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ORIGINAL ARTICLE

Knowledge, attitudes and barriers related to participation of medical students in research in three Arab Universities

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Abstract

Background: Exposure to training in research is essential in the medical curriculum. There have been previous studies which attempted to evaluate the knowledge regarding, and attitude towards medical research in undergraduate medical students in various countries. In this study we attempted to assess the research related knowledge and attitudes across three Arab Universities namely King Faisal University (Saudi Arabia), Arab Gulf University (Bahrain) and Kuwait University (Kuwait).

Method: A cross-sectional descriptive study was employed in which all medical students' form 3rd onwards was targeted for inclusion. Anonymous self administered pilot tested questionnaire were used for data collection to assess the students' knowledge related to, attitude towards and perceived barriers to scientific research. The attitude and knowledge scores were correlated with other variables e.g. year of study, schooling background and admission score.

Result: A total of 423 completed responses were received. The knowledge score was on the lower side- mean of 3.6±1.7 on 10 questions; meanwhile the majority of the students had a positive attitude towards scientific research. Many perceived barriers were highlighted by the students such as a shortage of time and a lack of adequate mentoring.

Conclusion: The study showed a moderately high attitude score towards research, but coupled with a low knowledge score. This could be related to various perceived barriers to undergraduate research. These barriers need to be addressed and also integration of research into the undergraduate curriculum is needed to ensure an improvement in the quality and quantity of undergraduate medical research.

Keywords

Medical students, scientific knowledge, Attitudes, Research Participation, Arab Gulf Countries.

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Introduction

Training in research is an important part of medical education. The attitudes of undergraduate medical students towards research might be influenced by a number of factors such as previous training and skills in research [1], motivated faculty staff [2] and motivational rewarding environment at the institution [3]. It is essential to inculcate critical thinking and reasoning skills and to develop positive attitudes towards scientific research amongst medical students from the beginning of their carrier [1, 3]. Studies have shown that early involvement in research promotes a tendency to continue the same in later stages of the medical profession [4, 5]. Several studies [1, 4-7] have assessed attitudes towards research and knowledge about scientific research amongst medical students in developed and developing countries. Khan et al., [1] in their cross-sectional study conducted among a group of Pakistani medical students reported moderate level of knowledge towards health research where about 80% of their students were falling in the middle two quartiles of the knowledge score.

Similar trends were demonstrated by the students on the attitude score. Vodopivec et al. [6] who conducted a study with similar questionnaire among first year Croatian medical students found a similar mean knowledge but much lower attitude scores. They have explained their lower scores as to better represent the baseline effect of secondary and high school education on knowledge and attitudes for research of students. Burgoyne et al., [2] found that the majority of Irish medical undergraduate students are motivated to pursue research.
Graduate entrants and male students appear to be the most confident regarding their research skills competencies. Furthermore studies that tackled potential barriers for research conduction among under and post graduate medical students are scarce [2, 8, 9] Heavy workload, financial difficulty and poor guidance and support from the medical school were their main barriers mentioned among undergraduate medical students in Ireland [2] while among junior medical faculty a lack of research training was only barrier to have statistically significant difference between those involved in research versus not. This barrier was also reported in a study done earlier in Pakistan. [9, 10] To the best of our knowledge, none of studies that assess the knowledge, attitudes and the perceived barriers towards research among undergraduate medical students have been carried out in any country of Arab gulf region.

The objective of this study was thus to assess the level of knowledge about and attitudes towards and the perceived barriers among medical students to participate in scientific research activities in medical schools at three universities, one each in Saudi Arabia, Bahrain and Kuwait.

Method

Setting

Research does not constitute a core part of the curriculum in the three medical schools, students' researches are based on individual initiatives and they are not a pre-requisite for a medical degree. Research methods courses constitute a core part of the medical undergraduate curriculum in the three institutions and integrated with other major subjects. Some universities have recently adopted Western curricula in which a research project is mandatory and contribute to a substantial part of their aggregate marks (King Faisal and Arab Gulf Universities).

