

Question	Item	Total	Academic Year			Academic Performance			Gender			Participation in previous research activities		
			First Year	Second Year	P-value	GPA <= 3.75/5	GPA > 3.75/5	P-value	Male	Female	P-value	Yes	No	P-value
Q5_17	Lack of research opportunities	3.71 (1.02)	3.72 (1.12)	3.70 (0.89)	0.896	3.56 (1.09)	3.82 (0.95)	0.159	3.56 (0.94)	3.87 (1.08)	0.097	3.59 (1.05)	3.84 (0.97)	0.167
Q5_18	I'm afraid from sexual harassment in research environments	2.18 (1.36)	2.07 (1.34)	2.3 (1.39)	0.351	2.31 (1.41)	2.08 (1.33)	0.367	2.56 (1.44)	1.77 (1.16)	0.001*	2.00 (1.31)	2.38 (1.40)	0.122

Motivation towards participation in research activities

Students were also asked to rate 17 statements related to motivation towards participation in research activities on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Figure 3

shows that students have very high motivation to participate in research activities particularly to facilitate entry into competitive residency training programs (Q6_5) with mean score of 3.98. Encouragement from previous participation in research experiences (Q6_9) was rated the lowest with mean score of 3.48.

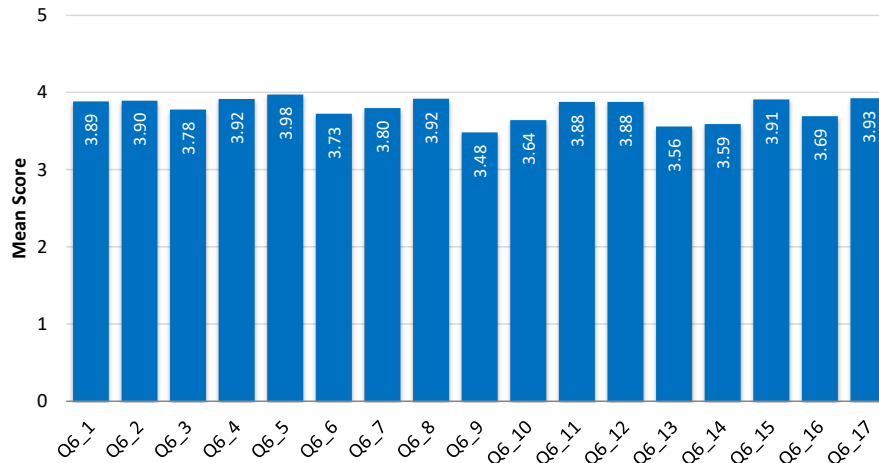


Figure 3. Mean score of motivation towards participation in research activities

Table 2 summarizes the independent sample t-test to examine if there is any difference in motivation among demographic variables. In terms of academic year, two statements were found to be significantly different between first and second year students, i.e. “Interest to improve curriculum vitae (CV)” and “Good method to fulfill leisure time”. The results indicate that motivations to improve their CV (first vs. second year: 4.19 vs. 3.59, $p < 0.001$) and fulfill leisure time (first vs. second year: 3.84 vs. 3.22, $p = 0.002$) were significantly higher among the first year than the second year students.

In terms of gender, 12 out of 17 statements were found to be significantly different between male and

female students. Female students scored significantly higher than male students for most statements related to motivation towards participation in research activities. This shows that females have higher motivation to participate than male students. In terms of previous participation in previous research experience activities, only one statement was statistically significant, i.e. “Interest to improve understanding of medical/academic subjects” (yes vs. no: 3.71 vs. 4.14, $p = 0.10$). In terms of academic performance, no statements were found to be significantly different between students with low and high GPA score.

Table 2. Mean score of motivations towards participation in research activities by demographic variables

