Addressing the Problems and Challenges of Medical Research During the Syrian Crisis

MHD Bahaa Aldin Alhaffar (bhaa.alhafar@gmail.com)
Damascus University https://orcid.org/0000-0002-9147-189X

Marwah Albarshah
hama university

MHD ALAA ALDIN alhaffar
Damascus University

Research

Keywords: medical research, EBM, Syrian crisis

Posted Date: May 29th, 2020

DOI: https://doi.org/10.21203/rs.3.rs-31248/v1

Abstract

Introduction : The Syrian crisis started 9 years ago causing substantial damage to the country's infrastructure, and the consequences of this tragedy have further stunted the underdeveloped research environment in Syria. This paper aims to address the challenges of conducting medical research among Syrian academics during the Syrian crisis.

Methods: The data were collected from (471) Syrian researchers (MsC or PhD students, university professors) from 13 universities and hospitals, covering 10 governates. A questionnaire was developed to collect the data and 52 factors were identified as research challenges.

Results: The main institutional challenges are: (94%) insufficient funding, (80.3%) difficulties in acquiring supplies and equipment, (79.6%) lack of neutrality in approving research proposals. In regards to the personal challenges, (70.1%) expressed a high level of motivation to carry out research but only (33.4%) are confident that they have enough knowledge, (53.1%) do not have academic writing skills, (73.5%) do not have the basic information about medical statistics. For the crisis related factors, (83.5%) cite collecting data and reaching the sources of data as the main challenge, (80.4%) for losing contact with the patients because of the war situation, (76.3%) for lack of governmental support for the research during the crisis.

Conclusion: Syrian medical researchers continue to face a number of challenges and the Syrian crisis has brought more problems and obstacles to the surface. However, despite those numerous challenges, researchers from Syrian institutes are still working on research projects.

Introduction:

The Syrian crisis has been affecting all aspects of life in Syria since it started in 2011. It is considered as the worst humanitarian catastrophe of this century (1). More than 13 out of 23 million Syrians have been displaced [2, 3, 4] in addition to hundreds of healthcare workers who have been killed and/or tortured which makes Syria one of the most dangerous places for healthcare providers. Several health facilities have been deliberately destroyed (Fouad et al, 2017) [5]. As a result, Syria's health care system has been catastrophically impacted, with supply lines shattered and a general degradation of key services [6].

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 [7]. Advances in health care and medicine including disease surveillance, diagnosis, treatment and prevention are all heavily reliant on the quality of research as well as health policy [8]. Moreover, the quantity and quality of research papers are considered as the most important indicators of scientific development in any country [7]. Medical students play an important role in the production of knowledge, thus, health-related research training and evidence -based scientific knowledge are a fundamental part of medical education [7, 9, 10].

In developing countries, researchers commonly initiate research studies with the best intentions. Unfortunately, researchers' lack of understanding of the social determinants of health and the unique cultural factors of the community inhibit all attempts to attain successful outcomes. Advances in bio-medical research during the last decade have highlighted the necessity of attracting greater numbers of physicians to careers that include a research component. Physicians' participation in research is essential to increase the number of clinical and research studies performed [11]. Many developing countries have insufficient resources or a weak infrastructure to support their own research [12].

In view of the above, it is vitally important to study the research environment in Syria, especially during this ongoing crisis, which is considered as a unique environment for researchers and health-providers.

Aim of The Research:

studying the difficulties and challenges of conducting medical research during the Syrian crisis.

Methods:

Study design:

A cross-sectional study was conducted to assess the challenges of medical research among academics in Syria during the Syrian crisis. A special questionnaire was developed and tested on a pilot sample before using the final version to collect the data. The validity of the questionnaire was approved through a pilot group, and their reliability was examined using Cronbach's Alpha (0.87). The final questionnaire was divided into **5 sections**:

1. Demographic information (8 questions)
2. General attitude to medical research (7 questions)
3. Institutional factors affecting medical research (23 questions)
4. Personal factors affecting medical research (13 questions)
5. Factors related to the Syrian crisis affecting medical research (8 questions)

A paragraphe was added at the beginning of the questionnaire to explain the purpose of the study and ask for the consent of the participants.