The three institutions have taken several steps to encourage medical students' research in the form of establishing laboratory facilities, provide extracurricular training for

both students and their research mentors, provision of research funds and incentives including attendance of the annual medical students' research conferences that took place in the Gulf region.

Design and Participants

This study was a cross-sectional descriptive where all medical students enrolled in the 3rd, 4th and 5th years in their respective medical schools attached to King Faisal University-Al Hassa (Saudi Arabia), Kuwait University (State of Kuwait) and Arab Gulf University (Kingdom of Bahrain) were the study population. Both genders and all nationalities were considered. The rationale for excluding the first two years based on their relatively little knowledge regarding the scientific research which may skew our data and for the 6th year, students were mostly in their clinical rotations and it was inconvenient to include them.

Data Collection

Data was collected through a self-administered, anonymous, pre-tested and validated questionnaire after seeking verbal consent following proper orientation of the students regarding the objectives and possible impact of the study. A structured questionnaire was adapted from the one developed by Vodopivec et al. [6]. Modifications were carried out after several peer review sessions to include items relevant to fulfill the objectives of the study. Vodopivec's questionnaire had a high reliability with a Cronbach's alpha of .848, while our modified questionnaire with 20 items was pilot tested on 23 medical students to assess its reliability. The Reliability coefficient (Cronbach's alpha) obtained for our final form as revealed form the pilot testing was .677.

The questionnaire consisted of the following components:

a- Personal data: Age in years, gender, year of enrollment in medical school, nationality, admission test score, type of secondary school, and parental educational status.

b- Attitudes towards science and scientific research: Twenty items with a Likert scale ranging from strongly disagree (1) to strongly agree (5).

c- Knowledge about scientific research and communication in medicine: Eight items were adapted from the initial tool used by Vodopivec et al [6] and additionally two were adapted from Khan et al. [1]. The reliability coefficient for the tool used by Vodopivec et al was 0.52. [6] A total of ten questions in multiple options format were used. Correct responses received a score of one each, while wrong answers received a score of zero. The knowledge part revealed a reliability coefficient of .451 for the 10 items included.

d- Eight statements were adapted from the available literature [1, 6, 9] to assess attitudes and participatory role of medical students in medical research.

e- The final component was composed of a list of possible barriers perceived by medical students that deter them from active participation in scientific research.

Proper orientation of the included students was carried out to explain the objectives of the study. Verbal consent was obtained before administration of the questionnaire, emphasizing the right to none participation. Data confidentiality was preserved according to the Helsinki declaration of bioethics.

Data analysis

Questionnaire forms with more than two missing elements were discarded (17 from Saudi Arabia, 12 from Kuwait and 11 from Bahrain). Data was entered and analyzed using SPSS version 13.0 (SPSS Inc. Chicago, IL). Descriptive and inferential statistics were

applied whenever appropriate. Numerical variables were reported as mean, standard deviation, and median while categorical data were reported using proportions and percentage. Non-parametric test of significance (Mann-Whitney and Kruskal-Wallis one way) were used to test the association of attitude and knowledge scores in relation to personal data of students. Spearman's Rank correlation was also used to assess the effect of age, year of enrollment on the attitude and knowledge scores. P value of < 0.05 was applied to indicate statistical significance.

Result

Response rates of 91%, 64.8% and 880% were obtained from the three medical colleges at the three universities (King Faisal University (KFU), Kuwait University (KU), and 88% Arab Gulf University (AGU) respectively. Personal and socio-demographic characteristics are displayed in Table 1.

Table 2 depicts the responses of the included medical students towards the attitude items. The majority of the students had a positive attitude to scientific research. Of the respondents 75.2 % agreed that there would be no progress of humankind without the progress of science and 81.6% agreed that the use of scientific methodology is the basis of medical progress, 85.2% agreed that every physician has to be well acquainted with scientific methodology and 82.7% agreed that the knowledge of scientific methodology is essential for obtaining accurate and objective data.