Question	Item	Total	Academic Year			Academic Performance			Gender			Participation in previous research activities		
			First Year	Second Year	P-value	GPA ≤ 3.75/5	GPA > 3.75/5	P-value	Male	Female	P-value	Yes	No	P-value
Q6_1	Interest to improve understanding of medical/academic subjects	3.89 (0.94)	3.91 (0.95)	3.86 (0.94)	0.756	3.88 (0.77)	3.89 (1.06)	0.970	3.75 (0.93)	4.03 (0.94)	0.091	3.79 (0.9)	4.00 (0.98)	0.215
Q6_2	Interest in specific research field or medical topic	3.90 (0.83)	4.00 (0.77)	3.77 (0.89)	0.124	3.83 (0.86)	3.94 (0.82)	0.441	3.75 (0.84)	4.05 (0.81)	0.045*	3.79 (0.85)	4.02 (0.81)	0.127
Q6_3	Interest to develop transferable skills e.g., communication skills	3.78 (0.88)	3.79 (0.91)	3.76 (0.86)	0.850	3.86 (0.83)	3.72 (0.92)	0.387	3.63 (0.89)	3.93 (0.86)	0.061	3.70 (0.89)	3.88 (0.87)	0.261
Q6_4	Interest to improve curriculum vitae (CV)	3.92 (0.95)	4.19 (0.86)	3.59 (0.95)	< 0.001*	3.92 (0.93)	3.92 (0.96)	0.978	3.61 (0.95)	4.25 (0.82)	<0.001*	3.91 (0.93)	3.93 (0.97)	0.892
Q6_5	Interest to facilitate entry into competitive residency training programs	3.98 (0.93)	3.99 (1.01)	3.96 (0.83)	0.901	3.92 (0.95)	4.01 (0.93)	0.595	3.7 (0.99)	4.27 (0.78)	0.001*	3.97 (0.82)	3.98 (1.05)	0.938
Q6_6	Interest to facilitate entry to PhD program/commence a research-focused career	3.73 (0.99)	3.79 (1.02)	3.64 (0.96)	0.400	3.69 (1.06)	3.75 (0.95)	0.750	3.58 (0.87)	3.88 (1.09)	0.086	3.68 (1.04)	3.78 (0.94)	0.600
Q6_7	Interest to present research findings in scientific meetings regionally and abroad	3.80 (0.97)	3.90 (0.96)	3.68 (0.97)	0.214	3.71 (0.98)	3.86 (0.97)	0.399	3.50 (1.02)	4.12 (0.8)	<0.001*	3.79 (0.87)	3.81 (1.08)	0.898

Question	Item	Total	Academic Year			Academic Performance			Gender			Participation in previous research activities		
			First Year	Second Year	P-value	GPA <= 3.75/5	GPA > 3.75/5	P-value	Male	Female	P-value	Yes	No	P-value
Q6_8	Interest to publish articles in peer-reviewed journals	3.92 (0.87)	3.94 (0.94)	3.89 (0.78)	0.760	3.88 (0.81)	3.94 (0.92)	0.707	3.72 (0.9)	4.13 (0.79)	0.008*	3.88 (0.77)	3.97 (0.97)	0.582
Q6_9	Encouragement from previous participation in research experiences	3.48 (1.00)	3.46 (1.04)	3.52 (0.95)	0.733	3.52 (0.92)	3.46 (1.06)	0.739	3.31 (0.94)	3.67 (1.04)	0.048*	3.48 (1.00)	3.48 (1.01)	0.991
Q6_10	Motivation from parents/faculty/senior students involved in scientific research	3.64 (1.06)	3.68 (1.13)	3.60 (0.97)	0.692	3.67 (0.91)	3.63 (1.16)	0.830	3.46 (1.03)	3.83 (1.06)	0.050*	3.7 (0.98)	3.58 (1.15)	0.539
Q6_11	Necessary competency for my future clinical career	3.88 (0.92)	4.00 (0.96)	3.73 (0.85)	0.102	3.71 (0.91)	4.00 (0.91)	0.086	3.68 (0.82)	4.08 (0.98)	0.015*	3.77 (0.88)	4.00 (0.96)	0.166
Q6_12	Good method to contribute to patient care	3.88 (0.83)	3.94 (0.81)	3.80 (0.85)	0.348	3.82 (0.82)	3.92 (0.83)	0.540	3.73 (0.77)	4.03 (0.86)	0.041*	3.77 (0.7)	4.00 (0.94)	0.128
Q6_13	Good method to fulfill leisure time	3.56 (1.14)	3.84 (1.11)	3.22 (1.08)	0.002*	3.65 (0.98)	3.50 (1.24)	0.483	3.33 (1.12)	3.80 (1.12)	0.023*	3.45 (1.15)	3.68 (1.12)	0.267
Q6_14	Interest to develop research competencies (e.g., data collection & analysis)	3.59 (1.01)	3.58 (1.06)	3.61 (0.97)	0.892	3.59 (1.00)	3.60 (1.03)	0.962	3.49 (0.95)	3.70 (1.08)	0.258	3.72 (0.91)	3.45 (1.11)	0.134
Q6_15	Interest to improve understanding of medical/academic subjects	3.91 (0.92)	3.99 (0.92)	3.82 (0.92)	0.325	3.81 (0.91)	3.99 (0.93)	0.288	3.7 (0.9)	4.13 (0.89)	0.009*	3.71 (0.91)	4.14 (0.89)	0.010*

