Archives of Oncology and Cancer Therapy

Volume 1, Issue 1, 2018, PP: 32-36

Patent and Publications Trends in Breast Cancer Chemotherapy

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Abstract

***Objective:** To analyse multi-source data including publications and patents, and try to draw the whole landscape of the research and development community in the field of chemotherapy for breast cancer.*

***Materials and Methods:** Publications and patents were collect from the Web of science and databases of the top five patent offices of the world, respectively. Bibliometric methodologies and technology are used to investigate publications/patents, their contents and relationships.*

***Results:** 29237 items published and 16053 patents from 1997 to 2016 including "chemotherapy for breast cancer" were retrieve. The top five countries in global publication and patents share were USA, Germany, Italy, China and France. The universities and enterprises of USA had the highest amount of publication and patents.*

***Conclusions:** The above results show that global research in the field of chemotherapy for breast cancer is increasing and the main participants in this field are USA and Canada in America, China, Japan and South Korea in Asia, and Germany, Italy, and France in Europe, and Australia in Oceania. In addition, this article demonstrates the usefulness of bibliometrics to address key evaluation questions and define future areas of research.*

Keywords: *breast cancer; chemotherapy; patents; publications; bibliometric*

Introduction

Breast cancer remains a major public health problem. Currently, among all cancers, breast cancer is the most common cancer in women in both developed and developing countries [1-5]. According to GLOBOCAN estimates, more than half (52.9%) of 1.67 million new breast cancer cases were diagnosed in developing countries in 2012 [6].

The treatment of breast cancer has improved over recent years and has led to an increased survival rate for patients. Current clinical therapies for breast cancer are offer on an individual patient basis via a multidisciplinary team and comprise surgery, radiotherapy and drug therapies targeting oncogenic processes [7]. However, in recent years, chemotherapy it has been used as a viable treatment option [8].

Furthermore, extensive research has been conducted to solve the problem of breast cancer, but the remedy remains uncertain. Faced with this dilemma, scientific research evaluation has as purpose monitoring of ongoing research initiatives to assess the efficiency and effectiveness with which they are being implement, and to determine the extent to which they are achieving their targeted objectives, and to recommend adjustments. On this premise, the present study was designed to determine the world share of

publications and patents, in the field of chemotherapy for breast cancer from 1997 to 2016.

Materials and Methods

We used a keyword search approach to identity the "chemotherapy for breast cancer"- related publications and patents data from Web of Science and patent's databases from United State Patent and Trademark Office, European Patent Office, State Intellectual Property Office of the People Republic of China, Japan Patent Office, Korean Intellectual Property Office and World Intellectual Property Office. In this study, Web of Science, which covering nearly all fields of science, was used to produce statistics on the scientific production of chemotherapy for breast cancer. Immunotherapy articles and reviews, in the field of breast cancer, were downloaded for the 20 publication years, 1997 - 2016. In order to approximate the overall number of published items on breast cancer, the following search strategy was employed; TS = (chemotherap*) AND TS = [(breast invasive ductal carcinoma) OR (infiltrating duct carcinoma$) OR (mammary ductal carcinoma$) OR (breast cancer) OR (breast neoplasm$) OR (breast tumo$r$) OR (human mammary neoplasm$) OR (human mammary carcinoma$)]; where TS = Topic search, $ = any character, *= two or more character. The same search strategic was performed in the Title/Abstract/Claims of the patent document. Additionally, the codes classification patents C07K16/00, CO/K16/3015, A61K39/00, and A61K39/395 were used. Document information included numbers of years of publication, citation, origin countries, source journals, institutes and enterprises. The records were downloaded using Microsoft Excel software, and additional coding was manually performed for the above fields.

Results and Discusion

29237 items published and 16053 patent documents from 1997 to 2016 including "chemotherapy for breast cancer" were counted (Figure 1). A development trend was found for items published, which increased from 425 in 1997 to 3031 publications in 2016. In addition, the development trend of patents had publication's similar behaviour as a growth trend was observed from 13 in 1997 to 1448 patents in 2016.

