Assessment of Environmental Health Research Centers in Iran due to knowledge production and utilization

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Received: 23 April 2017 / Accepted: 1 January 2018 / Published online: 30 March 2018
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Abstract

Background Knowledge production in environmental health promotion is one of the most important goals at the national level and establishing environmental health research centers (EHRCs) is one of the main strategies that will lead to achieving this goal. In this study, we are going to present the results of knowledge production and research performance evaluation of EHRCs in Iran.

Methods In this cross sectional study, a specific check list has been used to assess Knowledge production and utilization through annual evaluations undertaken by research centers in Iran. This article has the results of the 4-year evaluation (2011–2014).

Results The total number of EHRCs under the supervision of universities of medical sciences (UMS) is 34. The number of faculty members at these centers is 291 and the total approved projects by research council of UMS during 2011–2014, were 538. The number of published article increased from 282 in 2011 to 709 in 2014. During this period, the number of citations to EHRCs' articles was 4488 in Scopus database. The number of EHRCs' articles which have been referred in text books were 39. The proportion of published articles per academic member in environmental health has been 1.8 per year.

Conclusion Based on research performance evaluation, knowledge production and research is desirable in EHRCs, but research utilization to health environmental promotion is still inadequate and should be assessed by qualitative evaluation.

Keywords Environmental health · Research centers · Evaluation · Knowledge production

Background

Based on WHO definition, Environmental health addresses all the physical, chemical and biological factors that influence

human health [1]. There are two types of environment; natural and man-made [2]. The main characteristics of surrounding environment and other global resources is that they are communal. In fact, any environmental condition is common to different people, companies or regions. On the other hand, the action upon the environment has implications upon others [3]. Problems relating to environmental challenges are not new. Environmental risk factors, such as exposure to chemical agents, air, water and soil pollutions, climate change, and ultraviolet radiation can lead to more than 100 diseases and injuries. In 2012, more than 12.6 million people died as a result of living and or working in unhealthy environments [4].

During the past two decades, economic globalization has had an impact on environment and sustainable development [5]. It encourages the growth of polluted industries in countries with low environmental laws even though globalization can increase self-regulating demands on industries in these countries. In china, globalization increased self-regulation of environmental performance due to multinational ownership, customers etc. [6]. Also, urbanization is another factor that has impact on the environment. It is predicted that by 2020, 62% of the world' population will live in urban areas [7] and 90% of future population growth will be assigned to large cities in

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the developing countries [8]. The urban environment poses different physicochemical hazards. These include lead exposure, air pollution, traffic hazards, heat waves amplification and climate changes [9].

Elimination of these challenges requires the linkage of environmental research and policy. One of the most important roles of environmental research is creation of an accurate foundation of information that is essential for protection, restoration, management of environmental resources [10]. The linkage between environmental research and utilization to make an appropriate decision is now weak. For solving the urgent environmental problems, it is needed to have fundamental advances in understanding and in factual knowledge, strengthening the multidisciplinary research, supporting the funding strategies and training [11]. In fact, lack of cooperation to implement the comprehensive environmental research plan in different disciplines is one of the main problems for environmental health promotion [12].

During two past decades, Iran has experienced the most changes in political and economic issues. It has had various achievements with regards to environmental protection such as expansion of its research domain by setting up research centers, cooperating with international agencies and institutes, adapting environmental protection measures etc. [13].

Decision making in environmental issues can be complex, because it is a multi – dimensional subject and consists of sociopolitical, environmental, ecological, and economic aspects [14]. This complex process needs strong evidence and establishment of research centers [13] which can be appropriate for knowledge production [15] in this area. In the regards the, Iranian Ministry of Health and Medical Education (MOHME) facilitated the regulation and process of establishing environmental research centers. Till 2016, more than 30 environmental health research centers (EHRC) have been established and activated under the supervision of MOHME in Iran. In parallel with this activity, all of research performance in these centers has been evaluated annually.

In this study, we are going to present the results of knowledge production evaluation in Iranian EHRCs.

Methods

Setting

The current study takes place in Iran. Iran has 56 universities of medical sciences and the total number of approved Medical Research Centers (MRC) in 2015 was 650. Licenses for research activities for each of these MRCs have been issued by the Development Council of Universities of Medical Sciences and each approved MRC is evaluated after at least 1 year of establishment by the Undersecretary for research and technology (MOHME) based on research indicators. In this study,

environmental health research center (EHRC) is a center which is activated based on its mission in water pollution, wastewater, air control, soil remediation, radiation control, environmental biotechnology, food safety and hygiene.

Indicators

This study is a cross sectional one which has been undertaken based on evaluation results of knowledge production in ERCs between years 2011 and 2014. This study was conducted in 2015. The major inclusion criterion for EHRCs is having more than 1 year of research activity. The samples evaluated by comprehensive research indicators derived from HRS functions defined by WHO and have been modified by MOHME [16]. Indicators were selected based on stakeholders' opinions via brain storming in expert panel. The members of this panel consist of ten representatives from research centers and medical sciences universities; three scientometric experts and research team. Also, annually the indicators are revised and developed based on NHRS policies considering the opinions of the stakeholders.

