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A Bibliometric Study of Toxicological Research Output (1996-2012) of the Middle East Region

Hossein Forouzandeh¹ and Amir Jalali^{1*}

¹*Department of Pharmacology and Toxicology, School of Pharmacy and Toxicology Research Center, Jundishapur University of Medical Sciences, Ahvaz, Iran.*

Authors' contributions

This work was carried out in collaboration between both authors. Author HF wrote the first draft of the manuscript. Author AJ designed and managed the analyses of the study. Both authors read and approved the final manuscript.

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ABSTRACT

Aims: The aim of the present study was to qualify and quantify the toxicological researches in the Middle East countries. Comparisons were made with the rest of the world.

Place and Duration of Study: The current study was carried out during the 1st of January to the 31st of December, 2013 in the department of toxicology and pharmacology, Jundishapur University of Medical Sciences, Ahvaz, Iran.

Study design: This bibliometric study evaluates quantities and qualities of publications on toxicological researches in SJR for over 16 years (1996-2012).

Methodology: Strategy of the research was based on the keyword "toxicology". Neither

*Corresponding author: Email: amjalali@hotmail.com;

language nor document type restrictions were considered. Data were extracted, tabulated, and compared to identify the ranks as well as trends. Additionally, comparisons were performed on the basis of 'total number of documents', 'total number of citations', 'citations per documents', "citable documents", "cite-self cite per documents", "H-index", "self citation", and international collaboration.

Results: Results showed an increase in the number of publications and citable documents in the Middle East. Northern America, Western Europe, and Asiatic regions led quantitative and qualitative indicators like H-index and citation. Comparisons among the Middle East countries showed Turkey, Iran, Egypt, Saudi Arabia, and United Arab Emirates are the most productive countries, respectively. Although the Middle East productions of scientific publications on toxicology are neither qualitatively nor quantitatively comparable with other regions, the trend has changed quantitatively during 1996-2012. As a result, the Middle East countries have to support their scientific institutes to increase the quantities and qualities of toxicological publications.

Keywords: Middle east; toxicology; scimago Journal ranking; bibliometric study.

1. INTRODUCTION

Measures of scientific publishing in the form of numerical data are called bibliometric indicators [1]. These indicators have become a standard tool of scientific policy and research management during the last decade. Especially, academic institutions increasingly rely on citation analyses for making decisions about promotion, tenure, and funding [2,3]. These methods are principally quantitative, but are also used to make pronouncements about qualitative features of scientific literature [4]. Comparisons of bibliometric characteristics between regions can reveal differences in research orientations, capacities and collaboration patterns [5].

SJR is one of most important resources available on the World Wide Web. SJR site is an open-access resource, which lists many journal titles published in a wide variety of countries and languages. Originally, a research group from Spanish Universities developed an indicator named SCImago Journal Ranking (SJR) for the assessment of the quality of scientific journals while applying page rank algorithm on the Scopus database [6].

The Middle East is a region that includes lands between the Mediterranean Sea and the Persian Gulf and in some cases covers part of North Africa. This region consists of 18 countries [7].

This study was designed to evaluate and summarize the Middle East research outputs and their scientific impacts in the field of toxicology for an accurate identification of the Middle East toxicological research ranking from the 1st of January, 1996 to the 31st of December, 2013.

2. MATERIALS AND METHODS

The SJR database, accessible free of charge, was selected as the most suitable reference for ranking regions of toxicological publications. The subject-content analysis records were conducted according to the main regions of the world. All the regions were compared except for Africa due to lack of its SJR data. Data of toxicological research productivity for 16 years were obtained from SCImago journal ranking (SJR) during the 1st of January to the 31st of

December, 2013. Research strategy was based on the keyword "toxicology". Reviews, journal articles, case reports, and similar types of citations included in the study and language restrictions were not considered. All the number of documents that published in English was chosen. Comparison of the total number of documents and citable documents between the Middle East and the other regions were carried out. In following, we chose the "Countries" icon for comparison and then in the "Select countries or regions to compare" tool bar, Middle East, Western Europe, Northern America, Latin America, Eastern Europe, Asiatic regions, and pacific regions were selected. In the "Subject area" icon, "pharmacology, toxicology, and pharmaceutical" was selected and the comparison was limited to toxicology. Finally, the bibliographic data were transferred to Microsoft Excel and the graph was designed.

The ranking and analyzing indicators included: the number of documents, citable documents, citation, self-citation, cites per documents, (sites-self sites) per documents, H-index, sited documents, and international collaboration.