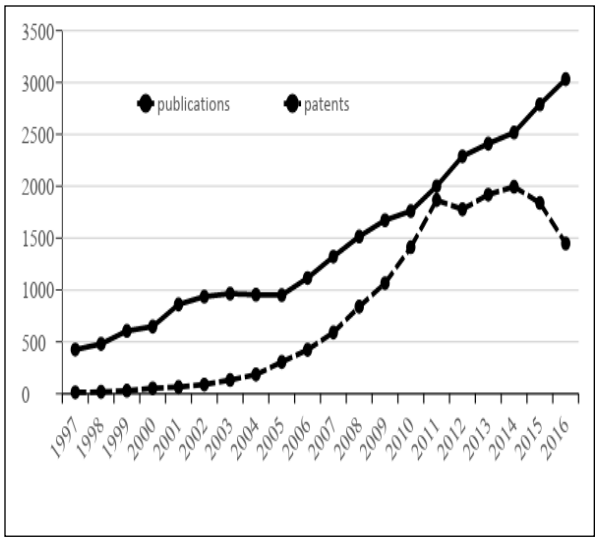

Figure 1. *Publication and patent trend distribution analysis based in "Chemotherapy for Breast Cancer"*

The global patent share of top 10 most productive countries in chemotherapy for breast cancer is shown in (Figure 2), with USA occupying the first rank and contributing the largest publication share (47.96%), followed by Germany (9.87%), Italy (7.33%), China (7.04), and France (5.62%).

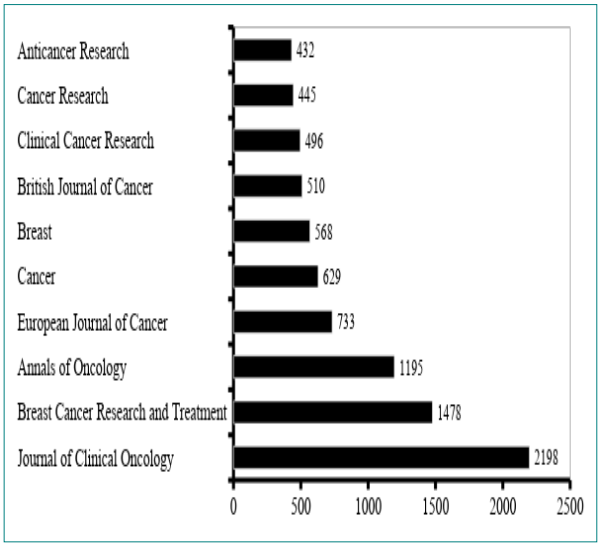

Figure 2. *Top ten journals publishing articles in the field of "Chemotherapy for breast cancer", 1997-2016.*

The global publication share of top 10 most productive countries in chemotherapy for breast cancer is shown in Table 1, with USA occupying the first rank with global share of 31.47%, followed by Italy (9.3%), Germany (7.69%), France (6.96%), England (6.95%), Canada, Japan, China, Netherlands and Spain (from 5.1% to 3.5%).

Table 1. *Top ten countries with publications based in "Chemotherapy for breast cancer".*

	1997-2001	2002-2006	2007-2011	2012-2016	Total
USA	1196	1926	1298	4783	9203
Italy	367	468	866	1028	2729
Germany	224	444	623	959	2250
France	240	339	561	895	2035
England	220	335	611	868	2034
Canada	136	202	460	703	1501
Japan	98	176	261	687	1222
China	5	46	175	986	1212
Netherlands	110	188	290	479	1067
Spain	71	149	286	528	1034

In total, 29237 articles were published in more 500 journals. Journal of Clinical Oncology published the most articles with 2198 articles comprising 7.5% of all the articles, followed by Breast Cancer Research and Treatment (5%), Annals of Oncology (4%), European Journal Cancer (2.5%), and Cancer (2.15%) (Figure 2).