Sampling:

The questionnaire was sent to participants via email. Data were collected from 8 different Governates and participants were from 4 different authorities (public hospitals or clinics, private hospitals or clinics, public and private universities), and 14 different affiliations. The sample balanced between males and females. other governorates were not reachable during the time of data collection.

All of the participants were MsC or PhD students, university professors. 765 academics were contacted and the data were collected between January and June 2019.

Statistical analysis:

Data were analyzed using SPSS V.22, both descriptive and inferential statistics methods were used. Shapiro-Wilk test was used to assess the normal distribution of the data, and afterwards, T-test and ANOVA test were used to test the significant difference.

Results:

Sample analysis:

(Table N.1) represents the sample characteristics. The total number of questionnaires accepted in the study was 465, the response rate was 60.8%. All participants signed an electronic consent form to participate in the study.

Table N.1 – Demographical Variables							
Variables		N	Percent	Variables		N	Percent
Gender	Male	191	58.9%	**Academic degree**	Master degree	311	66.9%
	female	274	41.1%		PHD	109	23.4%
Nationality	Syrian	458	98.5%		University professor	45	9.7%
	other	7	1.5%	**Academic year**	First	35	7.5%
Authority	public hospital or clinic	191	41.1%		Second	63	13.5%
	private hospital or clinic	35	7.5%		Third	81	17.4%
	public university	172	37%		Fourth	133	28.6%
	private university	67	14.4%		Fifth	93	20%
Affiliation	IUST	23	4.9%		Sixth	31	6.7%
	SPU	3	0.6%		Postdoctoral	29	6.2%
	al-bath university	15	3.2%	**Governate**	Al-Hasakah	9	1.9%
	Alphorat university	3	0.6%		Al-Souidaa	3	0.6%
	Tishreen university	18	3.9%		Tartous	6	1.3%
	Aleppo university	62	13.3%		Latakia	15	3.2%
	Hama university	71	15.3%		Aleppo	107	23%
	Damascus university	103	22.2%		Hamah	113	24.3%
	Al-Mojtahid hospital	45	9.7%		Homs	18	3.9%
	Al-Mouasat hospital	42	9%		Damascus	194	41.7%
	Yousef Alazmeh	27	5.8%	**Specialty**	medicine	214	45.4%
	Tishreen hospital	28	6.0%		dentistry	96	20.4%
	Alshaml hospital	12	2.6%		pharmacy	80	17%
	Tartous hospital	13	2.8%		public health	18	3.8%
					another medical field	57	12.1%

Males were (58.9%) of the sample and females were (41.1%). Most of the sample consisted of Syrian researchers (98.1%) in addition to a small number of participants had different citizenship (1.9%).

Data were collected from 8 Syrian Governates which were reachable to collect data. Damascus had the highest percentage followed by Hamah (41.7%, 24.3%) respectively.

Participants were from 4 different authorities, public hospitals or clinics (41.1%), private hospitals or clinics (7.5%), public universities (37%) and private universities (14.4%).

MsC students formed (66.9%) of the sample, PhD students were (23.4%), and (9.7%) were university professors from 14 different affiliations across Syria. Participants' professional fields were: medicine, dentistry, pharmacy, public health and other medical fields (45.4%, 20.4%, 17%, 3.8%, 12.1%) respectively **(Table N.1).**

General Attitude Of Syrian Academics Toward Medical Research:

Most of the Syrian academics are interested in medical research (91.6%), and they think it is very important (99.6%), and would like to develop a career in medical research (53.1%). However, only (10.3%) of the Syrian academics have published an article in peer-reviewed journal and only (35.9%) have attended research-related workshops **(Table N.2).**

Table N.2 – general attitude toward medical research					
variable	No	Yes	Authority	Academic degree	Specialty
are you interested in medical research	8.4%	91.6%	0.493	0.055	0.709
do you think medical research is important?	0.4%	99.6%	0.610	0.327	0.459
do you plan to build a research career?	46.9%	53.1%	0.034	0.004	0.750
have you published any research or article?	89.7%	10.3%	0.013	0.039	0.499
have you worked on a research project before?	66.9%	33.1%	0.042	0.047	0.026
have you been to any research workshop?	64.14%	35.9%	0.245	0.133	0.447
do you think medical research is only for academic degree?	80.6%	19.4%	0.327	0.934	0.808

Academics from public hospitals or universities had a significantly higher rate of publishing articles (P = 0.013), and there is a significant difference between public and private authorities to develop a career in research (P = 0.034).

