Original Article

Zohreh Anbari,
Abolfazl Mohammadbeigi[1,2],
Rahmatollah Jadidi

Department of Education Development Center, Arak University of Medical Sciences, Arak, [1]Department of Epidemiology, School of Health, [2]Health Policy and Promotion Research Center, Qom University of Medical Sciences and Health Services, Qom, Iran

Address for correspondence:
Dr. Abolfazl Mohammadbeigi,
Department of Epidemiology, School of Health, Qom University of Medical Sciences and Health Services, Qom, Iran.
E-mail: beigi60@gmail.com

Barriers and challenges in researches by Iranian students of medical universities

Abstract

Background: Health sciences research (HSR) is an essential part of improving health care which plays a critical role in the field of medicine and clinical practice. The aim of the current study was to assess barriers to the research by students of medical sciences as well as to find out effective strategies for management of student researches in Iranian universities. **Materials and Methods:** This study utilized a hybrid design with quantitative and qualitative analytical approaches conducted on 627 students in six schools of medical sciences in two universities in Central Province in Iran from April to December, 2012. Questionnaires were distributed among researcher and non-researcher students to find barriers to the research. These barriers were approved and validated by similar studies and strategies using the Delphi technique on 36 students. **Results:** The most important barriers among researcher students were institutional barriers (3.3 ± 1.3), but in non-researcher students they were individual barriers (3.6 ± 1.7). The majority of barriers to involvement in the research among researcher students appeared to be time, lack of access to electronic resources and prolongation of the process of buying equipment. In addition, the greatest barriers among non-researcher students included the lack of time, scientific writing skills, and access to trained assistants. **Conclusion:** The results showed the issue of attitudes towards compulsory research as a component of critical scholarship in the curriculum of medical courses. Moreover, employment of the research experts can be helpful for research training in schools of medical sciences.

Key words: Barriers, challenges, medical sciences students, research, students of medical sciences, universities

BACKGROUND

Health sciences research (HSR) is an essential part of improving health care and plays a critical role in the field of medicine and clinical practice.[1] Advances in health care and medicine including disease surveillance, diagnosis, treatment and prevention all rely heavily on the quality of researches as well as health policy[2] The quantity and quality of research papers are considered the most important indicators of scientific development in any country.[1] Since medical students play an important role in production of knowledge, health-related research training and evidence-based scientific knowledge are a fundamental part of medical education.[1,3,4] Studies have shown that early involvement in the research promotes a tendency to continue research in later stages of the medical

profession.[5,6] Also, early research education enables the students to develop critical appraisal skills,[7] along with encouraging them to pursue their career in basic medical sciences or clinical research.[8] In addition, the ability of evaluating the literature provides lessons in teamwork and brings about experience in writing and practice in communicating data with the scientific field.[9] Literature shows that medical students' involvement in research projects has declined in recent years.[10,11] Silcox showed that 75% of the postgraduate students prefer to engage in other scholarly activities compared to the research.[12] Studies have verified that medical students' involvement in research is highly associated with postgraduate research works.[6,13] The role of undergraduate research assistants becomes thus ever more important.[6,14] Furthermore, another study in Calgary University depicted that introducing a formal research workshop caused a significant upward trend in submission of medical researches by students from 11% to 59%.[15,16]

Research findings have shown that the majority of undergraduate medical students are interested in doing research, but that some official and educational factors turn out to be barriers and challenges in doing it. These factors include previous training and skills in research,[1] inexpert faculty staff,[17] motivationally worthwhile environment at the institution,[16] official procedure, lack of time, arduousness, intense workload, poor guidance and inadequate financial repayment.[15,16,18,19] Besides, in the primary care field, most studies found that time, financial constraints,[1] hard clinical practices,[20] and lack of interest[21] and financial inducements and infrastructure support are the key factors in promoting research.[22]

According to a recent study in Iran, 70% of medical sciences students are not willing to do research due to barriers and challenges in the research.[23] Therefore, it is important that students of medical sciences - including Medical, Nursing, Midwifery and Allied Health Sciences - should have positive attitude towards the role of research on health. However, problems in medical curricula, financial and logistical barriers could create challenges in involvement of students in HSR. As such, the aim of the current study was to assess barriers of execution of research projects by Iranian medical students as well as to investigate the effective strategies for management of student researches.