There was difference regarding attitude to science and scientific research, with respect to the university but without statistical significance. Those in KU held a higher attitude score of 69.1±9.0 compared to KFU (66.2±7.4) and AUG (66.2±7.2). Females at KFU and AGU have a higher attitude scores (67.1±7.3 and 68.3±7.2 respectively) compared to males (66.8±6.8 and 67.2±6.4 respectively) but without statistical significance. Attitude towards science and scientific research among the included medical students in relation to their year of enrollment showed no statistical difference (67.4±7.8 for 3rd year, 66.6±8.3 for 4th year and 66.8±6.5 for 5th year students, P=0.591). Third year students had a higher attitude scores (68.8±7.9 and 67.9±7.6 for KU and AGU respectively) compared to 4th and 5th years in KU and AGU.

Knowledge: A total score of 3.6±1.7 was obtained for the whole population of the included medical students at the three universities. Females were more knowledgeable about scientific research in KFU and KU (Mann- Whitney P=0.005). This gender difference was statistically significant in KU. On the other hand, males in AGU were more knowledgeable but without statistical significance.

There was a poor perception regarding the basic concepts of scientific research, as only 38.6 and 37.5 % of the respondents could correctly define 'scientific hypotheses and 'scientific theory' respectively. The same was true of basic statistical concepts like the ordinal scale (56.3% could define it) and the relation between the sample and representativeness (41.1% correct responses). The respondents also showed a poor general awareness of concepts related to medical databases and literature search. Citation index for journal articles was clear only to 28.4% of the respondents. (Table 3)

As far as actual involvement in scientific research was concerned - only 22.7 % thought they were confident in interpreting and writing a research paper. Of the respondents 16.8% have written a scientific paper. About 69 % of medical students showed a willingness for clinical research (which was

hospital based).Only 27.7% were willing to carry out community-based researches. (Table 4)

A number of perceived barriers to scientific research at their stage of medical education were mentioned by the students. The barriers mentioned by the medical students at the three Arab Universities demonstrated no significant differences. Lack of time due to being overburdened with educational activities, including exams, was mentioned by 62%.This was followed by 'lack of rewarding and motivational system' in their colleges towards those who initiate research. This was mentioned by 60% of the included medical students. Deficiency of appropriate knowledge and necessary skills ranked third. Lack of a proper mentoring to encourage and guide students in the field of scientific research was stated by 54.4%. (Table 5)

Favorable attitudes towards science and scientific research were significantly associated with the University (KU), type of secondary schools (private/international vs. public) and high educational status of the mother (Table 6). Non-parametric correlations: total attitude scores was positively associated with the admission test score (Spearman's rank r= .172, P= 0.015), while knowledge towards scientific research was negatively correlated with age of the students (r= -.158, P= 0.001).

Discussion

One of the largest studies that assessed the attitude of undergraduate medical students towards scientific research was conducted by Hren et al., in Croatia [7]. This study involved 932 students, with a response rate of 58% and showed that while the average score for attitude towards science was quite good (Mean score 166± 22 out of a maximum of 225), Knowledge score was relatively poor (Mean score of 3.2±1.7 on 8). A study from Pakistan by Khan et al., showed mean scores on a percentage scale of 49% and 53.7% for knowledge and attitude towards health related research [1]. Similarly In the present study the knowledge score was on the lower side- Mean score of 3.6±1.7 on 10 questions. There was no statistically significant difference in the knowledge scores across the three universities involved in our study. The attitude scores in our study were quite high with 81.6% agreeing that the use of scientific methodology is the basis of medical progress. Burgoyne et al. reported [2] that research competence among medical undergraduate students does not align more closely with research motivation as the letter stems from students' lack of understanding of the concept of translational research. Furthermore, lacking of students' awareness of the research activity being undertaken by their teachers and mentors augments their incompetence.

The relation between the year of undergraduate education and research knowledge/attitudes towards research has also been studied previously. The study by Khan et al., showed that students' knowledge and attitude towards health research significantly improved with increasing years of education at medical school. This according to the authors signifies a relatively satisfactory contribution of medical curriculum in developing research skills among medical students through well structured intensive training [1]. In the study by Hren et al., from Croatia, students who had finished Year 2 had the highest mean attitude and knowledge scores compared with other year groups [7]. A longitudinal study by Vukaklija et al., showed a definite increase in the attitude scores as the students moved from the first year to the sixth year of the undergraduate course [10]. In the present study there was no significant difference of attitude towards science and scientific research among the included medical students in relation to their year of enrollment. However third year students had a higher attitude scores

compared to 4th and 5th years in KU and AGU.