All the data obtained including figures and tables were simplified in a similar format. Data comparison was carried out and the trend was descriptively provided for each item.

The results included almost all the available comparison data of the regions. As it is obvious, only the data of indicators were obtained. These data are used to carry out retrospective comparisons. It should be noted that during the current study, more emphasis was put on the comparison data of the regions, which were obtained from the authorized source, SJR.

3. RESULTS

Figs. 1 and 2, shows the distributions and shares of documents for the Middle East and other compared regions during 1996-2012, respectively. Data reveal a slow increase in the production of documents and citable documents for the given period. All the regions of the world increased their productions during the study period.

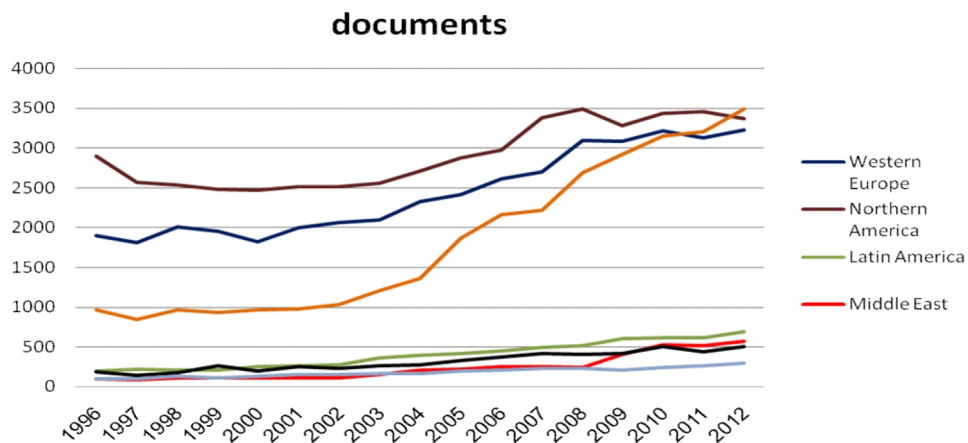


Fig.1. Distribution of documents during 1996-2012 based on SJR records for the middle east and the other regions compared. A significant increase has been seen in the documents published from Western Europe, Asiatic regions, and Northern America since 2006

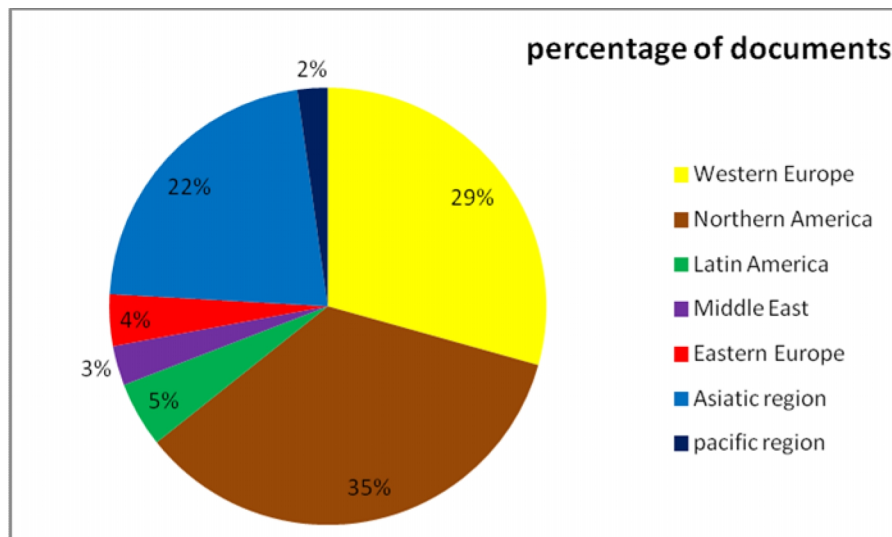


Fig. 2. The percentage shares of toxicological documents in different regions during 1996-2012. Northern America is by far the most productive area in the field of toxicology and responsible for 35% of all the documents. The whole contribution of Eastern Europe, Latin America, and the middle east is similar

Comparison of the total number of documents and citable documents between the Middle East and the other regions showed the Middle East with 4132 documents allocates 2% of the whole productions and rests on the 6th place after Northern America with 47912, Western Europe with 40165, Asiatic Regions with 30572, Latin America with 6709, and Eastern Europe with 5292 numbers of documents. This finding indicated a significant difference between the Middle East, and Northern America and Western Europe and showed a greater similarity with Latin America, Eastern Europe, and Pacific regions.

