Journal of Contemporary Medical Education
www.scopemed.org
DOI: 10.5455/jcme.20160521021529

Original Research

Factors influencing the medical students' overall satisfaction about research training programs offered in Saudi universities: An exploratory study

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Received: January 21, 2016
Accepted: April 24, 2016
Published: June 15, 2016

ABSTRACT

Background: The aim of this study is to determine the factors influencing medical students' overall satisfaction about research training programs offered in Saudi Universities. **Materials and Methods:** Medical students [N=207] belonging to seven Saudi universities were the focus of this study. A pre-tested questionnaire tool was used to capture the student responses on a five point Likert scale with respect to three factors viz (i) extent of research activities offered; (ii) involvement of faculty in research and, (iii) infrastructural facilities offered for research. A stepwise regression model was used to predict the overall satisfaction and the other explanatory variables. **Results:** The students overall satisfaction in research is likely to be influenced by three variables such as the infrastructural facilities offered for research (Coefficient of β is 0.187 and $p<0.01$); funding offered by the university for conducting research at the undergraduate level (Coefficient of β is 0.179 and $p<0.01$) and the emphasis put by the faculty for research (Coefficient of β is 0.282 and $p<0.01$). **Conclusion:** The variables such as infrastructural facilities, research funding and the emphasis placed by the faculty for research have significant impact on the medical students' overall satisfaction about the research training programs offered in selected Saudi Universities.

KEY WORDS: Medical students; Research; Training; Satisfaction; Saudi universities

INTRODUCTION

Medical training all over the world is becoming more students centered, with an emphasis on active learning rather than on passive attainment of knowledge[1]. Encouraging medical students to undertake research projects is certainly one of the ways of emphasizing active learning[2]. Higher Education Institutions [HEIs] in the Kingdom of Saudi Arabia [KSA] also witnessed this aspect and incorporated research as one of the important component for getting academic accreditation by the National Commission for Academic Accreditation and Assessment [NCAAA][3]. NCAAA mandated all teaching staff working in the HEIs must be involved in sufficient and appropriate scholarly activities to ensure that they remain updated with developments in their field and those developments should be reflected in their teaching. Also, it is emphasized that the involvement of students and postgraduates in research activity is an emerging priority[3]. As a result, the research environment in the universities across KSA is changing at a fast pace. Academically, the curriculum of undergraduate program in medicine at Saudi Universities expand over a period of seven years, which includes one year of compulsory internship training program. Students at these medical colleges are exposed to a course work of epidemiology and biostatistics during their 3rd year. It is followed by field work exposure where they are more involved in carrying out community based research in the 4th year of study. During the field exercise, the students are exposed to the research oriented tasks like development of questionnaire tools, executing data collection procedures, performing statistical analysis using appropriate statistical software, and writing research reports. In addition to that, each student needs to carry out a 'student graduation project' during their 6th year of study. However, there are no specific elective courses provided to the students during the undergraduate medical education program. As well, there is no specific program for Evidence Based Medicine offered during the internship period since such activity depends on the department where the students undergo their training in the clinical settings.

A previous study indicated that there is a significant increase in the number of students expressing their interest to pursue career in medical research as Physician investigator after their exposure to the mandatory undergraduate research elective[4]. Also, University research in collaboration with relevant industry is considered as the strategic avenue for the economic development and diversification of Saudi Arabia. Accordingly, the government has planned to spend 32 billion Saudi Arabian Riyals ($8.6 billion USD) on research and development as part of its 20-year National Science and Technology Plan[5]. Even though the efforts have been taken to strengthen the research related training in Saudi Arabia, the students tend to view this kind of training with negative attitudes and feelings[6]. Students have clear anticipations in mind of what institutions should provide to upkeep and facilitate their learning and enhance their research related prospects. Despite the fact that the undergraduate students recognize the benefits of research experience, they themselves should have a realistic

understanding on the research process and require training to recognize the skills needed for research and enhanced transparency in potential project outcomes[7].