Gender was not a significant predictor of knowledge about health research in the study by Khan et al. However, males had a significantly higher mean score on the attitude scale [1]. In the present study females were more knowledgeable about scientific research in KFU and KU (statistically significant for KU). Females in both KFU and AGU had a higher attitude scores compared to males but without statistical significance.

Other significant factors found in the present study were that good attitudes towards science and scientific research were significantly associated with the University (KU) and type of secondary schools (private/international vs. public).

Students' high school category did not affect their knowledge or attitude scores in the study by Khan et al [1]. Total attitude scores in our study was also positively associated with the admission test score.

There are many barriers which directly or indirectly discourage undergraduate students from getting involved in research. The main issues identified in our study were a lack of time, training, incentives and mentoring. The importance of training has been highlighted by Vujaklija et al., [10] in their study from Croatia it was shown that attendance of a course on research methodology had positive short-term effect on students' attitudes toward science. This positive effect they felt should be maintained by vertical integration of the course in the medical curriculum. In a study by Park et al it was shown that while most students who took up intercalated research training programs felt that it was a worthwhile endeavor, 80% complained of various problems like the added work interfering with social activities and contact with their friends [8]. The students' perception of barriers to research may also show regional differences for e.g. between developed and developing nations. Some of the barriers related to infrastructure – like access to the internet and laboratory facilities might be less of a constraint in the more developed countries. It is obvious however that some barriers like time constraints are universal and hence activities like research, which are not a priority for undergraduate students, tend to be sidelined. The solution for this would be to attempt to seamlessly integrate research into the undergraduate medical curriculum. Formal research training during the undergraduate period correlates positively with active involvement with research in future professional settings. [8] Ejaz et al [5] have highlighted the importance of encouragement from the faculty in the context of promoting undergraduate research. We are of the opinion that formal research must be integrated into all stages of the curriculum (ensuring that it is not an optional subject). This can be in the form of short research projects guided by the faculty, which in turn should ideally be turned into scholarship in the form of conference presentations or journal publications. Such integration will help the students develop various related skills e.g. hypothesis generation, research methodology including biostatistics and scientific writing. As assessment is the most important driving force for learning, an assessment procedure should also be incorporated to evaluate the research activities of the students. Short research fellowships or intercalated degrees would be an option to encourage positive attitudes towards research during undergraduate as well as post-graduate training periods. The study by Park et al showed that of all students who had completed an intercalated research degree during the medical undergraduate course, 90% had been involved in research since graduation. [10]

Actual participation in research activities was quite low in our study, even though a large number of students were interested in clinical research. Only 16.8 % of the respondents had written any kind of scientific paper. This could be partly due to a shortage of student forums and access to scientific journals with student sections. Very good responses have been shown in studies in other places regarding student publications in journals with dedicated student sections [11]. Participation in specific undergraduate research activity like research course has shown to have a positive impact on attitude towards research in the future [1, 7]. Another interesting aspect was the relatively lower interest shown by the majority of the respondent to community based research. This could be partly due the aura that hospital and lab-based research has which makes it appear more attractive. Early involvement in field studies and epidemiological research would probably help the medical students to develop a healthier attitude towards community based research.

While there are previous studies which have compared attitudes towards research in undergraduates being taught by two different types of medical curriculum (e.g.: traditional vs. reformed/problem-based curricula, where lower attitude scores were found in the traditional curriculum) [12], to the best of our knowledge this is the first study on undergraduate students knowledge and attitudes towards research which has compared the situation in different universities in different countries.

Conclusion

Medical students at three Arab universities in the Gulf region demonstrated a good attitude towards scientific research however they had a relatively low level of knowledge about scientific research. This was associated with significant perceived barriers deterring them form active participation in the research process. These barriers need to be addressed properly to improve the undergraduate research situation in these areas.

