

Medical Students' Attitudes and Influential Factors Towards Conducting Medical Research

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Abstract

Background: Medical research has become an essential part of medical students' curricula at several medical colleges in Saudi Arabia. This study aimed to assess medical students' attitudes and identify factors influencing their willingness to conduct medical research. **Methods:** This cross-sectional study was conducted between December 2021 and April 2022 using the students' attitudes towards research and the students' perceived influential factors toward participating in research activities questionnaires. A 5-Likert scale to calculate the average of the students' responses, where 5 indicated 'strongly agree' and 1 indicated 'strongly disagree'. The survey was distributed to medical students at the College of Medicine, King Saud bin Abdulaziz University for Health Sciences (KSAU-HS), Saudi Arabia. **Results:** A total of 500 responses were collected from the students (67.2% male and 32.8% female). Most students agreed with the following statement: 'Research is important for identifying and investigating problems in a subject matter' (N=399, 79.8%). More than half of the students agreed with the following statement: 'I am very interested in participating in research activities at the undergraduate level' (N=318, 63.6%). The top three influential factors for conducting medical research were 'to facilitate entry into competitive residency programs', followed by 'interest in specific research fields or medical topics' and 'to improve curriculum vitae (CV)'. **Conclusion:** The majority of the surveyed students showed a positive attitude towards conducting medical research in King Saud bin Abdulaziz University for Health Sciences, Saudi Arabia. Most students conduct research to gain a competitive edge and explore specialties of interest.

Key Words: Research; Medical students; Attitudes; Knowledge; Perception (Source: MeSH-NLM).

Introduction

Medical research has advanced medical practice because it helps physicians address the most pressing challenges in the healthcare sector, thereby reducing global health disparities by offering affordable treatments and rapid screening tools.^{1,2} It is crucial for researchers and medical students to understand research principles in order to produce reliable and high-quality articles.³ Previous studies have shown that early exposure to research can improve medical students understanding and the conduction of medical research. As a result, several medical colleges have incorporated research into their curricula.⁴⁻⁶ There are a few methods to incorporate research training into medical school curricula: either by research-driven curricula, research electives, or mandatory research projects for graduation.^{7,8} However, many medical students still do not have sufficient knowledge to conduct research projects and publish them.^{6,9,10} Given the need to build a research-facilitating curriculum, it is important to determine the attitude of medical undergraduates towards research in Saudi Arabia.¹¹

In the Kingdom of Saudi Arabia, there has been an increase in the number of medical undergraduates who have conducted

research before graduation, though only a few have been the first authors.^{6,9} Low number of graduates with research experience are commonly observed in colleges where research projects are not mandatory for graduation.^{6,9} However, only seniors and students with a high Grade Point Averages (GPA) were more likely to participate in research.^{6,9} A study conducted in Umm Al-Qura University in Saudi Arabia revealed that only 10.8% of health colleges' students have an adequate background in research, and only 6.6% had published a medical research paper.¹⁰ Despite the increasing number of medical students involved in research for various reasons¹², studies have shown that students' research projects are often not of good quality, nor are they particularly impactful towards the scientific community.^{13,14}

Currently, conducting a research project is a prerequisite for graduation in several Saudi medical colleges.^{6,15} In addition, the Saudi Commission for Health Specialties (SCFHS), a regulatory commission that sets requirements for students' enrollment into Saudi residency programs, recently announced that participation in research activities and publications in specified journals are granted 6 points out of the total 20 points available for residency applications as of 2022.¹⁶ There has been an increase in research summer schools to encourage students to gain hands-on

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experience with well-known researchers and physicians.⁶ While this will improve the students' knowledge about research principles, many global studies have shown that these changes usually become controversial since they can influence the quality and quantity of students' future contributions to the field by encouraging them to publish more articles with lower quality to increase their chance of getting accepted into a competitive residency program.^{6,12,16-18}

However, there is no available multi-campus study conducted in Saudi Arabia to thoroughly explore the attitudes of medical students toward conducting research, and the factors that influence students to do so. Multi-campus studies can provide better insights into students' attitudes and identify the influential factors in conducting research. Influential factors affect students' decisions to conduct research projects. The primary aim of this study was to assess medical students' attitudes towards conducting medical research and to identify the factors that influence their willingness to conduct research projects.

