

## Breast Cancer in Iran: the Trend of Iranian Researchers' Publications in MEDLINE Database

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### ABSTRACT

**Background:** The high incidence of breast cancer in young women in Iran and its resultant problems for families show the necessity of exploring studies conducted in this field. The present research was conducted to determine the volume of scientific production on breast cancer in Iran, and to compare it with that of other countries in the Middle East.

**Methods:** This systematic review study used scientometric indicators, and investigated Iran's volume of scientific production on breast cancer in MEDLINE database during 2000-2014. The scientific production was searched in MEDLINE database and retrieved with a combined strategy consisting of the keywords from Medical Subject Headings (MeSH), as well as, keywords suggested by specialists (physicians), and the data were transferred onto a checklist, which was designed in the Excel software, and were examined.

**Results:** Iranian researchers have published 578 scientific documents on breast cancer in the studied period, with the highest rate in the subfield of epidemiology (39%), followed by the two subfields of basic and clinical molecular research. The mean participation of Iranian researchers was 5.3 persons per article. Almost 37% of Iranian articles were published in journals with impact factors between 0.693-4.469. Among all journals publishing Iranian articles, the Breast Cancer Research and Treatment Journal has the highest impact factor. The majority of Iranian articles were published in Thailand, the United States and the England.

**Conclusion:** Iran's scientific production on breast cancer has increased linearly in the studied period, in particular, after 2009.

**Key words:** Breast Cancer, Iran, Epidemiologic Studies, Molecular Studies, Clinical Studies, Scientometrics, MEDLINE database.

22 |

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## Introduction

According to the World Health Organization's report in February 2009, breast cancer is the cause of 519 thousand deaths worldwide each year<sup>1</sup>. The total number of patients with breast cancer in Iran is 40000, increasing by more than 7000 annually<sup>2</sup>. Although the incidence of breast cancer in Iran is lower than in other countries, its increasing number in the recent years has made this disease as the most common malignancy among Iranian women. The highest incidence rate of breast cancer occurs one decade earlier in Iranian women as compared with their peers in developed countries, and more than 30% of patients are younger than 30 years old<sup>3</sup>. Another study on a sample of women with breast cancer in Kermanshah Province in 2001-2004 showed that the patients' mean age was  $46 \pm 9$ , and 34% of the samples were aged under 40, which is worrying in comparison with the western countries where only 6% of the patients are aged under 40<sup>4</sup>. Almost 70% of Iranian women with breast cancer only visit treatment centers when they are in the advanced stages of their sickness, and the treatment is not effective<sup>5</sup>. Women are the main pivot of the family and play a highly important role in the family. Women's diseases engage not only patients, but also their families, and shake the family foundation. Therefore, it is important to conduct a study and assess the number of studies on breast cancer. This lets know how active and effective, and how successful, a country has been in such an important field. To measure the number of studies on breast cancer and analyze their quantity and quality, comprehensive and reliable medical databases should be examined. There are many methods to assess the number of studies, among which scientometrics has become known as a suitable method for assessing scientific activities and their outcomes by measuring the volume of scientific production

in different fields and analyzing them<sup>6</sup>. Scientometrics aims to assess the latest progress in scientific-research activities in any scientific field and identify its growth factors. Scientometrics can be a useful and efficient method for officials and policy makers to manage financial and human resources with the highest efficiency. Exploring variables and providing an appropriate combination of their indicators, scientometrics explains the trend of scientific production and the outcome of scientific research practices<sup>7</sup>. Scientometrics is based on the analysis of information parameters, which are scientific articles, patents, journals, and in general, all published scientific information<sup>8</sup>. Scientometrics is a step toward training effective people for evaluating science, research and the creators of scientific achievements, such that the standardization of research and science can be realized on the basis of international rules and principles<sup>9</sup>. Since we are at the beginning of scientific production, a positive and realistic attitude toward scientometric results will be effective for encouraging researchers<sup>10</sup>. Determining the country's position and exploring the trend of scientific production growth can draw attention to research issues, paving the way for the country to achieve its deserving position<sup>11</sup>. Different scientometric practices have been conducted in various scientific fields, including MH. Biglu. who explored articles about the psychology<sup>12</sup>, Yang, Needleman & Niederman articles about dentistry<sup>13</sup>, Parta & Bhattacharya about the scientific production of India on cancer<sup>14</sup>, Ramos, Gutierrez & Royo about the scientific production of Spain on microbiology<sup>15</sup>, Stegmann & Grohmann documents related to the avian flu<sup>16</sup>. In another study by Donato & De Oliveria, articles about breast pathology were investigated<sup>17</sup>. Mousavi et al. explored articles about the epidemiology of breast cancer in Iranian women. They investigated all documents published by Iranian researchers in different database such as MEDLINE during 1998-2005, as well as, the