Recommendation

- Building a sound knowledge coupled with encouragement and provision of favorable environment are needed if we are keen to improve the medical research and health of our populations.
- Introduction of innovative educational methods to improve the attitudes and better retention of research methodology knowledge in order to prepare future scientists and researchers.
- Encouraging faculty to take an active interest in all aspects of student research – design, data collection, statistical analysis and preparation of scientific manuscripts.
- Involving students in faculty research and conducting student research workshops
- Encouraging the establishment of scientific journals with student research as the primary content.

Limitation

All three universities, though essentially following traditional/mixed curriculums, might have significant differences. We have not taken this aspect into account while doing the comparative study. Regarding the perceived barriers to research, faculty input would have been a valuable addition. This was not done in our study.

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Table 1: Basic characteristic of the included medical students from three Arab Gulf Universities.

Characteristics	University, *n* (%)			Total (N=423)
	King Faisal (N=183)	Kuwait (N=107)	Arab Gulf (N=133)	
Gender				
Males	134(73.2)	65(60.7)	42(31.6)	241(57.0)
Females	49(26.8)	42(39.3)	91(68.4)	182(43.0)
Year of enrollment				
Third	95(52.0)	37(34.6)	38(28.6)	170(40.2)
Fourth	44(24.0)	36(33.6)	50(37.6)	130(30.7)
Fifth	44(24.0)	34(31.8)	45(33.8)	123(29.1)
Type of secondary schools:				
Public	164(89.6)	73(68.2)	109(82.0)	346(81.8)
Private/International	19(10.4)	34(31.8)	24(18.0)	77(18.2)
Father educational status:				
Illiterate/ read & write	21(11.5)	1(0.9)	3(2.3)	25(5.9)
Primary/preparatory	36(19.7)	3(2.8)	13(9.8)	52(12.3)
Secondary	49(26.8)	29(27.1)	30(22.6)	108(25.5)
College or higher	77(40.0)	74(69.2)	87(65.4)	238(56.3)
Maternal Educational status:				
Illiterate/ read & write	30(16.4)	3(2.8)	4(3.0)	37(8.7)
Primary/preparatory	59(32.2)	2(1.9)	20(15.0)	65(15.4)
Secondary	40(21.9)	33(30.8)	28(21.1)	101(23.9)
College or higher	45(24.6)	69(64.5)	81(60.9)	195(46.0)
Age in years (mean± SD)	21.2±1.2	21.1±1.6	21.7±1.4	21.4±1.4
Marital status:				
Single	179(97.8)	102(95.3)	127(95.5)	408(96.5)
Married	4(2.2)	5(4.7)	6(4.5)	15(3.5)
Previous year Score: (N=229*)				
Mean ± SD	3.0±0.6	2.9±0.4	2.9±0.6	3.1±0.5
Median	3.0	2.9	2.9	3.0

* The GPA scores were mentioned by 229 students.

Table 2: Attitudes towards science and scientific research among the included medical students.