Methods

Study Design, Settings, and Participants

This cross-sectional study was conducted at the College of Medicine of King Saud bin Abdulaziz University for Health Sciences (KSAU-HS), Saudi Arabia, in the Jeddah and Riyadh campuses. The survey was distributed to medical students. Foundational and pre-medical students were excluded because the research course started during year three in the college curriculum. Interns were also excluded because they were more likely to be familiar with the process of conducting medical research as per the requirements of residency program application points, whereby at least one publication gives candidates an advantage over other applicants.

Questionnaires and Data Collection Process

This study utilized two self-administered questionnaires acquired with permission from recent studies: the Students' Attitude Towards Research (SAR)⁴ and the Students' Perceived Influential Factors Toward Participating in Research Activities questionnaires. This is a pre-piloted survey with high internal reliability (Cronbach's α coefficient = 0.88).¹² The survey included four sections. The first section investigated the students' attitudes towards research activities provided by the college. The second section identified students' opinions on faculty involvement in research projects. The third section examined the availability and quality of the infrastructural facilities offered by their colleges. The last section identified possible influential factors in conducting medical research. A 5-Likert scale was used to assess the level of students' agreement from 'strongly disagree=1,' 'disagree=2,' 'neutral=3,' 'agree=4,' to 'strongly agree=5.' Demographic information, such as sex, year of study, and GPA, which was collected in ordinal values, and previously published research, was collected. An online survey was distributed between December 12, 2021 and April 10, 2022. The estimated population was 1627 medical students from both campuses. Therefore, with a 5% margin of error and 95% confidence interval, the minimum

recommended sample size was 311 students as suggested by the Raosoft Sample size calculator. Considering that the non-response rate was 20%, the final sample size was 373. This study was approved by the Institutional Review Board (IRB) of King Abdullah International Medical Research Center (Study number: SP21J/458/11).

Statistical Analysis:

The participants were asked to complete the survey through a Google webpage, which was exported to Excel and then to JMP software (version 10.0; SAS Institute Inc., Cary, NC, USA). Quantitative variables are presented as means and standard deviations (SD), and qualitative variables are presented as frequencies and percentages. The chi-square test was used to compare categorical values and report any differences. Disagreement responses (1: strongly disagree, and 2: disagree) were grouped as "disagree", and agreement responses (4: agree, and 5: strongly agree) were grouped as "agree"; while neutral responses (3: neutral) were simply presented as "neutral." All calculations of the mean and SD were based on the average of the 5-point Likert scale that was used. A p -value of less than 0.05 was considered statistically significant.

Results

Students' Characteristics

A total of 500 students completed the survey in both campuses. The majority were male students (N=336, 67.2%) and from the Riyadh campus (N=273, 54.6%). Most were fourth-year students (N=218, 43.6%). Most of the students had a grade point average (GPA) ranging between 4.5 and 5 (N=354, 70.8%), and were in their pre-clinical phase (N=366, 73.2%). Only a few students had prior research publications (N=67, 13.4%). Further characteristics are presented in [Table 1](#).

Table 1. Participants' Characteristics

Characteristic	Descriptive Statistics
Campus [N (%)]	
Riyadh	273 (54.6%)
Jeddah	227 (45.4%)
Sex [N (%)]	
Male	336 (67.2%)
Female	164 (32.8%)
GPA* [N (%)]	
3 – 3.49	4 (0.8%)
3.5 – 3.99	34 (6.8%)
4 – 4.49	108 (21.6%)
4.5 – 5	354 (70.8%)
Level [N (%)]	
Freshmen	154 (30.8%)
Sophomores	218 (43.6%)
Juniors	87 (17.4%)
Seniors	41 (8.2%)
Phase of Study [N (%)]	
Pre-clinical phase	366 (73.2%)
Clinical phase	134 (26.8%)
Prior research publication [N (%)]	
Yes	67 (13.4%)
No	433 (86.6%)

Legend: *Grade Point Average; out of 5

Table 2. Attitude of Medical Students Towards Research.

