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A content analysis of articles published in recent decade in environmental health journals with an emphasis on air pollution

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ABSTRACT:

Introduction: Air pollution is one of the environmental concerns of many countries, including Iran. One of the most common and effective ways to explain the importance of this issue is to perform research and publish scientific articles. Therefore, this study aimed to monitor scientific publications on air pollution in the specialized environmental health journals of Iran within the last ten years.

Materials and methods: This descriptive cross-sectional study was conducted on all articles published in the field of air pollution in five specialized environmental health journals within 10 years (2008-2017). Data were collected using a checklist in accordance with the research objectives. The variables in the checklist were selected based on the recommended items for writing medical articles by the International Committee of Medical Journal Editors (ICMJE) and the World Association of Medical Editors (WAME). The obtained data was analyzed using descriptive statistics.

Results: Reviewing 1276 articles in 102 issues of the 5 specialized environmental health journals showed that 11.6 % of articles were published in the field of air pollution. The trend in air pollution researches over the past decade was a slow and growing trend. Studying articles related to air pollution showed that the highest proportion of articles (45.3 %) in this field were related to measuring the organic matter. The analysis of the content of the articles showed that, from the research methodology point of view, most articles (24.3 %) were performed by laboratory method.

Conclusion: Due to the widespread nature of air pollution issue in many cities of Iran and other countries in recent years and its destructive effects on human and other creatures, it is expected to focus and perform more researches on this issue. Hence, health policymakers should place the air pollution issue at a higher priority, and also it would be useful for researchers, especially graduate students, to focus on research in this area, drawing international cooperation.

Introduction

The presence of one or more pollutants, such as liquid, solid, and gas in the air, with specific concentration and timing which can be hazardous to humans, animals and plants, is considered as air pollution [1]. Air pollution has become a major environmental concern in all countries due to the recognition of its harmful effects on

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health, economy and the environment in recent years [2-3]. According to the World Health Organization (WHO), 800.000 people each year suffer from premature death due to cardiovascular, respiratory diseases or lung cancer induced by air pollution around the world [4]. In recent years, more environmental problems, such as air pollution, have happened, and the fine particulate matter problem in the southern provinces of the Iran has become one of the main health problems. The statistics of the meteorological organization show that the average dusty days during the past 50 years in Ahwaz and Abadan were 65 and 82 days respectively [5]. Considering the considerable damages caused by pollution on human health, the importance of preventing air pollution or controlling their source is necessary [6-7]. One of the essential steps in controlling any type of unwanted event and getting ready to deal with them is to collect and analyze the relevant data. Managers will not be able to make informed decisions in order to control such events without a full knowledge of the underlying causes or its consequences [8]. Therefore, it is also necessary to continuously investigate air pollution situation and to regularly review the existing documentation. Citation analysis is one of the useful methods to monitor published articles in the field of air pollution. Citation analysis and, more broadly, Scientometrics are the new scientific approaches for the quantitative analysis of scientific production, policy making and planning [9], through which it would be possible to monitor the available literature, such as published or unpublished sources and articles in order to control scientific activities and manage researches in relevant fields of science [10].

In recent years, a number of studies have been conducted on health issues, but despite the importance of the issue of air pollution, there are limited studies carried out in the field of environmental health. In a study, five specialized occupational health journals were reviewed and in 927 published articles, 27.24 % were related to ergonomics and 11.54 % used interventional method [11]. In the other study, four research journals of health management were studied using content analysis method; the obtained data showed the characteristics of researches in this area [12].

Due to the importance of the air pollution issue and its negative consequences in Iran, and the lack of proper knowledge in terms of related researches, this study aimed to monitor the scientific publications of air pollution in the environmental health journals in Iran within the past decade. The results of this study will help to make more precise decisions and, subsequently, reduce this serious health problem and promote the health status of Iranian people.