soarticles from 2000 issues of 94 Iranian journals during these years. They searched titles in these sources with breast cancer, breast carcinoma, breast tumor, and breast malignancy as the keyword along with the term “Iran”. In total, the full texts of 85 articles were examined, which showed the age of the patients varied from 15-84 years, and the highest prevalence was observed in the 40-49 year age group. The incidence rate of this disease in women is about 22 people per 100000. This study showed that the epidemiological aspects of breast cancer have been well studied; while its clinical aspects have received less attention<sup>3</sup>. Another study in scientometrics of medical sciences in Iran was conducted by Ali Montazeri, “Health-related quality of life in breast cancer patient: bibliographic review of the literature from 1974 to 2007”. The search setting included MEDLINE, ISI, EMBASE, CINHALL, AMEDDD, and PsycINFO databases, and the phrases “breast cancer” or “breast neoplasms” and quality of life were searched in the article title, which retrieved about 971 documents. The results indicated a remarkable growth in the number of articles about the quality of life of breast cancer patients in 1974-2007<sup>18</sup>. The majority of studies have searched few keywords only in the title of documents to find articles. Therefore, there is no comprehensive study about assessing scientific documents on breast cancer in MEDLINE database in Iran; consequently, the present study, with the help of a specialist(a physician), attempts to determine the growth trend of Iran’s scientific production on breast cancer and subsidiary issues, using keywords that improve the comprehensiveness of the study, and by identifying a particular strategy for retrieving scientific documents. The current research aims to identify the most prolific studies in this field, the participation rate of the authors, the status of the journals, and the countries that have published Iranian articles. Besides evaluating scientific activities on breast cancer, this paves the way

for conducting similar studies in all medical fields.

## Methods

The present research is a systematic review study. MEDLINE database is the research setting, and Iran’s scientific production on breast cancer during 2000-2014, which is published in scientific journals worldwide and their bibliographic information is indexed in MEDLINE database, from the research population. The raw data were obtained from the National Center for Biotechnology Information [NCBI] through the PubMed search engine, limiting the search to MEDLINE database based on the [SB] tag. MEDLINE database was selected for this study because “MEDLINE is one of the most reliable, accessible, and practical biomedical databases”<sup>12</sup>. MEDLINE is the first and the most important database of the United States’ National Medical Library, storing more than 20 million bibliographic data, as well as, the abstracts of 5800 different biological-science journals, in particular, on biomedicine. The unique characteristic of MEDLINE is its using the MeSH for indexing its records. The subject coverage of MEDLINE is biomedicine and health sciences<sup>19</sup>. There is another reliable medical database named EMBASE, which is the database of Excerpta Medica Abstract Journals. This database has several subsets in different areas such as cardiology, dermatology, pharmacology, genetics, immunology, gynecology, nephrology, gastrointestinal and pediatrics, which are kept up to date and store more than 20 million records and journals from more than 7000 specialty medical journals from 70 countries<sup>20</sup>. However, this database is not freely accessible, and all people cannot use it; therefore, the data in the present study were drawn from MEDLINE database. To ensure the retrieve of all related documents, a two-stage search was conducted. In each stage, the author’s field and address were used to specify the results according to