Question	Item	Total	Academic Year			Academic Performance			Gender			Participation in previous research activities		
			First Year	Second Year	P-value	GPA <= 3.75/5	GPA > 3.75/5	P-value	Male	Female	P-value	Yes	No	P-value
Q6_16	Interest in specific research field or medical topic	3.69 (0.95)	3.74 (0.91)	3.64 (1.00)	0.591	3.63 (0.93)	3.74 (0.96)	0.558	3.44 (0.91)	3.97 (0.92)	0.002*	3.77 (0.87)	3.60 (1.02)	0.323
Q6_17	Interest to develop transferable skills (e.g., critical thinking)	3.93 (0.86)	3.96 (0.82)	3.89 (0.91)	0.685	3.94 (0.75)	3.92 (0.93)	0.870	3.84 (0.89)	4.02 (0.81)	0.263	3.88 (0.83)	3.98 (0.89)	0.503

DISCUSSION:

This study focused on the barriers and motivations of medical students toward participation in undergraduate research activities. It is a very important topic because understanding the barriers and motivations of students regarding this issue can help improving research practices among future medical students.

The samples in this study were approximately equal across gender with majority are first year students and have high academic performance. Most of them ever participated in previous research activities at the college.

In this study, students highlighted several barriers toward participation in research activities as lack of support, mentoring, and facilities. More precisely, our study found that lack of support was rated the highest as barriers towards participation in research activities, followed by lack of on-campus basic science research laboratories, and lack of effective Undergraduate Research Committee. This findings has appeared to be consistent with finding of other studies (Kharraz et al., 2016; Nooeralahi et al., 2015; Giri et al., 2014; Griffin et al., 2011). We also found that the barrier in terms of lack of support is more apparent among female students. The major barriers to conduct medical research among female students were the lack of rewards and motivation and difficulty in obtaining approval for the study which has been reported by Al-Shalawy (2014) in his study. Abu-Zaid and Altinawi (2014) also explained the reason for the obstacle to research among females was because of a strict separation of males and females in the work environment, and both were supervised by a male manager.

The motives behind conducting research during medical school included the following: facilitating entry into competitive residency training programs, developing transferable skill, improving CV, and publishing articles in peer-reviewed journals. These results are comparable to the results of other studies. In the Canadian study, approximately half participants agreed that the main reason to participate in research during medical school was to facilitate acceptance into a residency of choice (Siemens et al., 2010). Similarly, Al-Ghamdi et al. (2013) reported that more than eighty percent of medical students were highly motivated to participate in research activities in order to facilitate acceptance into a residency program. Other reasons were to attain a research publication, improve research skills, and a positive achievement on students' resume.

In addition, it is also interesting to find that motivation to be involved in research activities is generally higher among female than male students. Females tend to have more interest in specific research field or medical topic, improve understanding of medical/academic subjects, contribute to patient care, add competency for future clinical careers, publish article in peer reviewed journal, facilitate entry into competitive residency training program, and improve CV. This confirmed the findings of Abu Zaid and Alnajjar (2014) that females showed positive attitudes towards undergraduate research.

Several studies have reported how students' barriers and motivations toward research are differ by gender. To the best our knowledge, this is the first study to evaluate barriers and motivation toward research among medical students by considering other students' characteristics such as academic year and academic performance. However, we do not have enough evidence to conclude that these two issues are differ by academic year and academic performance. This indicates that whether students are in their first or second year, or whether students have high or low GPA scores, they equally likely to have the same barriers or motivations toward undergraduate research activities.

There are several limitations to this study. First, the low response rate of 44.3% which was less than anticipated. Second, this is a self-reporting study and hence the results are liable to recall bias and unverified ratings, that is overestimation and underestimation of results. Third, we exclusively used closed-ended questions, we recommend future studies to include open-ended questions to further explore students' barriers and motivations.

CONCLUSION:

The findings of our study were similar to local and western studies Barriers toward participation in undergraduate research are mainly because of lack of support, mentoring, and facilities. Students show very high motivation to participate in research activities particularly to facilitate entry into competitive residency training programs, to improve research skills, and to improve curriculum vitae (CV). Female students appeared to have higher motivation in participating research activities than the male students. We believe that findings ways to address and solve barriers by the faculty staff and administrators are very crucial to ensure an improvement in research activities among medical

students.

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