Materials and methods

This descriptive cross-sectional and retrospective study was performed on all the published articles in environmental health journals, focusing on air pollution over past 10 years (2008-2017). Since air pollution is categorized as specialized area and environmental health indicator by the WHO [13] and the Centers for Disease Control and Prevention (CDC) [14], so the inclusion criteria into this research included the existence of the Environmental Health in the title of the journal, publishing at least four issues per year and publishing the articles at least three consecutive years. It should be noted that there is also the possibility of published papers on the issue of air pollution in other Persian and English journals in Iran, but they have been discarded for some research considerations.

According to these criteria, three Persian journals of "Quarterly journal of health and environment" affiliated to the Iranian Environmental Health

Science Association (IJHE), "Alborz Environmental Health Engineering Journal (JEHE)" and "Quarterly Journal of Research on Environmental Health (JREH)" of Mashhad University of Medical Sciences, as well as two English journals of "Environmental Health Engineering and Management Journal (EHEMJ)" and "Journal of Environmental Health Science and Engineering (JEHSE)" were selected. After visiting the dedicated website of journals, all articles were downloaded and the full text of the articles was reviewed. The data collection was done by a researcher-made checklist. In order to select the most important variables, the recommended criteria for compilation of articles were by the International Committee of Medical Journal Editors (ICMJE) [15] and the World Association of Medical Journal Editors (WAME) [16]. The checklist included the number of issues and articles, the type of pollutant and the environment studied, type and rank of the authors, the status of the researchers' participation with researchers out of Iran.

After collecting data, the information of all the articles were encoded and entered into the Excel file. Then, it was analyzed using descriptive and inferential statistics such as Index of dispersion, central tendency, and presented in the form of charts and tables.

VOSviewer software was also used to visualize the data and show the level of participation of continents and writers from different countries with Iran. This software helped to visualize the collaborative network of writers from different countries in different ways. For example, this software makes it possible to display data aggregate by different colors, clustering them or their dispersion at different geographic locations [17].

Results and discussion

According to the findings of this research, within the last decade, 1276 articles have been published in 102 issues in 5 Iranian Journal of Environmental Health. 36 issues and 626 articles were published in English, 66 issues and 650 articles were Persian. The largest number of Persian-language articles (430 articles) was related to the quarterly journal of health and environment affiliated to the Iranian Environmental Health Association and the largest number of English-language articles were related to the JEHSE (Table 1).

Table 1. Frequency distribution of all articles and articles published in the field of air in the specialized magazines of the health of the Iranian environment during 10 years of (2008-2017)

Journal / Publication year	Persian						English			
	IJHE		JEHE		JRHE		JEHSE		EHEMJ	
	Number of article	Air related article	Number of article	Air related article	Number of article	Air related article	Number of article	Air related article	Number of article	Air related article
2008	16	2	-	-	-	-	41	5	-	-
2009	32	2	-	-	-	-	42	3	-	-
2010	47	3	-	-	-	-	42	5	-	-
2011	48	4	-	-	-	-	45	5	-	-
2012	47	3	-	-	-	-	38	4	-	-
2013	48	13	16	1	-	-	31	3	-	-
2014	48	3	32	1	-	-	152	18	8	2
2015	48	8	32	7	32	2	86	6	32	2
2016	48	10	32	2	31	5	20	0	32	4
2017	48	8	24	4	21	5	25	3	32	5
Total	430	56	136	15	84	12	522	52	104	13

A review of the publication history showed that two journals of JRHE and JEHSE have a history of more than 10 years of publication, and other journals have a history of 3 to 5 years (Table 1). In terms of the number of published articles, the lowest number was reported in 2008 with 57 articles and the largest number was observed in 2014 with 240 articles. In total, among 1276 articles reviewed, 148 articles (11.6 %) related to the air pollution, and the highest frequency of these articles was 25 articles within 2015-2017. Fig. 1 shows the publication trend of all articles and articles related to air pollution in a comparative way. It is obvious that in a similar process over the past decade, the total number of articles as well as articles related to air pollution have been increased.