Indicating[8] several barriers related to the participation of students in research during medical school and these include: (i) lack of time with overburdened educational activities; (ii) lack of proper mentoring to encourage/guide the students in the field of scientific research and; (iii) lack of a rewarding and motivating system. It had been reported that lack of institutional incentive is the most significant barrier to students' participation in research activities[9,10]. In addition to that, a recent study indicated that lack of training in research methodology, scientific paper writing and publication activity and, lack of available research projects for students are the main obstacles preventing medical students from doing research[11].

A consumerist ethos emerged throughout students' expectations and perceptions, with positive and negative concerns[12]. Positively, students reflected on what they were investing financially in higher education and felt the need to invest time for learning and to develop their portfolio of skills. On the negative side, students consider themselves as dissatisfied customers in relation to many aspects of their experience, especially when minimum expectations were not met. In order to capture the students' experience, HEIs in KSA are carrying out several evaluations by students as required for academic accreditation by the NCAAA[13]. However, to ensure and plan better utilization of the research training programs provided to the medical students in Saudi Arabia, it appears pivotal to inquire into the factors influencing the students' satisfaction about such training programs offered in KSA. However, very few studies explored how various factors influenced the students overall satisfaction about research training programs offered in Saudi Universities. As a measure to accomplish this objective, the present study was conducted. The objective of this study is to explore the factors and its related variables influencing the students' satisfaction towards research training programs offered in selected Saudi Universities.

MATERIALS AND METHODS

Study design

An exploratory study design was used to understand the factors which influence the students overall satisfaction towards the research training program offered in Saudi Universities.

The instrument

The questionnaire tool used to collect data from the students had already been validated by a previous study[14] and it consists of 16 items related to three different attitude sub-scales such as (i) attitude of students to the research activities offered in their colleges; (ii) students opinion about faculty involvement in research and; (iii) students' opinion about infrastructural facilities offered by the college for research. Students' responses were captured using a five-point Likert scale ranging from 1-strongly disagrees to 5-strongly agree. This tool is highly suitable for investigating the state of students' attitude towards research in various academic settings by demonstrating the attributes such as (i) the explained variance of 62.079%, (ii) the overall 0.768 α-coefficients of internal consistency reliability, and (iii) the invariably positive and significant inter-factor correlations[14].

Sampling methods

Colleges of Medicine [N=7] belonging to seven government universities located at four different geographical zones in Saudi Arabia were the focus of this study. From those Colleges, only final year / internship students [N=210] were selected at random to participate in this study based on the homogeneity of students with respect to their level of exposure to research training. Students belonging to each college were given a random number and a sampling lot was finalized by the researcher by picking 30 samples from each college and then the questionnaire was distributed to the samples [N=210]. This selection of sample size from each college is justified based on the number of students undergoing final year / internship program in the selected colleges and an utmost care had been taken to include a minimum of 20% samples from each college. 207 completed questionnaires were returned, demonstrating the response rate of 98%.

Analytical methods

The performance grading criteria suggested by[15] is adopted to categorize the students' views on the existing research training programs offered in Saudi universities and it is given in Table 1. Further, the students' perceptions and attitudes about various attributes of the research training programs were analyzed using mean-agreement score and the cumulative percentage data of students who opted both "Agree" and "Strongly agree" in the five point Likert scale.

A confirmatory factor analysis was carried out to establish the relationships among the survey items so as to confirm

Table 1. Performance grading criteria

Performance Grading	Criteria			
	Mean	Median	First Quartile	Cumulative % of students with score 4 or 5
High quality	3.6 & above	4 & 5	4 & 5	80 & Above
Acceptable	2.6 - 3.6	3	3	60 - 80
Improvement required	Less than 2.6	1 & 2	1 & 2	Less than 60

the three factor solution before entering into any prediction model. Further, a stepwise regression model was used to predict the overall satisfaction and the other explanatory variables. All the analyses were done by using Statistical Package for the Social Science (SPSS) version 19. A p-value of less than 0.05 was considered as significant.