Research indicators are as follow:

- Total project: the number of research approved projects affiliated to environmental health research centers among 2011–2014. These projects approved by research council in UMS.
- Indexed published articles: the number of published articles indexed in ISI/web of sciences, Pub med/Medline and Scopus among 2011–2014
- Non indexed published articles: the number of published articles among 2011–2014, which were not indexed to any databases.
- Citation per paper: the number of citations to published indexed articles affiliated to research center in Scopus database among 2011–2014
- Abstract meeting: the number of articles presented in national and international congresses among 2011–2014
- Published books: the number of published books by EHRC s during 2011 to 2014
- Domestic and foreign patent: Number of national and international patents among 2011–2014
- Research grants: Number of absorbed national and international grants by Iranian researchers among 2011–2014
- Research collaborations: Number of research centers' collaboration with international agencies among 2011–2014 [17].

All of the research documents related to indicators entered to on line evaluation systems by research centers and then was judged by research evaluation experts in MOHME. Identification of papers, abstracts, books and citation were done by different strategies such as affiliation search of

research centers in different databases, finding the PDF of documents in web and so on. For verifying of patents, reviewing some necessary document such as research proposal, patent and confirmation letters were mandatory.

Data analysis to research scoring has been done by SPSS version 7, based on descriptive statistics.

Steps in the evaluation process consisted of: i) urging participation and coordination among ERCs; ii) designing the web-based evaluation form; iii) research scoring of each ERC based on available documentation; and iv) peer reviewing some of the documents, such as inventions and innovations.

Data availability All of the data related to this article exist in report of research evaluation of RCs. This report is available in www.hbi.ir.

Results

Based on above definition of EHRC, the total number of Environmental Research Centers in Iran is 34. Nine of these EHRC have been approved during study period which caused lack of data in 2011–2014. The first EHRC was established in 2003 in Tehran University of Medical Science (UMS). Seventeen universities of medical sciences (UMSs) consist of Urmia, Iran, Tabriz, Qom, Kurdistan, Kermanshah, Guilan, Lorestan, Mazandaran, Yazd, Isfahan, Alborz, Ahvaz, Kerman, Hamadan, Shiraz, Tehran, and MOHME have at least one environmental health research center.

The number of faculty members in EHRCs in 2014 was 312. Maximum number in Tehran UMS and minimum in Lorestan UMS. The average number of faculty member per research center was 12.5. Distribution of faculty members in environmental health research center was shown in Fig. 1.

Following, we present the results of research activities indicators of Environmental Health Research Centers in Iran during 2011–2014.

– Total projects:

Total approved projects in EHRCs during the period 2011–2014, was 538. These projects were approved by UMS' research council. The maximum number of project was related to EHRCs in Shiraz UMS ($N = 106$) and some of them had no approved projects.

The ratio of environmental research project to academic member was 1.7 (Max = 5 in Kurdistan; Min = 0.7 in Alborz). It means that, during these years, each faculty member has been involved almost in two research projects (Table 1).

– published articles:

The number of total published articles by EHRCs in 2011, 2012, 2013 and 2014 was 282, 349, 673 and 976 respectively and almost 53% ($n = 1208$) of these were published in domestic journals. The ratio of published article per academic member in these centers was 1.82 yearly. Also 97% of published articles were indexed in different data bases and only 3% of them were non-indexed (Fig. 2).

The total published indexed articles by EHRCs in Web of science, Pub med and other valid data bases after duplicate elimination during 2011–14 were 820, 250 and 1141 respectively. 13% of these articles were based on thesis. The number of indexed published article in Scopus in 2011 till 2014 was 148,316,405,521 respectively.

– Citation per paper

During these 4 years, the number of citations to EHRCs' articles was 2991 based on Scopus. The ratio of citation per

Fig. 1 Distribution of faculty members in Environmental Health Research Centers in Iran - 2014

Table 1 Frequency of projects and faculty member in EHRCs

EHRCs	Number of environmental project	Number of environmental health faculty member	Project/faculty member
Urmia UMS	31	13	2.38
Isfahan UMS	68	26	2.61
Alborz UMS	7	10	0.7
Ahvaz UMS	64	16	4
Tehran UMS	49	46	1.06
Shiraz UMS	106	32	3.31
Qom UMS	50	19	2.63
Kurdistan UMS	60	12	5
Kerman UMS	32	31	1.03
Kermanshah UMS	12	11	1.09
Lorestan UMS	8	2	4
Mazandaran UMS	51	21	2.42

paper was 2.15. It means that more than two articles in Scopus database refereed to each published environmental paper. The number of EHRCs' articles which have been referred in text books were 39 Fig. 3.

– Abstract meeting

Presenting of papers at scientific conferences during these years were 1617 of which 1230 were presented nationally and 387 were presented at international conferences. One fifth of these papers were affiliated to Tehran UMS.

– Published books:

During 2011–2014, 17 books have been published by EHRCs. These books were written by researchers from Isfahan, Kurdistan, Mazandaran.