Comparing the proportion of articles focused on the subject of air pollution with all published articles showed that over the past decade, an average of 11.66 % of papers (6.75 % -17.98 %) were related to air issues, and the issue of air pollution had a growing trend compared to other issues in the field of environmental health (Fig. 2).

Type of pollutant and environment

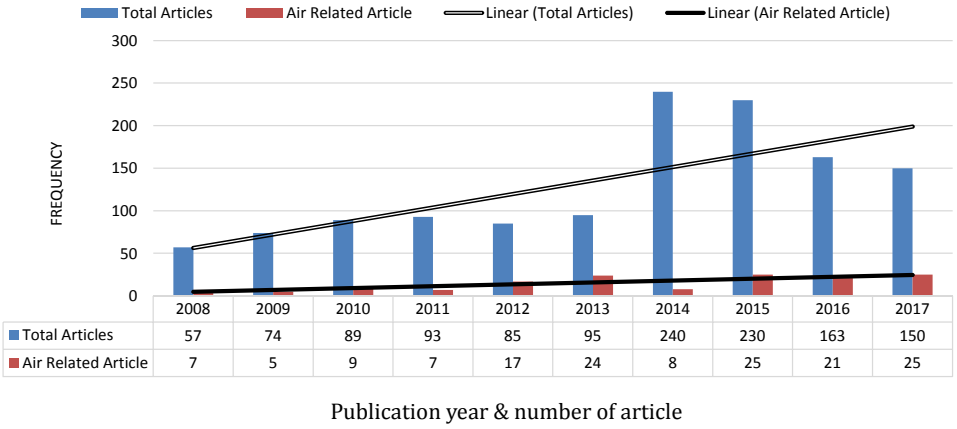

Fig. 1. Comparison of the publication trend of all articles and articles related to air pollution in Iranian environmental health journals (2008-2017)

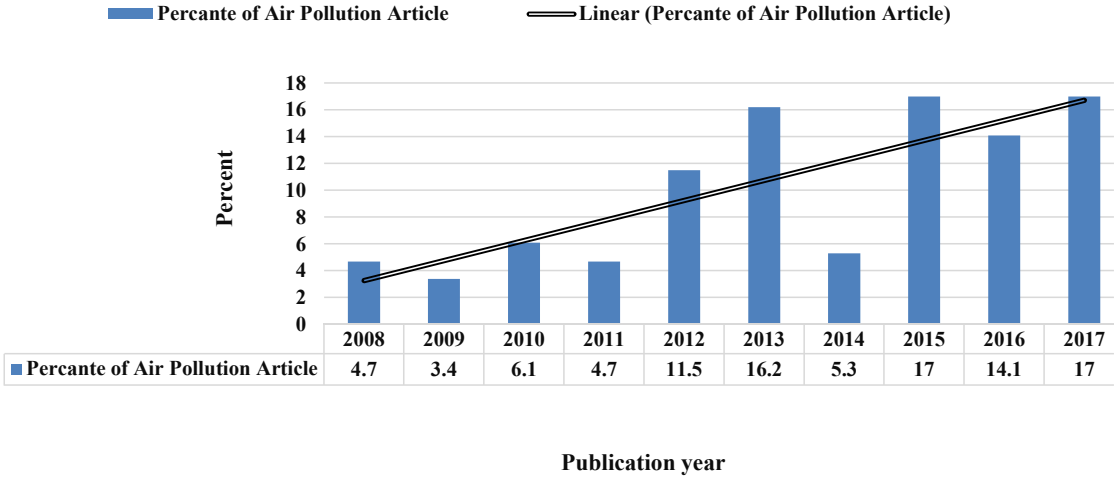

Fig. 2. Relative trend of air related articles in comparison with all articles published in environmental health journals (2007-2017)

Studying the articles related to air pollution in terms of the type of pollutants showed that relatively large amounts of pollutants have been analyzed in recent years, but articles related to measurement of organic matter (45.3 %) had the highest share (Table 2) also, in terms of the studied environments, 76 articles (51.3%) were related to open environments such as cities, open-pit mines and open industries (Table 2).