Items	Disagree* *n* (%)	Undecided *n* (%)	Agree** *n* (%)	Score Mean ±SD
1) Science has prolonged human life.	42 (9.9)	37 (8.7)	344 (81.4)	4.0±1.0
2) There would be no progress of humankind without the progress of science.	45 (10.6)	60 (14.2)	318 (75.2)	3.9±1.0
3) Valid discoveries are impossible without scientifically sound research.	69 (16.3)	72 (17.0)	282 (66.7)	3.7±0.9
4) Science gives us better understanding of the world	13 (3.1)	21 (5.0)	389 (91.9)	4.4±0.7
5) Scientific approach facilitates better understanding of problems.	12 (2.9)	37 (8.7)	374 (88.4)	4.2±0.7
6) Use of scientific methodology is the basis of medical progress.	19 (4.7)	58 (13.7)	346 (81.6)	4.2±0.8
7) Every physician has to be well acquainted with the scientific methodology.	15 (3.5)	48 (11.3)	360 (85.2)	4.1±0.8
8) The knowledge of scientific methodology is essential for obtaining accurate and objective data.	22 (5.2)	51 (12.1)	350 (82.7)	4.0±0.7
9) A fact can be established only by a scientific approach.	107 (25.3)	110 (26.0)	206 (48.7)	3.3±1.1
10) Scientists are creative and interesting people.	83 (19.6)	133 (31.4)	207 (49.0)	3.4±1.0
11) Physicians believing only in science are small-minded.	105 (24.4)	130 (30.7)	188 (44.9)	3.3±1.1
12) Scientific approach limits a physician's choices.	128 (30.3)	142 (33.6)	153 (36.2)	3.0±0.9
13) Science is the main cause of ecological catastrophe we face.	126 (29.8)	169 (40.0)	128 (30.3)	2.9±1.0
14) If science continues in the same direction it has so far, it will lead to the destruction of the humankind.	189 (44.7)	132 (31.2)	102 (24.1)	2.8±1.1
15) Scientific approach lacks humanity.	216 (51.0)	116 (27.4)	91 (21.5)	2.7±1.0
16) Scientific methods impose unnecessary rules.	173 (40.9)	137 (32.4)	113 (26.7)	2.8±1.0
17) Scientific methodology only makes the implementation of medical research more difficult.	221 (52.2)	123 (29.1)	79 (18.7)	2.6±0.9
18) Negative effects of science exceed positive ones	265 (62.7)	101 (23.9)	57 (13.4)	2.3±1.1
19) If there were no science, we would lead less troubled and healthier lives.	230 (54.3)	85 (20.1)	108 (25.5)	2.6±1.2
20) Scientific way of thinking is dull and boring.	244 (57.6)	88 (20.8)	91 (21.5)	2.5±1.2

* Includes strongly disagree and agree ** includes strongly agree and agree.

Table 3 Knowledge about scientific research of the included medical students distributed by Universities.

Items	Correct responses, *n* (%)			Total No. (%)
	KFU! (N=183)	KU† (N=107)	AGU* (N=133)	
1. How would you define the scientific hypothesis? * An answer or solution to a question which has a capacity of verification or empirical demonstration.	73(39.9)	36(33.6)	50(37.6)	159(37.6)
2. How would you define scientific theory? * System of hypotheses logically connected to one another, with common background, some of which have been verified.	92(50.3)	41(38.3)	30(22.6)	163(38.5)
3. How would you define the scientific truth? * Consensus of competent experts.	7(3.8)	12(11.2)	15(11.3)	34(8.0)
4. The essential characteristic of science is: * All scientific conclusions are temporary.	35(19.1)	25(23.4)	29(21.8)	89(21.0)
5. A scale from 1 to 5 (like grades on an examination) is called: * Ordinal.	107(58.5)	62(57.9)	69(51.9)	238(56.3)
6. Representativeness is a key characteristic of a: * Sample.	50(27.3)	46(43.0)	78(58.6)	174(41.1)
7. Medline is: * Medical database.	86(47.0)	65(60.7)	55(41.4)	206(48.7)
8. In the previous year you have published a paper in the prestigious Journal of Immunology. Now you want to check the number of citations your paper has received. The best way to do it would be to search the: *** Citation index of the Science Citation Index database.**	59(32.2)	25(23.4)	36(27.1)	120(28.4)
9. The essential part of a scientific paper is: * Acknowledgment to persons who assisted you during the research.	83(45.4)	54(50.5)	38(28.6)	175(41.4)
10. All listed rules apply to the process of writing an Introduction section of a scientific paper EXCEPT: * Make it longer rather than shorter.	81(44.3)	55(51.4)	60(45.1)	196(46.3)
Total knowledge score: Mean ±SD	3.7±1.5	3.6±2.0	3.5±1.8	3.6±1.7
Median	4.0	4.0	4.0	4.0

! King Faisal University, † Kuwait University, ** Arab Gulf University.

Table 4 Attitudes and participatory role in scientific research among the included medical students.