Statement	Disagree N (%)	Neutral N (%)	Agree N (%)*	P- value**
Statement regarding Research Activities Offered in the College				
I am much interested in participating in research activities at the undergraduate level	91 (18.2)	91 (18.2)	318 (63.6)	0.331
My college organizes and gives priority to include undergraduates in research activities	63 (12.6)	123 (24.6)	314 (62.8)	0.360
Faculty members have adequate skills to handle research methodology	59 (11.8)	113 (22.6)	328 (65.6)	0.014*
Faculty do not have sufficient time to mentor undergraduate students in research	133 (26.6)	139 (27.8)	228 (45.6)	0.836
The degree of involvement of the faculty in the research program is good	108 (21.6)	148 (29.6)	244 (48.8)	0.338
Our college has adequate infrastructure to organize research programs	65 (13)	114 (22.8)	321 (64.2)	0.005*
I had been exposed to basic and advanced statistical tools needed for the preparation of a research report	100 (20)	117 (23.4)	282 (56.6)	0.207
Statement regarding Students Opinions of Faculty Involvement in Research				
Faculty members place great emphasis on research	64 (12.8)	126 (25.2)	210 (62)	0.258
Faculty members discuss their own research interests in class	182 (36.4)	162 (32.4)	156 (31.2)	0.484
Faculty members use research findings as a part of their teaching material	100 (20)	151 (30.2)	249 (49.8)	<.001*
Research is important for identifying and investigating problems in a subject matter	23 (4.6)	78 (15.6)	399 (79.8)	0.060
I am always getting the chance to discuss about the scientific/academic research in my class	168 (33.6)	166 (33.2)	166 (33.2)	0.022*
Statement regarding Infrastructural Facilities Offered by College for Research				
Our college provides good infrastructural facilities (i.e. laboratory) needed to conduct research at the undergraduate level	130 (26)	166 (33.2)	204 (40.8)	0.547
The library facilities available in my college are sufficient for us to conduct research activities	99 (19.8)	171 (34.2)	230 (46)	0.758
Sufficient funding is offered by the university for conducting research at the undergraduate level	125 (25)	219 (43.8)	156 (31.2)	0.674
Overall, I am satisfied with the research training program offered at the undergraduate level	95 (19)	140 (28)	265 (53)	0.056

Legend: *Disagreement responses (1: strongly disagree, and 2: disagree) were grouped as "disagree", and agreement responses (4: agree, and 5: strongly agree) were grouped as "agree"; while neutral responses (3: neutral) was simply presented as "neutral."

**A p-value of <0.05 was considered statistically significant.

Students' Attitudes

Table 2 shows the respondents' attitudes towards research. The agreement responses 'strongly agree' and 'agree' were grouped as 'agree', the disagreement responses 'strongly disagree' and 'disagree' were grouped as 'disagree', and neutral was recorded as 'neutral.' More than 60% of students (N=318) had an interest in participating in medical research at the undergraduate level, and 282 (56.6%) agreed that they had been exposed to the basic and advanced statistical tools needed to prepare a research report. Additionally, most students (N=399, 79.8%) agreed that research is important for identifying and investigating problems in a subjective manner. There was a significant difference in students' responses to the following statement: 'always getting the chance to discuss scientific/academic research in their class' (P=0.022). Only 265 (53%) of the students agreed that, overall, they were satisfied with the research training program offered at the undergraduate level, which was close to significance (P=0.056).

Female students significantly agreed more than male students that the faculty has adequate skills to handle research methodology (3.93±1.01 vs. 3.7±1.06, P=0.014). Less than half of the students (N=228, 45.6%) agreed that faculty members do not have sufficient time to mentor undergraduate students in research, but this was not significant (p=0.836). Only 108 (21.6%) students disagreed that faculty involvement in the research program was good. The majority of the students (N=210, 62%) agreed that faculty members place great emphasis on research. Furthermore, a significant difference was found in the following statement: 'faculty members use research findings as a part of their teaching material' (p <.001), but the difference among students' agreement regarding whether 'faculty members discuss their own research interests in class' was not significant (p=0.484).

More than half of the students (N=314, 62.8%) agreed that their college organizes and prioritizes the inclusion of undergraduate students in research activities. The students agreed that their college had adequate infrastructure to organize research programs (N=321, 64.2%, p=0.005). Moreover, there was a difference in the students' responses when they were asked if their college provided good infrastructural facilities (i.e., laboratories and libraries) needed to conduct research at the undergraduate level (p=0.547). Only 230 (46%) agreed that the library facilities available at their college were sufficient for them to conduct research activities. The majority of students (N=344, 68.8%) either disagreed or were neutral when asked if the university offered sufficient funding to conduct research at the undergraduate level.

Influential Factors & Motives

The 5-Likert scale was used to calculate the average of the students' responses, where 5 indicated 'strongly agree' and 1 indicated 'strongly disagree'. The most influential factors chosen by the students were (1) facilitating entry into competitive residency programs, (2) interest in specific research fields or

medical topics, (3) improve curriculum vitae (CV), and (4) necessary competency for future clinical careers. On the other hand, the least influential factors were (1) good method to fulfill leisure time, (2) motivation by faculty/senior student researchers, (3) encouragement from previous participation in research activities, and (4) communicate research findings in scientific meetings. All influential factors are presented in [Figure 1](#).