Based on citation, the Middle East had the highest citation in 2006 and after that the citation decreased. Unfortunately, the Middle East had the lowest citation compared to the other regions.

The Middle East had the highest self-citation in 2006 and the index declined for this area afterwards. Notably, the decrease in self-citation of the Middle East was similar to those of Western Europe and North America.

The number of citations per documents for the Middle East and the other compared regions is shown in Fig. 3. The highest number of citations per document in the Middle East was seen in 2002 and after that this indicator decreased. Comparing the average number of citations per documents between these regions, we notice Northern America (with 18.76) has the highest citations per documents and the Middle East (with 14.11) lie in the 4th rank after Northern America, Pacific regions, and Western Europe.

Fig. 4 illustrates the distributions of self-cites per documents for the Middle East and the other compared regions. As shown in this figure, all the compared regions display a gradual decrease for this indicator after 2002 and thus it can be concluded that scientists have paid more attention to this index in recent years.

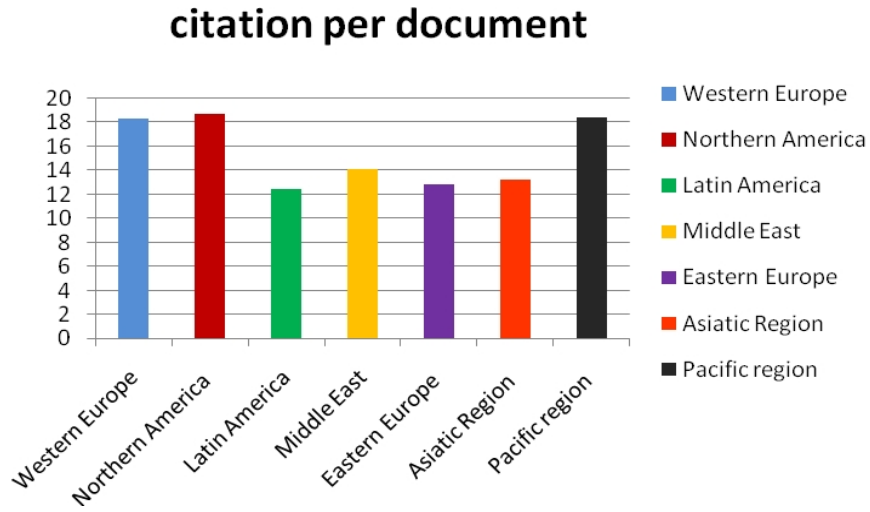


Fig. 3. Comparison of the middle east with the other regions based on the average number of citation per document

Fig. 5 makes it possible to compare the situation of the Middle East with the other regions with regard to their H indices in toxicology. In this regard, the Middle East rests on the last place.

Examining the pattern of international collaboration may also reveal the information on the intensity and breadth of collaborations between researchers in the Middle East institutions and the other countries. In terms of international collaboration in toxicological researches, the Middle East shows a fluctuation in the given period (Fig. 6).

The whole indicators described were presented and summarized in Table 1. Furthermore, Table 2 illustrates the situations and descending rankings of the Middle East countries considering “number of documents”, “citable documents”, “number of citations”, and “number of Self-citations” in addition to “citations per document” and “H-index”. As it is shown in this table, the five countries with the highest number of documents and citable documents in the Middle East include Turkey, Iran, Egypt, Saudi Arabia, and United Arab Emirates, respectively.

Table 1. Comparison of the descending trend of the middle east and the other compared regions during 1996-2012 in terms of the number of documents, citable documents, citations, self-citations, citations per document, and H-index in toxicology based on SJR data

Region	Documents	Citable documents	Citations	Self-citations
Northern America	49580	47912	876838	485228
Western Europe	41512	40165	692381	359617
Asiatic Region	30961	30572	326433	171716
Latin America	6833	6709	70566	29844
Eastern Europe	5392	5292	60705	17913
Middle East	4136	4132	43194	12786
Pacific region	3173	3056	51099	11817

Table 2. Comparison of the descending trend of the middle east countries during 1996-2012 in terms of the number of documents, citable documents, citations, self-citations, citations per document, and H-index in toxicology based on SJR data