Number, type and scientific rank of researchers

Studying the number of authors or the status of researchers' participation in air pollution studies showed that the number of collaborating researchers in each article was average of 4.38 ± 4.79, and more than three researchers were participated in research process in 85.1 % of the cases (126 articles). In terms of scientific rank, about a quarter of the authors (178 - 27.7 %) were a faculty member of the universities at the time of the publication or had one of the scientific rankings of the instructor, assistant professor, associate professor and professor (Table 3). The study of the professional major of first and corresponding authors in the articles related to air pollution showed that the professional major of 45.2 % of the first authors (67 articles) and 41.9 % of the corresponding authors (62 articles) was Sanitary engineering. Besides, in less than 13 % of the cases, the professional major and names of the first authors and corresponding authors were not mentioned.

The level of cooperation between Iranian re-

Table 2. Frequency of type of pollutant and environment studied in the articles of air pollution in specialized magazines of the health of the Iranian environment during 10 years (2008-2017)

Variables	Level		Number	Percentage
Type of pollutant	Organic matter		67	45.3
	Particles		25	16.9
	Bio-aerosols		11	7.4
	Heavy metals		8	5.4
	Minerals (nitrates, sulfates and coal from mining activities)		6	4
	Several types of pollutants		11	7.5
	Other		20	13.5
Environments	Outdoors	City boundary	64	42.6
		Open-pit mines	4	2.8
		Transportation vehicles	8	5.5
	Indoors	Packed environment within mines and industries	23	15.6
		Hospitals and health centers	12	8.3
		Homes, schools and restaurants	9	6.1
	Common	Open and closed environments	2	1.5
	Other		26	17.6

* The type of pollutant or type of environment was not clear in some articles, for example, articles were entitled as: bio indicators in the air, software design for AQHI, the effect of air pollution on hemoglobin, the effect of air pollution on economic indicators of residential areas, etc. These articles were considered as "others".

Table 3. Frequency of number, type and scientific rank of researchers and key words in the articles of air pullotion in specialized magazines of the health of the Iranian environment during 10 years (2008-2017)

Variables		Level	Number	Percentage
Number of authors		1-2	22	14.8
		3-5	96	64.9
		6-10	28	18.9
		11-18	2	1.4
Scientific rank	Teachers	Instructor	11	1.7
		Assistant professor	80	12.5
		Associate professor	61	9.5
		Professor	26	4
	students	Undergraduate	2	0.3
		Postgraduate	29	4.5
		PhD	30	4.6
	Graduated	Undergraduate	8	1.2
		Postgraduate	57	8.8
		PhD	11	1.7

searchers and other countries

In 148 articles published in the five environmental health journals, international collaboration was observed in 23 articles, all of which belonged to two English-language publications (EHEMJ and JEHSE). The higher number of articles with international collaboration was belonged to JEHSE (19 articles, 82.6 %). The classification of 81 researchers participating in 23 mutual papers in terms of continents showed that 25 researchers with 11 articles were from five Asian countries. The classification of researchers by country also showed that the largest number of researchers (9 authors) was related to universities in India. According to obtained results, there was no mutual article with researchers from the Oceania.

The relationships between the writers of different countries and continents with Iranian writers in writing scientific articles and their collaboration network were drawn using VOSviewer software (Fig. 3). The findings indicated that there were 18 nodes, and in fact 81 authors from 14 countries with different geographic locations collaborated in the compilation of these articles.