Institutional Factors Affecting Medical Research:

Twenty-three factors have been identified as institutional factors affecting the process of medical research in the Syrian institutes. Lack of financial support (94%), low number of supervisors (89.2%), and the decreased governmental support for medical equipment and its maintenance (91.6%) were the main institutional factors **(Table N.3).**

Table N.3 – institutional factors affecting medical research

variable	no	Yes	Authority	Academic degree	Specialty
do you think there is enough financial support for medical research in Syria?	94%	6%	0.297	0.428	0.716
Do you think there is impartiality in approving research protocols?	20.4%	79.6%	0.870	0.240	0.915
Do you think there is sufficient access to sources of scientific research?	29.7%	70.3%	0.359	0.369	0.471
Do you think that the mechanism of obtaining equipment for scientific research is difficult and takes a lot of time?	18.7%	81.3%	0.446	0.802	0.782
research funding takes a lot of time	15.7%	84.3%	0.675	0.987	0.814
there is no governmental facilitation to participate in medical conferences	35.1%	64.9%	0.760	0.791	0.984
review process takes a long time	21.5%	78.5%	0.976	0.288	0.716
research results are not applicable in real life	77.4%	22.6%	0.863	0.370	0.625
there is no activities to motivate students to start medical research	12.3%	87.7%	0.973	0.243	0.143
research supervisors are not enough	10.8%	89.2%	0.255	0.564	0.265
approving criteria are not clear	32.9%	67.1%	0.913	0.175	0.231
communication between students is weak	21.7%	78.3%	0.107	0.026	0.067
students do not learn basic research methodology	60%	40%	0.315	0.387	0.387
supervisors have to accept big numbers of research because of the lack of professors	34%	66%	0.920	0.567	0.612
there is no collaboration between governments and other research authorities	85.4%	14.6%	0.669	0.016	0.418
no enough governmental support for medical equipment's and maintenance	8.4%	91.6%	0.439	0.583	0.923
there is no collaboration between different specialties	16.6%	83.4%	0.908	0.883	0.651
there is no collaboration between different governates inside Syria	17.4%	82.6%	0.641	0.174	0.264
researchers do not have a complete freedom to choose the research topic	31.8%	68.2%	0.095	0.365	0.345
there is no awareness about the importance of medical research	16.3%	83.7%	0.121	0.461	0.624
there is no protection for researchers' rights	32%	68%	0.972	0.673	0.836
low attention for the importance of research methodology in Syrian universities	17%	83%	0.565	0.761	0.613
researchers do not have a complete freedom to choose the research topic	22.3%	77.7%	0.300	0.196	0.546

Moreover, participants reported a high level of impartiality in approving the research protocols (79.6%), and there is no freedom to choose the research topic (68.2%).

Additionally, the low collaboration between different specialties (83.4%), or different governates (82.6%), and the lack of awareness for the importance of medical research (83.7%) had a high percentage among the participants' responses. The other factors are presented in **(Table N.3).**

Personal Factors Affecting Medical Research:

Thirteen personal factors affecting medical research were investigated in this study. Participants reported a high level of motivation to start a medical research (70.1%), and expressed interest to work with a team on a medical research project (90.8%). However, the lack of essential research skills were a major obstacle to most of the sample, for instance, lack of protocol writing skills (56.1%), low literature review skills (46.5%), academic English skills (62.2%) and academic writing skills (53.1%).