Country	Documents	Citable documents	Citations	Self-citations	Citations per document	H index
Turkey	1,488	1,462	15,965	4,380	13.8	51
Iran	873	833	4,923	1,783	12.8	30
Egypt	662	655	7,466	1,062	14.5	38
Saudi Arabia	349	342	2,598	339	10.54	23
United Arab Emirates	109	105	1,368	162	14.66	20
Jordan	84	84	919	84	12.09	16
Kuwait	77	74	607	89	10.18	13
Lebanon	64	64	890	174	25.03	17
Oman	38	36	510	64	15.9	10
Palestine	25	25	200	19	11.26	8
Qatar	25	23	96	6	7.61	5
Syrian Arab Republic	17	17	132	14	7.96	5
Iraq	16	16	51	13	4.18	4
Yemen	7	7	52	4	7.58	4
Bahrain	5	5	7	1	1.4	2

(cite- self cite) per documents

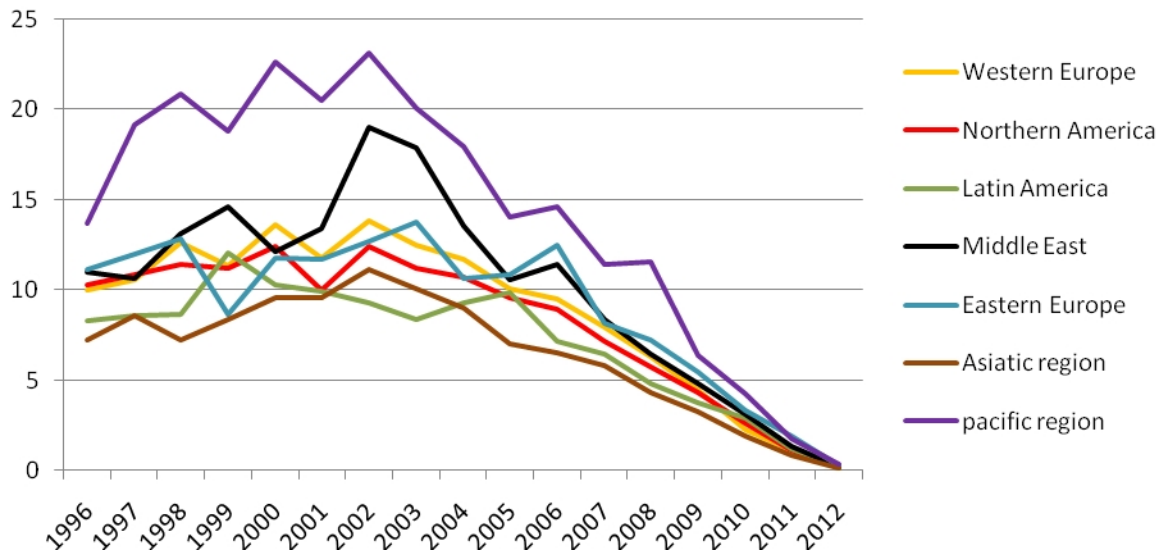


Fig. 4. Distribution of self-cites per documents during 1996-2012 based on SJR records for the middle east and the other compared regions. A balanced and steady decline is seen. The pattern of changes is very similar in most of the regions. The rates of fluctuations are higher in Europe and the middle-east. The lowest fluctuations are seen among Asiatic regions

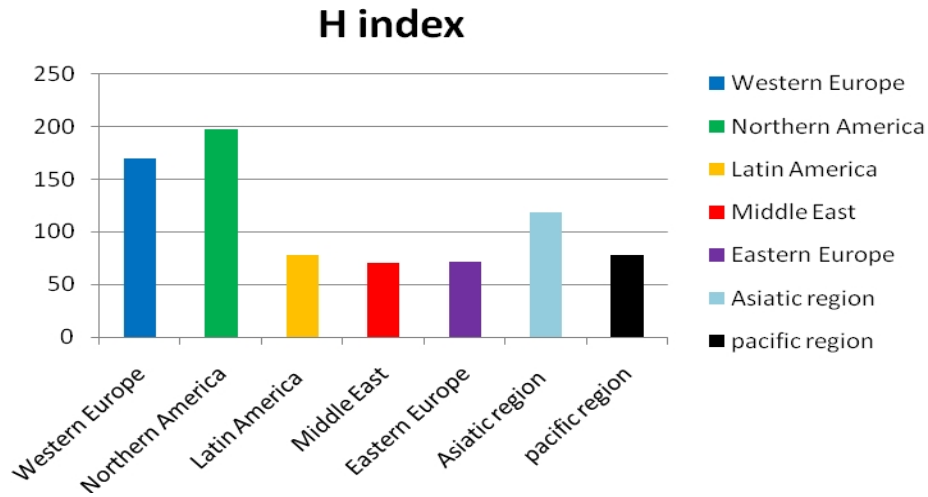


Fig. 5. Comparison of the middle east and the other regions with respect to H-index during 1996-2012. The H-index of the middle east is very close to those of Eastern Europe and Latin America