In this network, the size of each node represents the mutual articles of each country and continent with Iran, and the diameter of the bond between the two nodes is also proportional to the number of compilations. Since the scientific cooperation of other countries with Iran was considered in this study, Iran was placed in the center of the nodes with 23 articles. In this map, countries most involved with Iranian writers are closer to Iran, and in contrast, countries with less participation are shown farther. Based on the number of articles from different continents, Asia and Europe each had 11 and 8 mutual articles, respectively. The number of articles from different countries also indicated that India (3 articles and 9 authors), Turkey (3 articles and 5 authors) had more research partnerships with Iran (Fig. 3).

The findings of this study showed that among

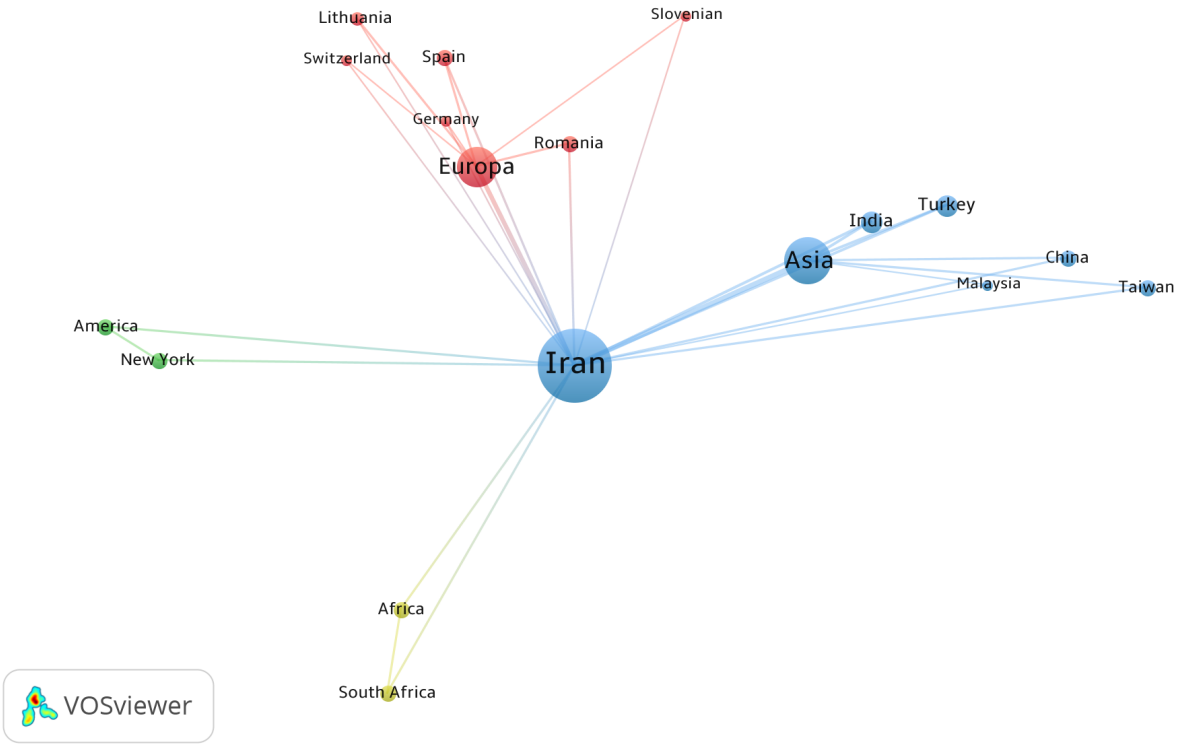

Fig. 3. Collaborative network of authors of mutual articles on air pollution divided by continents and countries (2008-2017)

1,200 articles published over the past decade in environmental health journals, 11 % were related to air pollution issue. It not only indicates that research on air pollution is one of the important areas in environmental health, but it also indicates the importance of the air pollution issue along with other environmental problems in the country. According to recent reports, air pollution in many cities of Iran, including Tehran, Mashhad, Isfahan, Tabriz, Shiraz, Karaj, Arak, and Ahwaz has been reported to be dangerous to the vulnerable population, such as children, the elderly and pregnant women [18]. In Tehran in 1999, the pollutant index was above the standard level in 90 % of the days and in 50 % of the days the situation was very unsafe and in 4% in a dangerous situation. In Isfahan, in 9 % of the days of a year, the index of pollutants was above the standard level, which was very unsafe in 4 % of the days [19]. Obviously, such problems are warnings to healthcare professionals in order to conduct extensive studies and researches in addition to examining the status quo, and try to identify the causes and its consequences and also to find effective and continuous solutions for air pollution.