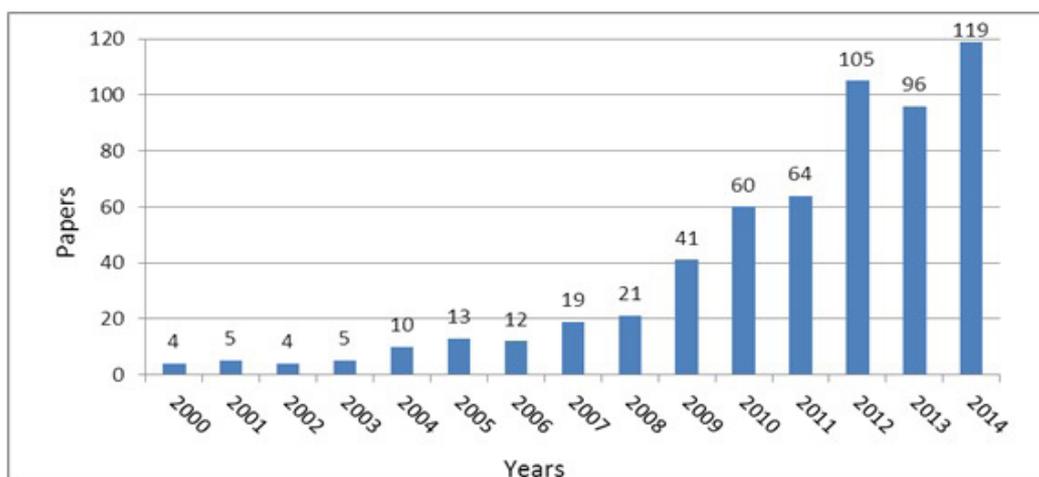


Fig.1: The Growth Trend of Iran's Scientific Documents on Breast Cancer in MEDLINE Database during 2000-2014

each particular country. In the first method, the Breast Neoplasms keywords (as in Medical Major Subject Headings, MeSH) were used, which retrieved 528 documents. In the second stage, all keywords related to breast cancer were collected with the assistance of a specialist to produce a comprehensive list of retrieved scientific documents on breast cancer. Then, a search strategy consisting of 14 keywords was formed and adopted for retrieving the remaining related documents; the 14 keywords are as follows: breast cancer, breast carcinoma, breast lymphoma, breast sarcoma, lymphosarcoma, breast lesions, breast malignancy, breast neoplasia, mastectomy, lumpectomy, gynecomastia, mastalgia, mastopexy, breast masses. Seventy five articles were retrieved with the second method; the documents were, then, presented to the specialist who, omitted irrelevant documents and finally reached 50 relevant ones. Accordingly, in total, 578 documents were collected through a two-stage search. All documents were then specified using MEDLINE database identification tag (PMID), the date of publication (DP), institutional affiliation (AD), authors (Au), journal title (JT), and the place of publication (PL);

all the information was transferred to a previously designed Excel file to be used for achieving the results. This stage was conducted completely manually; therefore, it was very time-consuming and needed a high degree of accuracy. To determine the mean number of authors per article, each article's number of authors was calculated and the mean number of authors per article in each year was determined; then, the mean number of authors per article through the period of study was determined. To identify the subfields of articles, they were delivered to the specialist, who studied all 578 Iranian articles, categorized them into the epidemiological, molecular and clinical subfields.

## Results

Iran produced 578 scientific documents on breast cancer during 2000-2014; the majority of them (84%) were published after 2009 years. The trend of the production of these documents is illustrated in figure 1. Epidemiological, molecular and clinical documents constituted 39%, 29% and 25% of Iran's breast cancer scientific documents, respectively and less than 7% of the documents

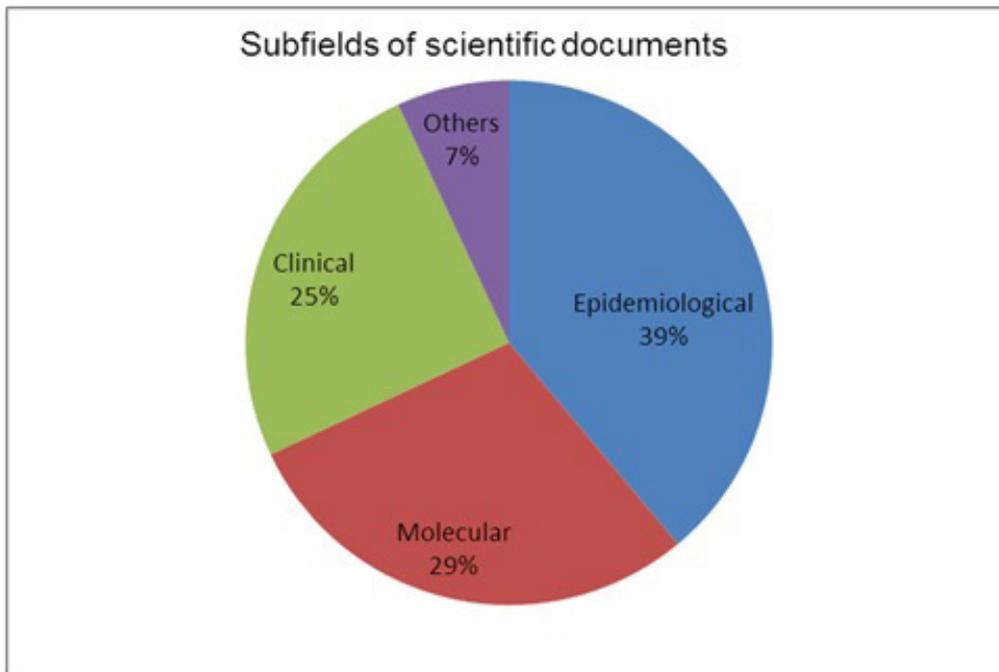


Fig.2: The Growth Trend of Iran's Scientific Documents on Epidemiological, Molecular, and Clinical Studies of Breast Cancer in MEDLINE database in 2000-2014