MATERIALS AND METHODS

This analytical study was conducted on six schools of medical sciences of two universities in Central Province in Iran between April and December of 2012. The subjects

for the study were selected by stratified random sampling method based on the field of study and gender from schools of Medicine, Nursing and Midwifery and Allied Health Sciences in Azad University (private sector), and University of Medical Sciences (public sector). Overall, 277 students were from University of Medical Sciences and 350 were from Azad University. The inclusion criteria were: (1) the academic year: 2 years or above; (2) place of education; they should have been studying only in these universities, so students from other universities and guest students from other universities (if they had studied less than two semesters at the guest university) were excluded; (3) research activities: students were divided into two groups, researchers and non-researchers. Researcher students were defined as the students who had at least one research project or academic paper. In this study, 19 students were excluded. Therefore, 572 students were non-researcher and 36 ones were labeled as researcher students. Ethical approval was obtained from each institutional review board and explanations for the objectives of the study and assurance of confidentiality were distributed among the students responding to the survey.

The barriers and limitations of the research between researcher and non-researcher students were assessed by means of two questionnaires (containing 35 and 25 close-ended questions, in two different dimensions including the institutional and individual barriers to research, respectively). The first 7 questions of the survey assessed demographic information and research background for the students being surveyed. The remaining 28 questions for researcher students and 18 questions for non-researcher students were in Likert's scale format and addressed the above -mentioned objectives. It should be mentioned that the students' opinions about strategies for promotion in management of student researches, the weaknesses, and the strengths of carrying out research in these universities were assessed by 5 open-ended questions. The validity of questionnaires was approved through focus group, and their reliability was examined using Cronbach's Alpha (0.89). In the second phase of study, a thorough search was carried out on Medline, Proquest, and CINAHL online journals and 30 articles were identified to provide effective strategies for management of student researches in Iran. A questionnaire was developed on the basis of the searched literature and student opinions about the mechanisms of removing barriers. This questionnaire included strategies based on structure, process, and output. Strategies with a schematic view were validated by Delphi technique. For this purpose, the questionnaire was sent to 36 experts. The scores of this questionnaire were classified as strongly disagree (1), disagree (2),

neutral (3), agree (4) and strongly agree (5). The average scores were calculated according to the formula: $Z = [(X/n) - P0)/\sqrt{(P0(1 - P0)/n}]$, $P0 \geq 75\%$, $n = 36$, $P < 0/05$, H1:P0 > 75%, H0:P0 ≤ 75%. If computed Z was over +1.64 or less than -1.64, the component of strategy would be approved and was valid, but if Z was calculated between (+1.64) and (−1.64) the component would be disapproved and was not valid.

RESULTS

All in all, 627 participants eligible for the study were taken into account 608 of whom responded to the questionnaires (response rate was 97%). In this study, 35.8% of students were in the school of medicine, 21.2% of students in school of Allied Health sciences, and 43% of students in school of Nursing and Midwifery [Table 1].

An almost equal number of male and female students participated in the study (44/7% and 55/3%, respectively). In this study, 94.1% of students did not have a research project or scientific paper, and had not collaborated on projects. The barriers of non-researcher students were individual barriers (3.68 ± 1.98) but those of researcher students were institutional barriers (3.5 ± 2.48) [Table 2].

The most important barriers to research evaluated from the perspective of researcher students in Schools of Medicine were insufficient funds (4.8 ± 1.04), but the barriers of non-researcher students in these schools were the lack of research use in the community (4.25 ± 0.95). This study showed that the barriers to the research from the perspective of researcher students in Nursing and Midwifery Schools were lack of using research results in community and lack of experts and trained research assistants (4.75 ± 1/4), but the barriers to research by non-researcher students in this schools were lack of experts and trained research assistants (4.8 ± 1.04). The barriers to the research from the perspective of researcher students in Schools of Allied health Sciences were lack of using research results in the community (4.75 ± 0.95), but the barriers of non-researchers in these schools were lack of experts and trained research assistants (4.8 ± 1.04). Lack of access to electronic resources (4.6 ± 1/4) and prolongation of equipment purchase (4.6 ± 1.5) were the most important problems for researcher students in the domain of institutional barriers, and as regards the individual barriers lack time for research was the most important cause [Table 3].