RESULTS

Descriptive analyses

The completed questionnaires (N=207) were collected and subjected to statistical analysis. Table-2 showing the descriptive statistics depicting the mean and cumulative percentage of students with score 4 or 5. The mean score for the overall satisfaction of the medical students about the research training program (Question 16) was 'fairly high' (Mean=3.09). All the other items in the questionnaire tool were rated by the students with the mean score ranging from 2.80 to 3.34.

Table 2. Mean and Cumulative percentage of medical students' agreement with score 4 or 5 about different attributes of the research training programs offered in Saudi Universities

Variable. No	Mean score	Standard deviation	Cum. Frequency
1	3.16	1.25	43.48
2	3.25	1.30	51.21
3	3.32	1.28	43.00
4	3.34	1.20	48.31
5	3.09	1.34	44.44
6	2.94	1.44	42.03
7	2.84	1.48	38.16
8	3.01	1.47	45.41
9	2.80	1.41	37.68
10	3.04	1.37	44.44
11	3.07	1.34	44.44
12	3.03	1.41	44.44
13	3.12	1.26	43.96
14	3.29	1.36	49.28
15	3.15	1.33	41.55
16	3.09	1.35	42.03

Confirmatory factor Analysis

A Confirmatory Factor Analysis [CFA] was carried out to establish the relationships among the survey items so as to confirm the three factor solution before entering into any prediction model. Univariate normality has been established for all the variables before attempting a structural equation model.

The confirmatory factor analysis (CFA) showed a chi-square value of 130.55 with the p value of 0.003 ($p<0.05$) indicated that the model is fits perfectly in the population.

Multivariate analysis

The result of Multivariate analysis confirmed that there were significant multiple variables influence the students to have satisfaction towards the research training opportunities provided in Saudi universities. The questionnaire related to overall satisfaction (Q16) is fixed as dependent variable, with three variables (i.e. Q15, Q8, and Q13) as independent variables viz.

i) Sufficient funding offered for conducting research at the undergraduate level (Q15).

ii) Faculty members place great emphasis on Research (Q8).

iii) Availability of good infrastructural facility (i.e. Laboratory) for conducting research at the undergraduate level (Q13).

Stepwise regression method of Multivariate analysis demonstrated a statistically significant effect in the study. From the table 4 and 5, it is found that all the three independent variables are statistically significant ($p<0.001$) at 95% confidence interval. The predicted R-value indicates an average of 30% of variance in the students overall satisfaction is explained by the three independent variables. Also, there is a statistically significant difference in the impact of all the three variables with respect to the students' overall satisfaction (Table 5 and 6). To be specific, research funding had the strongest impact on the overall satisfaction ($\beta 15=0.282$), while other variables such as infrastructural facilities and emphasis given by the faculty for research had little effect on overall satisfaction, ($\beta 8=0.187$, $\beta 13=0.179$). The β value proves that the parameters are unbiased with the less standard error. The Tolerance and VIF (Variance Inflation Factor) demonstrates that there is a high strength in measuring the interrelationship among the three independent variables.

Table 3. Model Fit Summary

Model	NPAR	CMIN	DF	P	CMIN/DF
Default Model	30	130.549	90	0.003*	1.451
Structured Model	120	0.000	0		
Independence Model	15	208.632	105	0.000	1.987

*p<0.05

Table 4. Stepwise regression of overall satisfaction (Model summary)

Model	R	R Square	Adjusted R Square	Std. Error of Estimate	Change Statistics				
					R square change	F change	df1	df2	Sig. F Change
1	0.224[a]	0.050	0.046	1.279	0.050	10.825	1	206	0.001
2	0.300[b]	0.090	0.081	1.255	0.040	8.881	1	204	0.003
3	0.344[c]	0.119	0.106	1.238	0.029	6.646	1	203	0.011