Items	Responses, *n* (%)		
	Yes	No	Undecided
1. Confident in interpreting and writing a research paper.	96(22.7)	224(53.0)	103(24.3)
2. Ever participated in a research project (apart from mandatory academic projects).	168(39.7)	215(50.8)	40(9.5)
3. Wrote a scientific paper.	71(16.8)	251(59.3)	101(23.9)
4. Undergraduate students should participate in research.	322(76.1)	34(8.0)	67(15.8)
5. Undergraduate students can plan and conduct a research project and write a scientific paper.	154(36.4)	231(54.6)	38(9.0)
6. Medical students can plan and conduct research project without supervision.	84(19.9)	298(70.4)	41(9.7)
7. Willingness to conduct clinical research	293(69.3)	77(18.2)	53(12.5)
8. Willingness to conduct community-related-research	117(27.7)	208(49.3)	98(21.0)

Table 5: Perceived barriers towards participation in scientific research as stated by the included medical students.

Percieved barriers	University, *n* (%)			Total, N (%)
	KFU*	Kuwait	AGU**	
Lack of proper mentoring from the faculty staff.	97 (53.0)	64 (59.8)	69 (51.9)	230 (54.4)
Our faculties do not give the opportunity to conduct our own research.	68 (37.2)	30 (28.0)	52 (39.1)	150 (35.5)
Lack of time due over burden with educational activities including exams.	135 (73.8)	86 (80.4)	91 (68.4)	264 (62.4)
Lack of proper laboratory and other facilities.	88 (48.1)	57 (53.3)	76 (57.1)	221 (52.2)
Inefficient faculty staff to deliver necessary knowledge and skills	90 (49.2)	44 (41.1)	63 (47.4)	157 (37.1)
Inaccessibility to the medical and other electronically relevant data bases.	85 (46.4)	53 (49.5)	57 (42.9)	195 (46.1)
Lack of rewarding and / or motivation	113 (61.7)	67 (62.6)	74 (55.6)	254 (60.0)
Lack of proper funding and monetary problems.	89 (48.6)	43 (40.2)	81 (60.9)	213 (50.4)
Lack of appropriate knowledge and necessary skills.	118 (64.5)	51 (47.7)	67 (50.4)	236 (55.8)
Lack of interest	59 (32.2)	55 (51.4)	52 (39.1)	166 (39.2)

* King Faisal University, ** Arab Gulf University, ! Responses were not mutually exclusive.

Table 6: Attitudes and knowledge scores of medical students in relation to students' sociodemographic and personal characteristics.

Socio-demographics	Total (N=423) *n* (%)	Attitudes score Mean ±SD	Knowledge score Mean± SD
University			
King Faisal	183 (43.3)	66.4±6.6	3.7±1.5
Kuwait	107 (25.3)	69.1±9.0	3.6±2.0
Arabian Gulf	133 (31.4)	66.2±7.4	3.5±1.8
P value †		0.040*	0.635
Gender			
Males	241 (57.0)	66.9±7.8	3.6±1.8
Females	182 (43.0)	67.1±7.4	3.6±1.6
P value !		0.85	0.641
Year of enrollment			
Third	170 (40.2)	67.4±7.8	3.7±1.9
Fourth	130 (30.7)	66.6±8.3	3.5±1.6
Fifth	123 (29.1)	66.8±6.5	3.5±1.5
P value†		0.591	0.43
Type of secondary schools:			
Public	346 (81.8)	66.8±7.5	3.6±1.6
Private/International	77 (18.2)	69.8±7.5	4.0±2.7
P value!		0.012*	0.030*
Father educational status:			
Illiterate/ read & write	25 (5.9)	65.5±4.9	3.5±1.4
Primary/preparatory	52 (12.3)	65.4±6.4	4.0±1.5
Secondary	108 (25.5)	67.4±7.8	3.4±1.7
College or higher	238 (56.3)	68.3±8.0	3.6±1.7
P value†		0.357	0.229
Maternal Educational status:			
Illiterate/ read & write	37 (8.7)	65.6±5.3	3.5±1.5
Primary/preparatory	65 (15.4)	65.6±6.4	3.7±1.6
Secondary	101 (23.9)	68.3±8.4	3.6±1.7
College or higher	195 (46.0)	69.3±8.5	3.7±1.8
P value†		0.126	0.447

*Statistically significant; P< 0.05. !Mann Whitney, †Kruskal Wallis tests.

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