Lack of experts and assistants for cooperation with students and unfamiliarity with digital libraries were the most important problems for non-researcher students in the domain of institutional barriers [Table 4].

In this study there were differences among institutional barriers in schools and between non researcher students. Students of schools of Allied Health Sciences faced with more institutional barriers in comparison with other schools ($P = 0.001$). There was no significant difference ($P = 0.37$) between sex and level of students in the schools. In comparative study on barriers in the articles, 40 articles showed individual barriers to be weakness in value, skill and research knowledge; 24 articles emphasized lack of research knowledge and institutional barriers were barriers related to the research field including: 38

Table 1: Demographic characteristics of the students in universities of medical sciences and Azad universities

Demographic variables	N (%)
Age	
<20 year	212 (35)
20 years or above	395 (65)
Sex	
Male	272 (44.7)
Female	336 (55.3)
School	
Medicine	218 (36)
Nursing and midwifery	262 (43)
Allied health sciences	128 (21)
Marital status	
Single	546 (89.8)
Married	61 (10.2)
Students	
Researcher	36 (5.9)
Non- researcher	572 (94.1)

Table 2: The mean and standard deviation of the research barriers between universities of medical sciences and Azad universities in Iran

	Mean±SD					
	Schools of allied health sciences		Schools of medicine		Schools of nursing and midwifery	
Barriers	128 (21%)		218 (36%)		262 (43%)	
	Researcher students 3 (8.3)	Non- researcher students 125 (21.9)	Researcher students 20 (55.5)	Non- researcher students 198 (34.6)	Researcher students 13 (36.2)	Non- researcher students 249 (43.5)
Institutional barriers	3 ± 1.3	3.3 ± 1.6	3.3 ± 1.3	3.4 ± 1.2	3.3 ± 1.2	3.2 ± 1.2
Individual barriers	3.2 ± 1.4	3.8 ± 1.5	3 ± 1.3	3.4 ± 1.2	3.1 ± 1.5	3.6 ± 1.5

SD: Standard deviation

Table 3: The mean and standard deviation of research problems of "researcher students"

Barriers	Reply	Total based on schools (Mean±SD)	F	P<0/05
Institutional barriers	The amount of pay for research is low	4.1±1.2	1	0.37
	Equity in the approval of proposal is poor	1.3±0.9	0.18	0.83
	The access to electronic resources is poor	4.6±1.4	1.54	0.22
	The process of buying equipments is poor	4.6±1.5	1.40	0.25
	The process of payment is long	4.14±0.9	0.64	0.53
	The provision of facilities is poor for participation in congresses	3±1.5	2.43	0.10
	The process of project and article arbitration is long-term	4.3±2.2	2.67	0.08
	The process of proposal approval is long-term	2.2±0.6	0.05	0.95
	There are unnecessary steps in projects' approval	3.5±1.5	1.30	0.28
	The encouragement systems for researcher students are poor	3.2±1.2	0.53	0.95
	The results of the research cannot be used	3.9±1.3	7.15	0.002
	The familiarity with clinical research center is poo	3.5±1.1	0.35	0.709
	The familiarity with activity of student research committee is poor	1.4±1.2	0.86	0.43
	The access to trained assistants is poor for research	4.5±1.5	0.12	0.88
	Research lines are not in the departments	4.3±1.1	0.30	0.74
	Supervising on student's research is poor	2.8±1.6	0.08	0.92
	The criteria of project approval or rejection are unreliable	3.2±1.6	1.16	0.32
	The criteria of assessment on proposal are unreliable	3.8±1.6	0.55	0.58
	The cooperation with students for research is poor	1.3±0.6	0.98	0.38
	Assistance with student to do research is poor	2.3±1.5	0.10	0.902
Total		3.3±1.3	0.22	0.796
Institutional barriers	I have not time for research	4.1±0.6	16.67	0.001
	I have not motivation for the research	3.2±2.5	0.27	0.76
	I have not interest to teamwork for research	2.6±0.9	0.30	0.74
	I have not knowledge for writing proposals	2.3±1.4	2.14	0.13
	I have not skill for reporting project	2.4±1.1	0.27	0.76
	I have not skill for scientific writing	2.3±0.8	2.67	0.08
	I have not mastery on statistical analysis	3.9±1.2	0.72	0.49
	I have not skill for using of electronic databases	2.8±1.7	0.89	0.42
	I have not familiarity with digital libraries (INLM)	3.6±1.9	1.78	0.18
Total		3±1.4	0.800	0.22