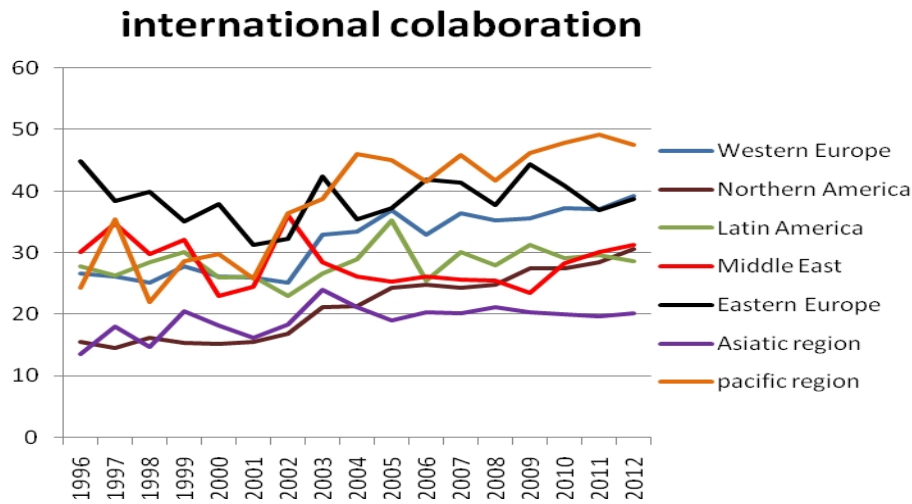


Fig. 6. Distribution of international collaborations during 1996-2012 based on SJR records for the middle east and the other compared regions. The greatest scientific collaborations are seen in the Pacific regions

5. DISCUSSION

This study aims at analyzing the scientific productions of the Middle East institutes in the field of toxicology using the SCImago Journal Ranking (SJR) tool, which facilitates comparisons during long-term periods. SJR is a web-based research evaluation tool allowing the assessment of the publication outputs and citation rates of institutions and countries [5].

SCImago Journal Ranking (SJR) was found to be a suitable database for searching and ranking bibliometric studies. This database is an open-access and user-friendly database for comparing all the regions of the world. Although the present study may have several limitations, we believe results represent a useful tool for scientists and public health policy-makers to plan and organize researches on toxicology in the Middle-East countries.

This study offers a comparison between the Middle East documents and those of the other prominent regions of the world together with their citation impacts and other indicators within a 16-year period (1996-2012).

Citation analysis along with peer judgments and assessments of document counts and venues is one of the most widely used method for evaluating the research performances of scholars [8]. Citation counts provide researchers and administrators with a reliable and efficient indicator for assessing the research performances of authors, institutions, and countries with their relative impacts and work qualities [9,10]. The Middle East share in terms of total output of documents within the group of regions selected by researchers during 1996-2012 is 3% so as to place it on the 6th position. Northern America, Western Europe, and Asiatic regions conducted quantitative indicators. This trend has been shown in other biomedical fields as well [11]. This is due to a long-lasting interest in this field within these regions, especially Northern America. Furthermore the majority of scientific journals are intended to further the progress of science, usually by reporting new research in English language. Most journals are highly specialized. The publication of the results in proper format is an essential part of a new publication. Therefore it is rationale to conclude that Northern America and Western Europe researchers have more ability in order to supply enough details than Middle East researchers to verify the results and get chance to make more publications.

The Middle East has got a lower position in the citation rank point of view. This indicator should be improved by performing high-quality and outstanding researches among these countries.

“Citations per Document” is considered as one of the most important indicators, which show the average number of citations for each document [12]. According to this indicator, the Middle East lies in the 4th rank. H-index (Hirsch index) is another qualitative indicator widely used in bibliometric studies. H-index is a stable and consistent estimator of scientific achievements, which uses as a measure to quantify the scientific outputs of a single researcher, university research groups, and journal and any of (more extensive) publication sets [13]. In this regard, the Middle East is ranked in the 7th position.