Figure 1. This Figure Demonstrates the Influential Factors Toward Conducting Research Among Medical Students



Legend: 'Facilitating Entry into Competitive Residency Programs' is the First Influential Factor and 'Having an Interest in Specific Research Field or Medical Topic' is the Second Influential Factor.

Discussion

This cross-sectional study aimed to assess medical students' attitudes and identify the influential factors in conducting medical research. The study outcomes revealed that most of the students recognize how vital research is in identifying clinical issues and trying to solve them in a subjective matter. Most of the students showed an interest in participating in research activities at the undergraduate level. Moreover, statistical analysis revealed that most students were exposed to basic and advanced statistical tools necessary for the preparation of a research report. These results are essential because medical students will eventually become physicians who need to incorporate evidence-based medicine into their practice to ensure the best health service outcomes, evaluate their practice in a critical but logical manner, and remain updated. The most influential factors for participating in research were (1) facilitating entry into competitive residency

programs, (2) interest in specific research fields or medical topics, and (3) improving curriculum vitae (CV).

Similar to the outcomes of this study, several studies have demonstrated positive attitudes towards research among medical students who have been exposed to research activities.^{5,6,14,15,19} Prior exposure to research activities may help students understand the importance of research and how it can advance science and medicine. This positive attitude may indicate that some students view research as a method to gain a more comprehensive understanding of medicine, but our results showed that it was ranked as the fifth factor, which may be because students prefer to understand medicine through textbooks and other sources recommended by their faculty. These outcomes emphasize the importance of establishing strong research programs and encouraging students to integrate research into their learning as it can increase the likelihood of students becoming more knowledgeable physicians.² Interestingly, our results regarding the influential factors in conducting medical research were very similar to another study conducted at Alfaisal University.¹² The top influential factor in the aforementioned study and this study was to facilitate entry into competitive residency programs. This shows that medical students, regardless of their institution, conduct research to gain a competitive edge to help them apply for residency. However, in our study, the second influential factor in conducting medical research was the interest in a specific research field. This stems from the fact that King Saud bin Abdulaziz University for Health Sciences students view research as a method to explore different specialties and build connections with physicians from different fields to decide which specialty they will eventually apply to.

Students agreed that their faculty members used research findings to teach, which may lead to research-oriented students subjectively investigating information. There was a difference in the students' responses regarding the opportunity to discuss scientific research in class, which may be due to the lack of understanding of research at their undergraduate level. Half of the students were satisfied with the research training curriculum in their college, indicating that most students are equipped to conduct research projects and try to integrate their research findings with the clinical theories they learn.

The students reported several barriers to conducting research at their colleges. Almost half of the students agreed that faculty members did not have sufficient time to mentor undergraduate students. Moreover, other studies have shown similar outcomes.^{6,20-23} This may discourage interested students from participating in research projects and delay the advancement of research. Almost half of the students disagreed with or were neutral about their satisfaction with the research program offered at their college. This may be due to several reasons: (1) Saudi medical colleges focus on the fundamentals of medicine rather than research, (2) the research program is part of a curriculum that does not explain in detail complex research methodologies,

(3) most faculty members are not involved in student projects because it is time-consuming to mentor students and faculty members have various professional and academic commitments, and (4) some of the students may not be able to finalize their research projects due to busy schedule conflicts with their medical curriculum and examinations.

In this study, facilitating entry into competitive residency programs was the most influential factor in conducting medical research. In 2013, a study conducted in Pakistan reported the same reason as the second most common influential factor.²⁴ It was the second most common influential factor in another study conducted in Canada.²³ Facilitating entry into competitive residency programs is a common influential factor among medical students who conduct research projects. While improving the curriculum vitae (CV) was the third influential factor in our study, it was the most influential factor in several previous studies.²⁴⁻²⁶ Medical students around the globe conducted research to advance their careers and build their resumes. This may be because residency programs and academic institutions emphasize research activities without examining the quality of the research conducted and/or published. This may pressure students to participate in research activities without having any interest in a career in research, and consequently, many published research articles remain unread and uncited for several years.