SD: Standard deviation, INLM: Iranian national library of medicine

Table 4: Comparing the mean and the standard deviation research problems of "non-researcher students"

Barriers	Reply	Total based on schools (Mean±SD)	F	P<0/05
Institutional barriers	The access to electronic resources is poor	4.4±1.8	18.60	0.001
	There are unnecessary steps in projects approval	3.2±1.9	4.35	0.01
	The encouragement systems for researcher students are poor	3.5±1.4	10.10	0.001
	The results of the research cannot be used	4.3±1.1	24.94	0.001
	The familiarity with clinical research center is poor	2.1±1.8	44.99	0.001
	The familiarity with activity of student research committee is poor	1.3±1.4	26.51	0.001
	The access to trained assistants is poor for research	4.5±0.9	12.35	0.001
	Research Lines aren't in the departments	4.2±2.5	2.52	0.08
	Assistance with student to do research is poor	2.1±0.7	21.87	0.001
Total		3.3±1.6	6.42	0.001
Institutional barriers	I have not time low for research	4.2±1.5	1.80	0.16
	I have not motivation for the research	2.9±1.1	24.69	0.001
	I have not interest to teamwork for research	2.1±2.7	7.42	0.001
	I have not knowledge for writing proposals	4±1.2	134.05	0.001
	I have not skill for scientific writing	4.2±1.5	103.69	0.001
	I have not skill for reporting project	3.9±1.9	30.67	0.001
	I have not mastery on statistical analysis	4.4±1.6	6.52	0.001
	I have not skill for using of electronic databases	2.53±1.8	11.45	0.001
	I have not familiarity with digital libraries (INLM)	4.2±2.1	0.92	0.001
Total		3.6±1.7	1.02	0.02

SD: Standard deviation, INLM: Iranian national library of medicine

articles showed lack of time to do research, 20 articles pointed to the low quality of research, one article showing contradiction in clinical research, and 36 articles depicted incomprehensible statistical analysis. Finally, student

Table 5: Management strategies for the promotion of research by students

Strategy	Components
Strategies structures	Upgrades processes research, allocation of research funds to researchers, strengthen the incentive policies, presentation of the research line in the departments based on disease epidemiology and health changes, employment and training research assistants, integration of research into the undergraduate curriculum
Strategies processes	The research assistants must support students in implementation of the research, buying timely equipment for research, reducing unnecessary bureaucracies in implementation of projects
Strategies outputs	Evaluation of papers and projects and provide feedback, the results of investigations apply to researchers and community

research management model included strategy structures, processes and outputs [Table 5].

DISCUSSION

This study is the first attempt in Iran that looked at barriers to research in different academic settings both in private and public universities (Azad and Medical Sciences Universities). This study is also the first attempt to highlight differences in barriers in the research ward of different schools and between researcher students and non-researcher ones. On the whole, the majority of students sampled were not involved in the research. However, the number of students currently involved in research was similar to some studies done before.[1,4] Researcher students were faced with institutional barriers but non researcher students with individual barriers. This finding is in line with that of some studies.[17,24] Prolongation of the equipment purchase was the most important problem for researcher students in the domain of institutional barriers. While doing research in the field of medical science is necessarily of empirical nature and interventional research, which necessitates the purchase of equipment and laboratory animals, any delay in the purchase of supplies for researchers, in addition to reducing motivation, can cause changes in the cost of laboratory equipments because of the imbalance in the market.