– Domestic and foreign patent:

Only two patents by EHRC of Isfahan and Tehran universities of medical sciences have been registered during 2011–2014.

– Research grants:

EHRCs have received 36 research grants from national and international agencies. Isfahan UMS has received maximum grants ($n = 20$) in Environmental Health. Among 4 years, total amount of research grant attraction was 1,905,000 \$. The maximum amount for 2013 (780,000\$) and the minimum was related to 2014 (205,000\$).

– Number of International collaboration

The number of international collaboration during 4 years was 40. The most international collaborators in environmental health are from Australia, US and Malaysia.

Discussion

Based on results, the number of EHRCs affiliated to UMSs is only 34 (less than 5% of all medical sciences research centers in Iran). The average number of faculty member in each

Fig. 2 Number of indexed and non-indexed published article by EHRCs (2011–2014)

Fig. 3 Number of citation and published article in EHRCs (2011–2014)

research center was 12.5 (almost 2% of all academic members in UMSs). It means that, environmental health researchers are twice as active compared others.

During 2011–2014, each faculty member involve in almost two environmental health (EH) projects. During these years, the number of published articles by EHRSs has almost quadrupled. Comparing the number of approved EH projects and published articles show that research output of each project was approximately four scientific articles. It can be concluded, although these EHRCs were successful in knowledge production, unfortunately, environmental issues remains as one of the main health problems in country. It might be the consequences of inappropriate function of knowledge cycle and pay more attention to knowledge transfer & Exchange (KTE) activities can be a proper solution. A good knowledge cycle provides the proper evidence for decision making at policy level. It is the main base for research dissemination and finally can improve the environmental health at community level [18].

The growth rate of published article by EHRCs in Scopus database was 2.5 (148 in 2011 to 521 in 2014). While, the number of published article in Scopus by United State Environmental Protection Agency, Harvard School of Public Health and University of Chicago in 2014 was 194, 34 and 16 respectively (www.scopus.com). In 2014, based on the number of environmental documents in Scimago database, Iran ranked fifth. The first rank was related to china (<http://www.scimagojr.com/countryrank>). Based on results, the ratio of citation per Iranian environmental paper was 2.15. This is while; the citations per American, British and Chinese environmental document in 2014 were 7.28, 9.94 and 4.41 respectively. In 2014, based on citation per document, Iran ranked 164th in Scimago database (<http://www.scimagojr.com/countryrank>). Since the number of citation per document is one of the qualitative indicators for research ranking [19], so strategies related to manage environmental

health human resources and empowering them can enhance the effectiveness of research activates and quality of articles [20].

Based on our study, the number of conference paper by Iranian researchers in environmental field is appropriate, but Very few of them ($n = 11$) have been indexed in Scopus. This indicator in Turkey and Egypt were 13 and 4 respectively (www.scopus.com). In developed countries such as United State, United Kingdom and Italy, this number was 319, 76 and 52 respectively (www.scopus.com).

Finally, it should be noted that, in the field of environmental health research, despite efforts, environmental health problems remains. It may be due to lack of awareness of evidence-based studies in the field of environment, public health knowledge related to environmental and occupational stressors and increasing number and complexity of environmental health hazards [21]. The complexity of environmental health problems requires that health care professionals to be patient and respect to foundation of health science. Combining health promotion skills and a system thinking approach will better position researchers and professionals to solve problems [22]. In fact, promoting innovative solutions in environmental problems is partly due to environmental knowledge production by researchers [21].

Suggestions:

- Increase public health knowledge related to environmental and occupational stressors
- Increase awareness of policy makers related to environmental evidence-based studies [21]
- Promoting innovative solution in environmental problem by strengthening the system thinking approach [22]
- Capacity building of human resource [21]
- Planning the appropriate strategies to human resource management in EH [20]

Conclusion

Based on results of research centers evaluation in Iran, it seems that knowledge productions in all of research centers are desirable, but the main mission in environmental health research centers is health environmental promotion which cannot be achieved only by article publishing. Carrying out the interventional projects, knowledge transfer & exchange, evidence based policies and intersectional cooperation are needed in order to achieve this goal. Therefore, qualitative evaluation of research centers based on their missions is very essential which is addressed to the Vice chancellor for Research and Technology in 2016.

Acknowledgements The authors would like to express their thanks to deputy for Research and Technology experts in Universities of Medical Sciences.

Authors' contributions AE supervised the study and he participated in all stages of study. MBE was the main investigator and she also has participated in all stages of the study (design of the study, collected the data, analyzing of data and manuscript preparation). KF was co- investigator which performed data collection and technical analysis. AM was advisor of the study and participated in the intellectual helping in different stages of the study. All authors read and approved the final manuscript.

Compliance with ethical standards

Competing interests The authors declare that they have no competing interests.

Consent for publication Not applicable.

Ethics approval and consent to participate Not applicable.

Abbreviations MRC, Medical Research Center; MOHME, Ministry of Health and Medical Education; EHRC, Environmental Health Research Center; WHO, World Health Organization; UMSSs, Universities of Medical Sciences; EH, Environmental Health; KTE, Knowledge Translation & Exchange

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