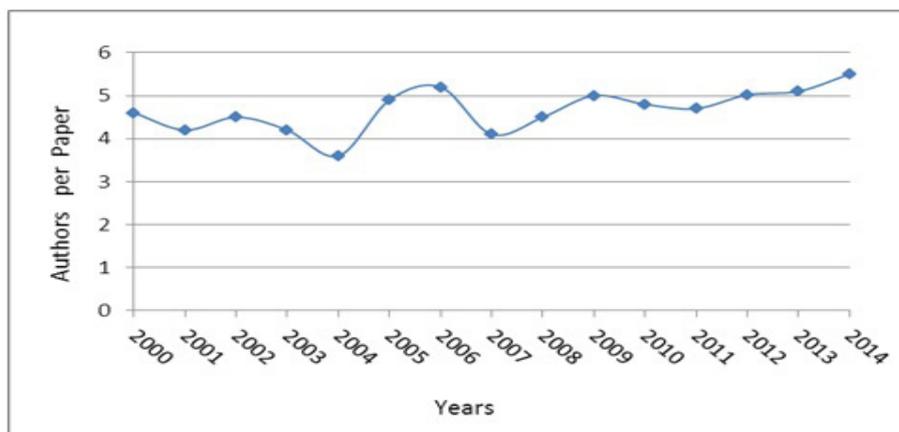


Fig.3: The Mean Participation Rate of Iranian Researchers (number of authors) in the Production of Information on Breast Cancer (2000-2014)

**Table 1: The Number of Researchers Contributing in the Production of at least 6 Documents in MEDLINE database on Breast Cancer during 2000-2014**

Rank	The Researcher's Name	University/Institution	Center's Name	Articles' Number
1	Abolrasoul Talee	Shiraz University of Medical Sciences	School of Medicine, Department of Immunology	32
2	Abbas Qaderi	Shiraz University of Medical Sciences	Medicine, Department of Immunology	24
3	Ali Montazeri	Jahade Daneshgahi	The Health Science Research Center	20
4	Morteza Atri	Tehran University of Medical Sciences	Medicine Faculty	14
5	Mohamad Hashemi	Zahedan University of Medical Sciences	Department of Clinical Biochemistry	13
6	Ramin Sadegi	Mashhad University of Medical Sciences	Nuclear Medicine Research Center	12
7	Mohsen Taheri	National Institute of Genetic Engineering and Biotechnology (NIGEB), Tehran	Division of Medical Biotechnology	12
8	Sadaf Alipour	Tehran University of Medical Sciences	Department of Surgery, Arash Women's Hospital	11
9	Parvin Mehdipour	Tehran University of Medical Sciences	Dep. of Human Genetics	11
10	Mohamad Esmail Akbari	Shahid Beheshti University of Medical Sciences	Center Research Center	10
11	Ebrahim Eskandari-Nasab	Zahedan University of Medical Sciences	Department of Clinical Biochemistry	10
12	Mandana Ebrahimi	Jahade Daneshgahi, Tehran Medical Sciences Branch	Breast Cancer Research Center	10
13	Iraj Harirchi	Tehran University of Medical Sciences	School of Medicine, Department of Surgery	10
14	Mahboube Razmkhah	Shiraz University of Medical Sciences	Shiraz Institute for Cancer Research	10

belonged to other fields. The number of epidemiological, molecular and clinical studies increased over the studied period (Fig.2). In the studied period, 5061 researchers had contributed to the production of 578 Iran's scientific documents, such that Iranian articles had been authored by 1-14 researchers, with the mean participation rate of 5.3 persons per article among Iranian researchers;

whereas, this rate was 4.57 persons during 2000-2008, increasing to 5.3 persons after 2008 (Fig.3). Table 1 presents researchers who had participated in the production of at least 10 documents in MEDLINE database during 2000-2014. Among these researchers, Abolrasoul Talei, Abbas Ghaderi and Ali Montazeri contributed in the production of more than 13% of the documents, and according to