Weaknesses in research methodology were another type of barriers. Our findings are comparable with the results of a study conducted in Iran, regarding the medical students' perspectives on the teaching of medical statistics in the undergraduate medical curriculum, which emphasized that biostatistics should be taught early in the curriculum, but there is a need to reinforce such skills throughout the graduating years.[23] The other barrier was the lack of use of research results in the community. Lack of a comprehensive plan of research in universities is one factor which leads

to a decrease in motivation to do research. Vodopivec *et al.*, showed students' knowledge and attitude towards health research significantly improved with increasing years of education at medical school.[24] This indicates a relatively satisfactory contribution of medical curriculum in developing research skills among medical students through well-structured concentrated courses.[9] The results were consistent with those of a survey conducted by Siemens *et al.* A study in Pakistan showed barriers to the research participation included the access to research mentors and available time.[25] Compulsory involvement in the research projects has been shown to improve students' knowledge and attitudes towards research.[23,26]

It is believed that encouragement in students of medical sciences can improve the physician scientists and help developing countries to achieve self-reliance in HSR.[3] However, according to our results and other literature, research training is an important part of medical education.[1] Moreover, while a major proportion of medical students are internet-addicted for game and entertainment, training in the research is essential in the medical curriculum to prevent waste of time.[17,27] Furthermore, due to some lacks in graduated and under graduated students, a movement initialized towards conducting early research experience in medical students,[11,24,28] and research methodology within the school of medicine curriculum to facilitate the doctors understanding of published medical literature is indispensible.[29-34]

CONCLUSION

Increasing the quality of the research at universities needs better infrastructure work. Having assistants for cooperation with students as well as integration of research into the undergraduate curriculum are strategies for removing some research barriers. Besides, improvement in the quality and quantity of undergraduate medical research is essential. Therefore, investment for development of medical curriculum is a superior and robust method in catering for the health -related research demands of the society.

REFERENCES

1. Khan H, Khawaja MR, Waheed A, Rauf MA, Fatmi Z. Knowledge and attitudes about health research amongst a group of Pakistani medical students. BMC Med Educ 2006;6:54.
2. Fairhurst K, Huby G. From trial data to practical knowledge: Qualitative study of how general practitioners have accessed and used evidence about statin drugs in their management of hypercholesterolemia. BMJ 1998;317:1130-4.
3. Scaria V. Whisking research into medical curriculum: The need to integrate research in undergraduate medical education to meet the future challenges. Calicut Med J 2004;2:e1.