The contributions of different institutes were estimated by the affiliation of at least one author. The top 10 organizations involved in "chemotherapy against breast cancer" are shown in Figure 3, with UTMD Anderson Cancer Center occupying the first rank and contributing the largest publication share (5.04%), followed by UNICANCER (4.55), Harvard University (3.76%), University of California (3.27%), and Health Boston System (2.3%).

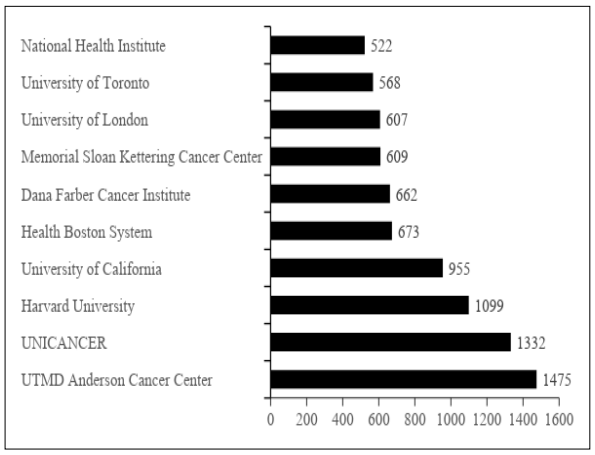

Figure 3. *Top ten institutions with articles on "Chemotherapy for breast cancer", 1997-2016.*

16053 patent documents, the global patent share of top ten most productive countries, is shown in Figure 4, with USA occupying the first rank and contributing the largest publication share (52%), followed by England (9.89%), Germany (7.7%), Japan (5.8%) and Australia (3%). The Figure 5 shows the top ten of assignees with patents. Genentech Incorporation is the leading assignee reporting 736 patents contributing 4.6%, followed by Novartis (4.44%), Wisconsin Alumni Reserach (3.2%), Schering Corp. (2.8%), and Wyeth Corp. (2.76%).

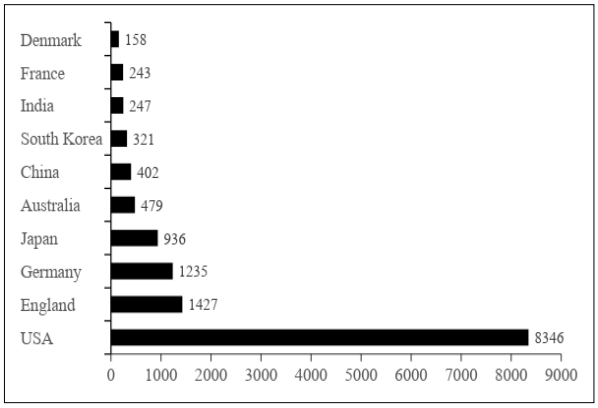

Figure 4. *Top ten countries with patents based in "Chemotherapy for breast cancer". 1997-2016.*

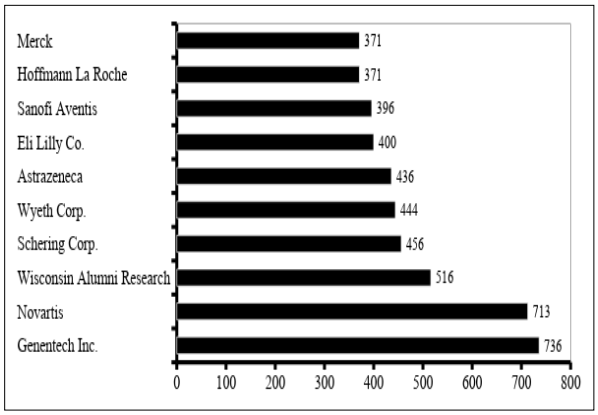

Figure 5. *Top ten of applicants with patents on "Chemotherapy for breast cancer", 1997-2016.*