**Table 2: The Impact Factor of Journals published more than 6 papers of Iranian articles on Breast Cancer Indexed in MEDLINE Database during 2000-2014 (along with the number of Iranian published articles)**

No	The Publishing Journal of Iran's Scientific Production	Iran's Scientific Production		
		Number	Percentage	Impact Factor
1	Breast cancer research and treatment	8	4%	4.469
2	Cancerletters	9	4%	4.258
3	PloS one	6	3%	3.73
4	Tumor biology: the journal of the International Society for Oncodevelopmental	15	7%	2.518
5	Molecular biology reports	9	4%	2.506
6	DNA and cell biology	7	3%	2.344
7	Gene	7	3%	2.196
8	Medical oncology (Northwood, London, England)	23	11%	2.147
9	The breast journal	9	4%	1.831
10	Oncology research	7	3%	1.634
11	Pathology oncology research : POR	8	4%	1.555
12	Asian Pacific journal of cancer prevention : APJCP	142	66%	1.5
13	Archives of Iranian medicine	14	6%	1.222
14	Indian journal of cancer	6	3%	1.131
15	Journal of cancer research and therapeutics	8	4%	0.761
16	Acta medica Iranica	8	4%	0.715
17	Acta cytologica	7	3%	0.693
18	BMC cancer	7	3%	0.693
19	Iranian biomedical journal	6	3%	0.00

the Lotka's law (The quantitative percentage of researchers in a discipline that have contributed to its many research practices), they are regarded as prolific researchers in the production of information on breast cancer in Iran. Iranian researchers published their scientific production in 216 journals, 4 of which that publish the majority of Iran's scientific production had an impact factor from 1.222 to 2.518. Among journals that published Iranian articles,

Breast Cancer Research and Treatment has the highest impact factor of 4.469. Table 2 shows the high-impact factor journals that published Iranian articles on breast cancer (along with the number of published articles). Exploring the publication place of Iranian articles shows that they were published in 34 countries, that is, 23.7.% of them in Thailand, 23.4% in the United States, 16.4% in England and 11.9% in Netherlands, as is presented in more details in table 3.

**Table 3: The Publication Place of Journals Publishing Iran's Scientific Production on Breast Cancer Indexed in MEDLINE Database in 2000-2014**

	Countries	The Frequency of Journals' Publication Place			Countries	The Frequency of Journals' Publication Place	
		Numbers	Percentage			Numbers	Percentage
1	Thailand	137	23.7%	18	Scotland	3	0.5%
2	U.S.A	135	23.4%	19	Slovakia	3	0.5%
3	England	95	16.4%	20	Spain	3	0.5%
4	Netherlands	69	11.9%	21	Australia	2	0.3%
5	Iran	32	5.5%	22	Canada	2	0.3%
6	India	18	3.1%	23	Singapore	2	0.3%
7	Ireland	13	2.2%	24	Sweden	2	0.3%
8	Germany	10	1.7%	25	Tanzania	2	0.3%
9	Japan	7	1.2%	26	Brazil	1	0.2%
10	Switzerland	6	1.0%	27	China	1	0.2%
11	Pakistan	5	0.9%	28	Czech Republic	1	0.2%
12	Egypt	4	0.7%	29	Denmark	1	0.2%
13	Italy	4	0.7%	30	Finland	1	0.2%
14	Poland	4	0.7%	31	Greece	1	0.2%
15	Saudi Arabia	4	0.7%	32	Korea (South)	1	0.2%
16	France	4	0.7%	33	Norway	1	0.2%
17	New Zealand	3	0.5%	34	Turkey	1	0.2%
Sum						578	%100.00

## Results

The majority of Iran's scientific production on breast cancer occurred in 2012 and 2014. A careful study of the trend of Iran's scientific production indicates that it had an almost steady growth in 2000-2014, such that it increased from 4 documents in 2000 to 119 documents in 2014, meaning that the production of scientific documents increased by almost eight documents each year, which is a fairly good growth rate. This constant growth may be related to technological progress, access to more databases, the equipment of hospitals and treatment centers, or the increased prevalence of the disease in recent

years, and therefore, it's becoming assigned to the ministry's research priorities since 2009. The low level of Iran's scientific production before 2009 may be attributed to various problems such as the consequence of Iraq-Iran war, the lack of research infrastructures, and thus, a lower budget for research. As the majority of production in this field in the studied period relates to the three last years, that is 2012, 2013 and 2014, the current trend promises a better future for the country. The remarkable point about the research results is the growth of Iran's scientific production after 2008 (485 documents in 2009-2014) compared to its previous years (93 documents), which shows the volume of