4. Aslam F, Shakir M, Qayyum MA. Why medical students are crucial to the future of research in South Asia. PLoS Med 2005;2:e322.
5. Segal S, Lloyd T, Houts PS, Stillman PL, Jungas RL, Greer RB 3rd. The association between students' research involvement in medical school and their postgraduate medical activities. Acad Med 1990;65:530-3.
6. Ejaz K, Shamim MS, Shamim MS, Hussain SA. Involvement of medical students and fresh medical graduates of Karachi, Pakistan in research. J Pak Med Assoc 2011;61:115-20.
7. Hren D, Lukić IK, Marusić A, Vodopivec I, Vujaklija A, Hrabak M, *et al.* Teaching research methodology in medical schools: Students' attitudes towards and knowledge about science. Med Educ 2004;38:81-6.
8. Ghali WA, Saitz R, Eskew AH, Gupta M, Quan H, Hershman WY. Successful teaching in evidence-based medicine. Med Educ 2000;34:18-22.
9. Frishman WH. Student research projects and theses: Should they be a requirement for medical school graduation? Heart Dis 2001;3:140-4.
10. Bakken LL, Sheridan J, Carnes M. Gender differences among physician-scientists in self-assessed abilities to perform clinical research. Acad Med 2003;78:1281-86.
11. Lloyd T, Phillips BR, Aber RC. Factors that influence doctors' participation in clinical research. Med Educ 2004;38:848-51.
12. Silcox LC, Ashbury TL, VanDenKerkhof EG, Milne B. Residents' and program director's attitudes toward research during anesthesiology training: A Canadian perspective. Anesth Analg 2006;102:859-64.
13. Reinders JJ, Kropmans TJ, Cohen-Schotanus J. Extracurricular research experience of medical students and their scientific output after graduation. Med Educ 2005;39:237.
14. Wyngaarden J. The clinical investigator as an endangered species. N Engl J Med 1979;301:1254-9.
15. Pasko T, Smart D. Physician Characteristics and Distribution in the US 2005 Edition. American Medical Association Press; 2004.
16. Burgoyne LN, O'Flynn S, Boylan GB. Undergraduate medical research: The student perspective. Med Educ Online 2010;10:15.
17. Amin TT, Kaliyadan F, Abdulatheem Al Qattan E, Al Majed MH, Al Khanjaf HS, Mirza M. Knowledge, attitudes and barriers related to participation of medical students in research in three Arab Universities. Edu in Med 2012;4:e43-56.
18. Prescott RJ, Counsell CE, Gillespie WJ, Grant AM, Russell IT, Kiauka S, *et al.* Factors that limit the quality, number and progress of randomized controlled trials. Health Technol Assess 1999;3:1-143.
19. Centre for Reviews and Dissemination. Systematic Review of Barriers, Modifiers and Benefits Involved in Participation in Cancer Clinical Trials. New York, UK: University of York; 2006.
20. Rosemann T, Szecsenyi J. General practitioners' attitudes towards research in primary care: Qualitative results of a cross sectional study. BMC Fam Pract 2004;5:31.
21. Jowett SM, Macleod J, Wilson S, Hobbs FD. Research in primary care: Extent of involvement and perceived determinants among practitioners from one English region. Br J Gen Pract 2000;50:387-9.
22. Shewan LG, Glatz JA, Bennett CC, Coats AJ. Contemporary (post-Wills) survey of the views of Australian medical researchers: Importance of funding, infrastructure and motivators for a research career. Med J Aust 2005;183:606-11.
23. Ashtyani SC, Shamsi M. Comparison of barriers to research activities forms the point of view of normal and talented students at Arak University of Medical Sciences. Edu Res Med Sci 2012;1:26-32.
24. Vodopivec I, Vujaklija A, Hrabak M, Lukić IK, Marusić A, Marusić M. Knowledge about and attitude towards science of first year medical students. Croat Med J 2002;43:58-62.
25. Siemens DR, Punnen S, Wong J, Kanji N. A survey on the attitudes towards research in medical school. BMC Med Educ 2010;10:4.
26. Astin J, Jenkins T, Moore L. Medical students' perspective on the teaching of medical statistics in the undergraduate medical curriculum. Stat Med 2002;21:1003-7.
27. Fang D, Meyer RE. Effect of two Howard Hughes Medical Institute research training programs for medical students on the likelihood of pursuing research careers. Acad Med 2003;78:1271-80.
28. Ahmad F, Zehra N, Omair A, Anjum Q. Students' opinion regarding application of epidemiology, biostatistics and survey methodology courses in medical research. J Pak Med Assoc 2009;59:307-10.
29. Ghamari F, Mohammadbeigi A, Mohammadsalehi N, Hashiani AA. Internet addiction and modeling its risk factors in medical students, Iran. Indian J Psychol Med 2011;33:158-62.
30. Jaffery NA, editor. Medical education: A Collection of Articles. 2nd ed. Karachi: Ziauddin University Publications; 2005. p. 75-6.
31. May T. Social Research: Issues, Methods and Process. 1st ed. Great Britain: Open University Press; 1996. p. 25-6.
32. Ahmadi A, Ershad M, Givzadeh H, Mohammad-Beigi A. General physicians' knowledge about nutrition in Shiraz, Iran. Pak J Bio Sci. 2009;12:981-85.
33. Fariba G, Abolfazl M, Narges M. A survey of the students' knowledge about hepatitis in Shiraz University of Medical Sciences. Hep Month. 2006;2006 (2, Spring):59-62.
34. Moshfeghi K, Mohammadbeigi A. Comparison the effects of two educational methods on knowledge, attitude and practices of arak physicians about breast cancer. Pak J Bio Sci 2010;13:901.