Table 5. Stepwise regression of overall satisfaction (ANOVA)

Model		Sum of Squares	df	Mean Square	F	Sig
1	Regression	17.718	1	17.718	10.825	0.01[a]
	Residual	335.538	205	1.637		
	Total	353.256	206			
2	Regression	31.716	2	15.858	10.061	0.00[b]
	Residual	321.540	204	1.576		
	Total	353.256	206			
3	Regression	41.909	3	13.970	9.108	0.000[c]
	Residual	311.347	203	1.534		
	Total	353.256	206			

a. Predictors: (Constant), factor 15
b. Predictors: (Constant), factor 15, factor 8
c. Predictors: (Constant), factor 15, factor 8, factor 13

Table 6. Stepwise regression of overall satisfaction (Coefficients)[a]

Model		Unstandardized Coefficients		Standardized Coefficients (Beta)	t	Sig	Collinearity Statistics	
		B	Std. Error				Tolerance	VIF
1	Constant	2.339	0.245	0.224	9.532	.000	1.000	1.000
	Factor 15	0.239	0.073		3.290	.001		
2	Constant	1.653	0.333		4.959	.000		
	Factor 15	0.288	0.073	0.270	3.934	.000	0.950	1.053
	Factor 8	0.177	0.059	0.204	2.980	.003	0.950	1.053
3	Constant	1.081	0.397		2.725	.007		
	Factor 15	0.282	0.072	0.265	3.912	.000	0.949	1.053
	Factor 8	0.187	0.059	0.216	3.193	.002	0.945	1.058
	Factor 13	0.179	0.069	0.170	2.578	.011	0.993	1.007

DISCUSSION OF FINDINGS

This study was conducted as a part of a large research project, which primarily steered to study the Health Science students' attitude towards research training programs offered in Saudi Universities[16]. Unlike the previous study, this research article focuses only on medical students and attempted to study the factors influencing the students' overall satisfaction towards research training programs offered in Saudi Medical Schools. Precisely, this study examined the predicting factors which influence the overall satisfaction of medical students' towards the research training programs offered in Saudi universities.

For the purpose of executing this study, a survey had been conducted among the medical students of seven government universities in Saudi Arabia. Further, to attain homogeneity of the samples with respect to the scope and basic course requirements for research and development, the students studying in the final year and those who are doing the internship training of the bachelor of medicine programs were approached and their responses (N=207) were collected using a questionnaire tool.

The results of this study indicated that the overall satisfaction of the medical students about the research training programs was reported as 3.09 in the five point rating scale and it is graded as 'acceptable level' of performance. Over 43% of the medical students were interested to participate in the research training programs offered by their respective colleges. Likewise, a previous study indicated that over 55% of the Saudi medical students participated in the research activities in their medical school[17]. Contrary to these findings, a former study

pointed out that most of the Brazilian medical students are interested to participate in scientific research during their schooling[10].

In the present study, 42% of the medical students expressed their satisfaction about the research training programs. Ironically, an earlier study indicated that over 75% of the medical students in Saudi Arabia rated their overall experience in research as 'outstanding' to 'excellent'[18]. Even though the requirements of curriculum (i.e. foundation courses; clinical training and mandatory research components) are common for the medical programs offered at different Saudi universities, the methodology adopted to impart training is an important factor that might influence both students' participation and satisfaction towards heath research[19]. Another explanation to these observed differences is the school-level effect where there is some dissimilarity in the infrastructural facilities (i.e. laboratory, library and teaching hospital) and intellectual capital (i.e. availability of faculty and skilled manpower for research guidance) are obvious with respect to the conduct of scientific enquiry[17].

In the present study, only 43% of medical students felt that their faculties actively involved the students' in research activities and 45% of students expressed that their college has adequate infrastructure to organize such research programs. These results are in conformance to the findings of earlier studies which indicated that there is lack of funding for research and teaching load of the faculty is cited as one of the common barriers for conduct of research in medical schools[22, 23, 24].