Table N.4 – personal factors affecting medical research					
variable	no	Yes	Authority	Academic degree	Specialty
do you have time for medical research	33.1%	66.9%	0.855	0.132	0.246
do you have the motivation to start medical research	29.9%	70.1%	0.106	0.649	0.333
are you interested in working with a team on a research project?	9.2%	90.8%	0.461	0.415	0.496
do you have enough knowledge about writing a research protocol?	56.1%	43.9%	0.002	0.516	0.119
do you have literature review skills	46.5%	53.5%	0.024	0.571	0.516
do you have academic writing skills	53.1%	46.9%	0.032	0.945	0.236
can you do basic statistical analysis	73.5%	26.5%	0.088	0.434	0.186
are you familiar with medical research search engine	52.2%	47.8%	0.074	0.142	0.752
are you afraid of being responsible of the whole process od the medical research?	26.7%	73.3%	0.300	0.962	0.528
do have problems finding the right supervisor for your medical research?	26.7%	73.3%	0.007	0.182	0.370
do you think your level in English is enough to start a medical research?	62.2%	37.8%	0.731	0.218	0.421
do you think there is an important result of your research?	50..6%	49.4%	0.241	0.125	0.663
is your community interested in medical research?	73.8%	26.2%	0.313	0.222	0.572

The fear of being solely responsible for a medical research project was common (73.3%), which was the same figure for finding the right supervisor for the research (73.3%).

Finally, the participants of the sample think that the community were not interested in medical research, and the results of research were not applicable in real life (73.38%, 50.6%) respectively **(Table N.4).**

Participants from public authorities had significantly better research skills in writing the research protocol, literature reviews, and academic writing compared to the private sector (p = 0.002, 0.024, 0.032) respectively.

Syrian Crisis Factors Affecting Medical Research:

The Syrian crisis has directly or indirectly affected different aspects of life. 8 specific factors were identified relating to the Syrian crisis and affecting the medical research process. Most of the sample participants found it difficult to conduct a medical research during the crisis (78.3%). Internet and electricity rationing directly affected the medical research process (74.4%), and data sources were quite difficult to access during the crisis (73.5%), and there was a high rate of sample drop out during the crisis (80.4%).

There has been a significant loss of documents and governmental databases because of the war which directly affected the medical research (72.5%), and it has been more difficult to obtain approval for research during the crisis (56.4%).

Surprisingly, participants from public authorities didn't find that the crisis had an impact on the data collection process compared to the private sector (P = 0.007).

Table N.5 – Syrian crisis factors affecting medical research					
variable	no	Yes	Authority	Academic degree	Specialty
do you think it is hard to do research because of the Syrian crisis?	21.7%	78.3%	0.597	0.517	0.524
does internet or electricity shout down affect your research process?	25.6%	74.4%	0.064	0.609	0.150
do you find it hard to obtain research approvals?	43.6%	56.4%	0.544	0.063	0.247
do you find it hard to reach sources of data and to collect data?	26.5%	73.5%	0.007	0.870	0.972
do you think Syrian community is interested in medical research?	86%	14%	0.420	0.087	0.192
do you think the loss of documents and governmental databases because of the war affected the medical research?	27.5%	72.5%	0.338	0.275	0.121
do you think the occurrence of new problems and issues because of the crisis affected medical research?	32.9%	67.1%	0.760	0.217	0.105
the drop in the sample size because of the crisis affected medical research	19.6%	80.4%	0.486	0.105	0.217

Discussion:

There is no doubt that the Syrian crisis has been widely affecting Syrians' lives [1]. Lack of health facilities and the spread of new diseases, as well as the systematic targeting of the Syrian researchers and the brain drain outside Syria during the crisis period have intensified the need for medical research during this time of current conflict.

Before the war, the production of scientific research in Syria has been reported in a quantitative and qualitative analysis in 2011 (13). The author of the previous study found that the Syrian institutions producing research had a gap that need to be bridged. However, there was a spectrum of research originating from Syrian universities except for clinical research which was of a limited number and quality (13).

The overall research productivity from the Arab world has been gradually increasing but there was unbalanced distribution of research production between the Arab countries (14–15). Saudi Arabia and Egypt produced almost 60% of research from the Arab speaking world (13).