As shown in Table 1, the total number of Persian and English articles has undergone a growing trend over the last decade. This suggests an increase in the contribution of research papers on air pollution, in line with the scientific progress in other fields in Iran. With regard to increasing scientific production, it is clear that in the past years, Iran has gained the first place in the region with a significant growth in scientific production [20]. Besides, the growing trend and increasing the contribution of articles related to the air pollution issue can be influenced by the increasing attention of people in the context of air pollution and the exacerbation of some health problems in recent years [21]. Considering the principles

governing third-generation universities, one of the most prominent features of such universities is to address the present problems of society and to meet the needs of the population [22].

Regarding the type of pollutants, organic matters had the highest share (45.3 %) in the related articles. Since organic compounds after particles are in the second place in the frequency and distribution of airborne pollutants [23], this situation is somehow normal; but regarding the changes in air pollution priorities in Iran and the region, it is expected to change the number of researches and articles in the coming years in order to meet the needs of the society. As mentioned earlier, it is expected that activities in the third-generation universities will take place in a scientific approach and in accordance with the needs of the society and people [24].

The findings showed that 9.3 % of the authors were undergraduate, postgraduate and PhD students. Given the characteristics of this age group like challenges, succession, pragmatism, entrepreneurship [25] and their need to gain new experience, it is expected to increase their contribution in scientific researches, especially environmental health and air pollution. However, the students' low participation in writing articles has several reasons that should be resolved. In a study conducted by some researchers, entitled "The obstacles for doing research from the viewpoint of the Iranian students of medical sciences university", they found that the motivation factors of students for doing research include: some personal barriers (including lack of familiarity with the principles and statistical methods, the inability to analyze data, inability to interpret data, and lack of time and concentration), lack of connection with those who are active in research area, and the complicated bureaucratic regulations [26].

The classification of 23 articles with the participation of 81 researchers from 14 countries (including Iran) showed that the highest number of articles with the frequency of 11 (47.8 %) was from 5 Asian countries. One of the reasons can be the close proximity of Asian countries. Other researchers also reviewed the level of scientific collaboration in more than 35,000 articles of Chinese researchers in the Elsevier journal in 2004, and concluded that the geographical proximity is an effective factor in increased scientific cooperation [27].

Also, many Asian countries have close relationship and they have relatively closer and broader political link, which can be another reasons for the high level of participation among Asian scholars. Of course, the limited participation of Iranian scholars with European and American countries can also be due to the political or even economic issues. As some researchers in the field of herbal medicine publications showed that during 1997 to 2014, the process of collaborative articles was growing, but since 2014 and after political sanctions against Iran, the scientific cooperation was declined in this regard [28].

The strength of this study is to analyze the relatively extensive time frame (10 years), and review the articles in five specialized environmental health journals in both Persian and English languages. This study limitation includes lack of reviewing air pollution articles published in other journals, because part of environmental health studies are published in public health journals, occupational health journals or medical sciences university's journals.

Conclusion

Given the issue of air pollution and its consequences in various cities, especially metropolises and southern regions of Iran, the number of published articles on the subject of air pollution in closed environments was less than expected.

Hence, it would be worthwhile for health policy makers to specify national research priorities in terms of air pollutions, and also provide useful solutions in order to encourage Iranian environmental health researchers to perform more studies in this regard.

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Competing interests

The authors declare that there are no competing interests.

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Ethical considerations

This study was approved and registered by the Code of Ethics (IR.GMU.REC.1396.110).

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