It has been reported that Saudi residency program directors in competitive specialties, such as plastic surgery, anesthesiology, and urology, prefer candidates who have high-quality research publications.²⁷⁻²⁹ In contrast, specialties that are relatively less competitive in Saudi Arabia, such as internal medicine, obstetrics and gynecology, family medicine, and pediatrics have fewer publications.³⁰ This issue extends to the United States as orthopedic residency program applicants list research projects in their resumes as 'submitted'; but, in reality, remain frequently unpublished or published in low-impact journals.³¹ Furthermore, this issue extends beyond residency applications, as the selection for fellowship programs requires more scholarly work.³²

Local and international residency programs and academic institutions should consider enhancing research outcomes and improving evidence-based medicine. Many medical students conduct and publish research to get accepted into competitive programs, but it is unknown how many pursue a career in research once they are accepted into their desired specialty and program. Students' efforts should be directed toward basic/translational and clinical research that attempts to experiment and investigate various ways to contribute to medicine efficiently and productively.

Limitations

This study had several limitations. For example, this study utilized a self-administered, web-based survey. Therefore, the response rate was low. This was because the survey was distributed during the students' final examination. Additionally, this study was

conducted at only one university, which means that the results and conclusions may not be applied to other universities. However, campuses in two different cities were included to ensure a diverse and large sample of students. King Saud bin Abdulaziz University for Health Science is a research-oriented university and has the King Abdullah International Medical Research Center (KAIMRC) within its campus, which may have impacted students' responses. This was a cross-sectional study, which means that it only represented students' attitudes at one point in time.

Conclusion

In conclusion, medical students at King Saud bin Abdulaziz University for Health Sciences generally showed a positive attitude towards conducting medical research. The most influential factor in conducting medical research was facilitating entry into competitive residency programs. The second influential factor was the interest in a specific research field or medical topic. The study outcomes revealed the importance of recruiting interested medical students in basic and/or clinical studies so that they can contribute to the scientific field in the early stages of their careers. This study is important for policymakers, residency program directors, and research center directors to reconsider published research and research activities as prerequisites for acceptance into competitive programs. Further studies should investigate whether medical students pursue research activities after college, their attitudes, and influential factors, as well as their research skills and how they acquired them.

Summary – Accelerating Translation

Title: Medical Students' Attitudes and Influential Factors Towards Conducting Medical Research

Main Problem: Currently, conducting a research project is a prerequisite for graduation in several Saudi medical colleges.^{6,15} In addition, the Saudi Commission for Health Specialties (SCFHS)- a regulatory commission that sets requirements for students' enrollment into Saudi residency programs-recently announced that participation in research activities and publications in specified journals are granted 6 points out of the total 20 points available for residency application as of 2022. While this will improve the students' knowledge about research principles, many global studies have shown that these changes usually become controversial since they can influence the quality and quantity of students' future contributions to the field by encouraging them to publish more articles with lower quality as an attempt to increase their chance of getting accepted into a competitive residency program.

Aim: To assess medical students' attitudes towards conducting medical research and identify the factors influencing their willingness to conduct research projects.

Methodology: This cross-sectional study was conducted at the College of Medicine of King Saud bin Abdulaziz University for Health Sciences (KSAU-HS), Saudi Arabia, in the Jeddah and Riyadh campuses. The survey was distributed to medical students. This study utilized two self-administered questionnaires acquired with permission from recent studies. The first section investigated students' attitudes towards research activities provided by the college. The second section identified students' opinions on faculty involvement in research projects. The third section examined

the availability and quality of the infrastructural facilities offered by their colleges. The last section identified possible influential factors in conducting medical research. A 5-Likert scale was used to assess the level of students' agreement from 'strongly disagree=1,' 'disagree=2,' 'neutral=3,' 'agree=4,' to 'strongly agree=5.'

Results: A total of 500 students completed the survey on both campuses. More than 60% of students (N=318) had an interest in participating in medical research at the undergraduate level, and 282 (56.6%) agreed that they had been exposed to the basic and advanced statistical tools needed to prepare a research report. Additionally, most students (N=399, 79.8%) agreed that research is important for identifying and investigating problems in a subjective manner. Less than half of the students (N=228, 45.6%) agreed that faculty members do not have sufficient time to mentor undergraduate students in research. The most influential factors towards conducting medical research chosen by the students were (1) facilitating entry into competitive residency programs, (2) interest in specific research fields or medical topics, (3) improve curriculum vitae (CV), and (4) necessary competency for future clinical careers. On the other hand, the least influential factors were (1) good method to fulfill leisure time, (2)

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