The result of this study has found that postgraduate students did not have enough knowledge of research methodology which was one of the most important factors affecting their medical research productivity. Studies have shown that the early involvement of medical students in research promotes a tendency to continue researching in later stages of the medical profession [16, 17]. Additionally, early research education enables the students to develop critical appraisal skills [18] along with encouraging them to pursue their career in basic medical sciences or clinical research [19]. Furthermore, 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 [20]. Literature shows that medical students' involvement in research projects has declined in recent years [21, 22]. Silcox showed that 75% of postgraduate students prefer to engage in other scholarly activities compared to the research [23]. Studies have verified that medical students' involvement in research is clearly associated with postgraduate research [17, 24]. The role of undergraduate research assistants becomes thus even more important [17, 25]. Another study from Calgary University depicted that introducing a formal research workshop resulted in a significant increase in submission of medical research by students from (11%) to (59%) [26, 27].

Research should be conducted using an appropriate method for the unique community and the culture of the proposed research site. Challenges have been encountered when conducting research in developing countries where cultural perspectives often vary significantly from those of developed countries. These challenges include protecting the rights of the most vulnerable and disadvantaged populations while balancing the needs of the many (28). The same results have been found in this study, the Syrian community is not interested in medical research and have not found it useful, and the Syrian researchers were not working on research that have an application in real life.

Some of the problems of scientific research in developing countries include lack of educated human resources that are capable of conducting scientific research. Developing countries' governments research priorities, funding and financial support are insufficient to conduct scientific research. Existence of requirements to carry out a scientific research, such as expensive equipment, the need of various specializations to carry out a research, and the length of time to complete research Some researches require a continuous communication between the researcher and the members of the sample, which may be difficult in developing countries due to the limited means of communication. Import difficulties in developing countries are also among the most important factors limiting scientific research, but governments rarely admit this as a causative element. For example, the required time for the arrival of imported scientific equipment and spare parts, different foreign currency exchange and the approval of governments in developing countries to commence a research [29].

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 a barrier and challenge in doing it. These factors include previous training and skills in research [7], faculty staff who lack experience [30], motivationally worthwhile environment at the institution [27], official procedures, lack of time, arduousness, intense workload, poor guidance and inadequate financial renumeration [26, 27, 31, 32].

In the primary care field, most studies found that time, financial constraints, (Khan et al, 2006) [7] difficult clinical practices [33], and lack of interest (Jowett et al, 2000) [34], as well as financial inducements and infrastructure support are the key factors in promoting research (Shewan et al, 2005) [35]. According to a recent study in Iran, 70% of medical science students are not willing to undertake research due to barriers and challenges in the research [36]. In addition, the increasing cost of education, higher financial returns from clinical careers, reduction of research budgets with increased competition for research funding may have contributed to this decline (37). Poor training in research skills in the medical curriculum is thought to be responsible for this (38).

Finally, the Syrian crisis has presented new challenges and factors which made the process of medical research more difficult for all the Syrian researchers. Scholars in Syria are facing unusual situations because they can not access patients in specific areas, can not get governmental approval for the research proposals and can not use some of the highly technical equipment. However, all of these challenges have not inhibited their motivation, and during the current Syrian situation there has been a noticeable increase in the quantity and the quality of the published research.

Conclusion:

Syrian medical researchers are facing a bewildering array of challenges. Despite the many difficulties, scholars in Syrian institutes are still working on research projects, and the experience of Syrian researchers can be very inspiring for academics working in areas of conflict or in settings of limited resources.

Abbreviations

EBM
Evidence-Based Medicine.
MSc
master of science (master degree student)

Declarations

Ethics approval and consent to participate:

Approved on 16/04/2019, Ethical Committee Damascus university (Damascus University, Damascus, Syria; +963 113341864; manager@hcsr.gov.sy),

Consent for publication:

Not applicable

Availability of data and materials:

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests:

The authors declare that they have no competing interests

Funding:

No sources of funding.

Authors' contributions:

- **MBA:** supervised the research, wrote the manuscript, analyzed the data, finalized the research.
- **MA:** supervised data collection, wrote the manuscript.
- **MAA:** reviewed the manuscript, finalized the paper.

Acknowledgements:

We hereby thank everyone who helped collecting data for this research.