Further, a step-wise regression model was used to predict the students' overall satisfaction with respect to the other three factors included in the questionnaire tool. Three different factors with fifteen variables included in the questionnaire were explored with an expectation to see how each one of them influences the students' overall satisfaction towards research training offered at various Saudi Universities. Among the three factors analyzed, only three variables were directly related to the overall satisfaction of the students about the research training programs offered in selected Saudi universities (95% CI; $p<0.5$). Specifically, the variables such as the infrastructural facilities and funding offered for research are contributing to the students' overall satisfaction towards research training programs. Supporting the findings of this study, a previous study also reported that the lack of institutional incentive is the most significant barrier to students' participation in research activities indicating funding as an important element for research[9,10]. Also, the emphasis made by the faculty on research is the next significant variable which influences the students' overall satisfaction towards research in this study.

This result also indicated that the students' overall satisfaction about research could be enhanced by providing good infrastructure, funding and adequate faculty support. Also, there is a need to revise and restructure the curricula by integrating scientific research training in the undergraduate medical education program in Saudi Arabia[20]. At most care needs to be taken while interpreting the results of this study. Firstly, this study was limited to the students experience about the research training programs offered at selected medical schools in Saudi Arabia. Further, the obtained results may not be applicable to others programs of the selected study settings since different programs might be at different levels of the developmental phase in terms of research and development.

CONCLUSION

This study will help the educational policy planners to get a policy oriented clue about the most significant variables to be improved for strengthening the research related activities offered at medical schools in Saudi Arabia. From the results of this study, it is observed that medical students have less interest in participating in the research activities offered in their respective colleges. Three variables consist of infrastructural facilities, funding and the emphasis put forth by the faculty for research are influencing the students' overall satisfaction towards research training programs offered at selected medical schools in Saudi Arabia. Further, it is recommended to strengthen research related activities in Saudi medical schools by conducting more research oriented workshops and training programs to trigger the students' interest to participate in research. Future work should include a wider survey of the pertinent questions regarding the role of research in other Health Science programs.

Practice Points

- Factors such as infrastructural facilities, funding and faculty involvement in research are influencing the students' overall satisfaction towards research training programs
- The curricula need to be restructured to integrate scientific research training into undergraduate medical education by including mandatory undergraduate research elective.
- More research oriented training programs needs to be conducted to trigger the students' interest to participate in research.

CONFLICT OF INTEREST STATEMENT

Authors declared that they have no conflict of interest.

FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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Source of Support: Nil, Confl ict of Interest: None declared

APPENDIX-1: STUDENTS ATTITUDE TOWARDS RESEARCH QUESTIONNAIRE ITEMS

I. Research activities offered in the College

1. I am much interested in participating in research activities at the undergraduate level
2. My College organizes and gives priority to include undergraduates in Research activities
3. Faculty members have adequate skills to handle Research Methodology
4. Faculty do not have sufficient time to mentor undergraduate students in Research
5. The degree of involvement of the faculty in research programme is good
6. Our College has adequate infrastructure to organize research programmes
7. I had been exposed to basic and advanced statistical tools needed for preparation of Research Report

II. Students opinion of Faculty's involvement in Research

8. Faculty members place great emphasis on Research
9. Faculty members discuss their own research interests in Class
10. Faculty members use research findings as a part of their teaching material
11. Research is important for identifying and investing problems in a subject matter
12. I am always getting the chance to discuss about the scientific/academic research in my class.

III. Infrastructural facilities offered by my College for Research

13. Our College provides a good infrastructural facilities (i.e. Laboratory) needed to conduct research at the undergraduate level
14. The Library Facilities available in my college is sufficient for us to conduct research activities
15. Sufficient funding is offered by the university for conducting research at the undergraduate level

IV. Overall Satisfaction

16. Overall, I am satisfied with the research training program offered at the undergraduate level.