We use citation, cite per documents, self-citation and H-index for evaluating the qualities of documents. When the number of documents and citable documents were considered, the Middle East rested in the 6th place. For the remained qualitative indicators such as self-citation and H-index, the ranking was lower.

In a similar work done in 2013, productions of the Middle Eastern Arab (MEA) countries in toxicological researches were analyzed for a 10-year period (2003–2012). The indicators used in this study included MEA authorship pattern and productivity, collaboration patterns, journals in which MEA researchers publish their articles, journal classification based on ISI or non-ISI database, impact factors of publications, number of citations received by the publications, and areas of interest for published papers for evaluating the trends of contributions in the field of toxicology between 2003 and 2012. They indicated Egypt,

Palestine, Kingdom of Saudi Arabia, and Jordan have the highest research productivity across the Arab world and show a promising rise and a good start for toxicology research activities within these countries [14].

In another study conducted in 2012, Delirradand et al. compared Iran with Turkey in the field of toxicology. The following indicators were used: frequency of articles, types of documents, most proliferating authors, most cited toxicological articles, and most productive organizations. Data were obtained from the Web of Science. They concluded Iranian toxicologists represent a better performance than their Turkish counterparts although the overall authorship pattern is well distributed among Turkish researchers and organizations [15]. Toxicological researches in the Middle East lags behind those of the developed regions. It is simplistic to say that there is a single reason for the lower quantities and qualities of the Middle East publications in contrast to those of North America and West Europe. The main cause of this gap is rooted in the good attentions of such nations to social, cultural, and economic variables, political elements, international impacts, and geographical factors [16].

It is likely that the level of acceptable research activities in the Middle East is limited to particular countries due to the presence of institutional accredited educational plans. It should be noted that research activities are not common in a few of the Middle-East countries such as Yemen (Table 2) due to unknown reasons. Several studies have discussed the reasons leading to the scarcity of medical researches in the Middle East regions [17-19]. These studies suggested regional conflicts are the main cause for the paucity of medical publications in some Arab countries. Furthermore, lack of funding, freedom, and democracy may contribute to low scientific research outputs in the Middle East [17,18,20]. One of the substantial requirements for a technological progress is having a good educational system. In the Middle East and North Africa, access to education has improved dramatically over the past few decades. However, a lot of controversies still remain. For instance, the majority of girls are ruled out from educations. Even where access is not a problem, the quality of available education is often low [21]. Nevertheless, in the developed countries, basic and applied scientific studies such as toxicological researches are taken into account equally as an essential investment in the long-term welfare [22].

Regardless of the contamination of the live stock food and water by environmental pollutants, the need for an increased frequency of toxicological studies seriously persists.

This study showed the Middle East still lacks distinct and elaborate toxicological programs at different educational levels, especially university level (14). It is suggested that heavy metals and poison-bearing pollutants, which enter food stuffs are responsible for toxicological events [23-26].

The Middle East may currently produce only 2% of the world toxicology literature, but the output is growing rapidly as presented in Fig. 1. Accordingly, it is likely that Turkey, Iran, Egypt and Saudi Arabia are performing a series of targeted toxicological studies to make a development and environmental changing in the Middle East. It is likely that the keys to the continuation of toxicology progress in the region are three essential factors: expanding educational opportunities, the establishment of toxicology centers and more attentions. Finally, it must be noted that the outcomes of bibliometric analyses may be different depending on the database chosen. Based on the author's knowledge, this research is the first comparative study that analyzes the quantities and qualities of toxicology-based researches between the Middle East countries and the remained regions of the world.

6. CONCLUSION

The present study shows an increase in the number of documents in the field of toxicology within the period of analyses but the rise is slower than those of Northern America, Western Europe, and Asiatic regions. Therefore, more efforts should be made to help the Middle-East countries develop scientific collaborations with Northern America, Western Europe, and Asiatic regions in order to increase researches within interdisciplinary terms. Findings indicate this field of knowledge has been rising since 2002 for the Middle East. Furthermore, this comparison shows the Middle East position in quantitative areas such as 'number of documents' and 'citable documents' is better than its position in qualitative areas. Therefore, the qualities and quantities of the publications should be encouraged.

ETHICAL APPROVAL

This survey was conducted with an approval from the ethical committee of Jundishapur University of Medical Sciences. Moreover, this study is not against public interests and the release of information is allowed by legislation.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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