References

1. Black I. Report on Syria conflict finds 11.5% of population killed or injured. The Guardian. 2016;2016:11. Google Scholar.
2. 80 Syrian Observatory for Human Rights. More than 330000 people die while about 13000000 wounded and displaced since the beginning of Syrian revolution 2015. http://www.syriahr.com/en/?p=28089. Accessed 16 Oct 2015.
3. Cousins S. Syrian crisis: health experts say more can be done. Lancet. 385(9972):931–4.
4. Barnard A. Death toll from war in Syria now 470,000, group finds. The New York Times. 2016;2016:11.
5. Fouad FM, Sparrow A, Tarakji A, et al. Health workers and the weaponisation of health care in Syria: a preliminary inquiry for the lancet-American University of Beirut Commission on Syria. Lancet. 2017.
6. Syrian Centre for Policy Research. Syria: alienation and violence, impact of Syria crisis report 2014. Damascus–Syria;2015. https://reliefweb.int/sites/reliefweb.int/files/resources/alienation_and_violence_impact_of_the_syria_crisis_in_2014_eng.pdf. Accessed 1 Nov 2017.
7. 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.
8. 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.
9. 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.
10. Aslam F, Shakir M, Qayyum MA. Why medical students are crucial to the future of research in South Asia. PLoS Med. 2005;2:e322.
11. Zier K, Friedman E, Smith L. Supportive programs increase medical students’ research intrest and productivity. J Investig Med. 2006;54:201–7.

12. Igoumenidis M, Zyga S. Healthcare research in developing countries: Ethical issues. Health Science Journal. 2011;5(4):243–50.
13. Diab MM, Taftaf RM, Arabi M. Research productivity in Syria: Quantitative and qualitative analysis of current status. Avicenna J Med. 2011;1:4–7.
14. El Ansari W, Afifi Soweid RA, Jabbour S. Geography of biomedical publications. Lancet. 2004;363:489.
15. Tadmouri GO. Biomedical science journals in the Arab world. Saudi Med J. 2004;25:1331–6.
16. 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.
17. 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.
18. 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.
19. Ghali WA, Saitz R, Eskew AH, Gupta M, Quan H, Hershman WY. Successful teaching in evidence-based medicine. Med Educ. 2000;34:18–22.
20. Frishman WH. Student research projects and theses: Should they be a requirement for medical school graduation? Heart Dis. 2001;3:140–4.
21. 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.
22. Lloyd T, Phillips BR, Aber RC. Factors that influence doctors' participation in clinical research. Med Educ. 2004;38:848–51.
23. 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.
24. Reinders JJ, Kropmans TJ, Cohen-Schotanus J. Extracurricular research experience of medical students and their scientific output after graduation. Med Educ. 2005;39:237.
25. Wyngaarden J. The clinical investigator as an endangered species. N Engl J Med. 1979;301:1254–9.
26. Pasko T, Smart D. Physician Characteristics and Distribution in the US 2005 Edition. American Medical Association Press; 2004.
27. Burgoyne LN, O'Flynn S, Boylan GB. Undergraduate medical research: The student perspective. Med Educ Online. 2010;10:15.
28. Stapleton G, Schröder-Bäck P, Laaser U, Meershoek A, Popa D. Global health ethics: An introduction to prominent theories and relevant topics. Global Health Action. 2014;7:23569. [PubMed: 24560262].
29. Vose PB, Cervellini A. Problems of scientific research in developing countries. Copenhagen: The Royal Danish Agricultural Society; 1981.
30. 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.
31. 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.
32. Centre for Reviews and Dissemination. Systematic Review of Barriers, Modifiers and Benefits Involved in Participation in Cancer Clinical Trials. New York: University of York; 2006.
33. 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.
34. 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.
35. 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.
36. 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.

37. Houlden RL, Raja JB, Collier CP, Clark AF, Waugh JM. Medical students perceptions of an undergraduate research elective. Med Teach. 2004;26:659–61.
38. Bansal RK. Research stimulating programme for interns. Ind J Med Sci. 1996;50:185–9. of Transcultural Nursing. 2015:1–9. (online ahead of print).