Iran's scientific production has increased almost 4.22 times greater than the documents during 2000-2008. The growth rate after 2009 is outstanding; it is very promising and indicates greater efforts of Iranian researchers in the recent years in spite of the political and economic sanction of Iranian scientists by the foreign countries. The present research depicts Iran's scientific production growth on breast cancer after 2009, which is also approved by the results of two studies by MH. Biglu<sup>21,22</sup>. The results of the current study are also compatible with the findings of a study by Biglu, in which the scientific production of the entire world in a 40-year period was assessed, showing scientific production growth in the post-1985 years<sup>6</sup>. It seems that technological progress, in particular, the emergence of small computers and the possibility of communication between Iranian and the developed countries' researchers might have been effective in this respect. The great number of the leading researchers in the scientific production on breast cancer belongs to the institutions in Tehran and Shiraz, which might be due to the existence of a specialized center in this field. Most (8 out of 12) centers where the prolific researchers on breast cancer scientific production are working are located in Tehran. This might be due to the fact that the concentration of funding and facilities in the country's capital city has provided a more suitable environment for science production in these centers; reversely, the weaker contribution of researchers out of Tehran might be attributed to the shortage of funding, facilities and academic staff in other cities. According to the present study results, as well as, the findings of the previous studies by Biglu<sup>21</sup> have been among the most prolific Iranian researchers in MEDLINE database. The current study also shows that the authors' team work witnessed a good growth in 2000-2014; likewise, the results of Biglu study point to a remarkable

growth in the authors' group participation; however, the limitation of this study was that MEDLINE database had only the first author's address; therefore, it was not possible to identify the specialty and the research field of some article contributors, and it was not possible to know how many specialists had contributed to each article.

More than one thirds of the Iranian articles were published in journals with the impact factor of 0.693 and above, which proves the value of Iranian articles and Iranian researchers' exactitude in choosing journals for their articles. 23.4% and 16.4% of Iran's scientific production were published, respectively, in the U.S. and England journals, proving that Iranian researchers have sought to publish their scientific production in accredited and top academic ranking journals<sup>21</sup>, which is also approved by Biglu.

Epidemiology is the major subfield of Iran's scientific production (39%), followed by molecular (29%) and clinical (25%) studies, which is consistent with the results achieved by Mosavi et al.<sup>3</sup>.

This study showed that among the subfields, epidemiological, compared to molecular and clinical studies underwent a more remarkable growth during 2000-2014, as epidemiological production increased from 1 to 31 articles. Epidemiological studies were conducted more conveniently, needing less funding and facilities, making it easier for Iranian researchers to undertake; whereas, molecular studies, which require a great deal funding, were feasible in all institutions and conditions, and therefore, they lack much inclination and ability to conduct them. Meanwhile, molecular research is nowadays highly valued in medical sciences, and the developed countries employ their best efforts toward conducting this kind of studies. This issue requires officials' attention to allocate more budget and facilities to molecular research because of its importance, and to prioritize research practices in order to boost studies in this subfield.

In most scientometric studies conducted in MEDLINE database, the search results have been restricted to the existence of the keyword in the title of documents<sup>3, 23-25</sup>. As all document titles do not include keywords related to the research, the present study has the advantage of searching keywords throughout documents; therefore, all relevant documents have been retrieved. Another advantage of the present research, compared to other studies in this field, is that it used 15 keywords to increase the comprehensiveness of the search; while other studies have only used 2-4 keywords, which are not able to retrieve all documents<sup>3,18</sup>. However, the general limitation of this research lies in that it has explored articles on breast cancer that are only indexed in MEDLINE database; while some of the articles of Iranian researchers have been published in domestic or other foreign journals that are not indexed in this database. If these articles are collected and evaluated, the status of Iran's production of science on breast cancer will be brought to the light better.

## Conclusion

The number of Iranian researchers' scientific production on breast cancer increased compared to the pre-2009 years. It is hoped, following the current trend, that Iran will take better measures in this field and improve its position in the world. As the production of scientific information is nowadays the main competitive field between countries, it is recommended to evaluate the status of scientific production in each country or institution by conducting scientometric studies in different disciplines. This will allow experts to compare their status with others', make better decisions about spending money and time in different scientific branches, overcome their deficiencies, and progress further.

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