Breast cancer research evaluation allows answering questions related to the performance of research to determine the extent to which they are achieving their targeted objectives, and to recommend adjustments. This study analysed publications and patents in the field of chemotherapy for breast cancer and some important points about the trend of research in this field were obtained. Our findings suggest a growing interest in the field of chemotherapy for breast cancer as shown by the increased number of items each year. Other different studies have examined several fields in breast cancer research. For example, the trends for breast cancer research have been addressed in several countries such as France [9], China [10], Mexico [11], Iran [12], India [13] and Portugal [14]. On the other hand, there is another study in the field of breast cancer diet, which shows that the main participating countries, including the US, are consistent with ten of the present study [15]. Additionally, a study of reconstructive breast surgery research shows a match between the same countries groups obtained in our study [16]. Similarly, Ha., et al. shows that USA is the leader in articles published in the field of breast cancer imaging research [17]. Finally, the results of another study on gene therapy for breast cancer show that the main producing countries of publications and patents are similar to those obtained in this study [18]. There are few studies based on data integration of research publications and patents, or any two of them. This work represents the first bibliometric assessment of chemotherapy for breast cancer research that includes publications and patents. The findings of this study should provide useful information for those who will be performing research and studying chemotherapy for breast cancer and for prospective models in the study of breast cancer [19].

Conclusion

This analysis has also demonstrated the leading role which the United States plays in chemotherapy for breast cancer research, due to the following: a) it is the largest producer of scientific papers, b) is the leading producer of patents, c) has eight of the ten major institutions/companies producing scientific articles, and d) has six of the top ten institutions/production companies of patents in the field of chemotherapy for breast cancer. The present study shows predominance in research and patents for the following countries: USA and Canada in America; China, Japan and South Korea in Asia; Australia in Oceania, and Germany, France, England and Italy in Europe.

Acknowledgement

This work was supported by a grant from Social Security Mexican Institute Grant FIS/IMSS/PROT/G15/1485 for the Laboratory of Cellular Biology, Biomedical Research Center East, Social Security Mexican Institute. Conflict of Interest The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

[1] Anaya-Ruiz M., et al. "Female breast cancer incidence and mortality in Mexico, 2000-2010". Asian Pacific Journal of Cancer Prevention 15.3 (2014): 1477-1479.

[2] Dogan N and Toprak D. "Female Breast Cancer Mortality Rates in Turkey". Asian Pacific Journal of Cancer Prevention 15.18 (2014): 7569-7573.

[3] Shi XJ., et al. "Mortality characteristics and prediction of female breast cancer in China from 1991 to 2011". Asian Pacific Journal of Cancer Prevention 15.6 (2014): 2785-2791.

[4] Youlden., et al. "Incidence and mortality of female breast cancer in the Asia-Pacific region". Cancer Biology and Medicine 11.2 (2014): 101-115.

[5] Malvezzi M., et al. "European cancer mortality predictions for the year 2014". Annals of Oncology 25.8 (2014): 1650-1656.

[6] Ferlay J., et al. "GLOBOCAN 2012 v1.0, Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 11. Lyon, France: International Agency for Research on Cancer; 2013". Last accessed September. 2015.

[7] Majeed., et al. "Breast cancer: major risk factors and recent developments in treatment". Asian Pacific Journal of Cancer Prevention 15.8 (2014): 3353-3358.

[8] Ernst B and Anderson KS. "Immunotherapy for the treatment of breast cancer". Current Oncology Reports 17.2 (2015): 5.

[9] Thonon F., et al. "Trends and evolutions of French breast cancer research: a bibliometric study". Bulletin du Cancer 102.5 (2015): 417-427.

[10] Hong W and Dong E. "The past, present and future of breast cancer research in China". Cancer Letters 351.1 (2014): 1-5.

[11] Perez-Santos JLM and Anaya-Ruiz M. "Mexican breast cancer research output, 2003-2012". Asian Pacific Journal of Cancer Prevention 14.10 (2013): 5921-5923.

[12] Shahkhodabandeh S., et al. "Breast cancer in Iran: iranian scientists approach to breast cancer researchers in medline database". Iranian Quarterly Journal of Breast Disease 2.2 (2009): 49-59.

[13] Singh N., et al. "Mapping of breast cancer research in India: a bibliometric analysis". Current Science 110.7 (2016): 1178- 1183.

[14] Donato HM and De Oliveira CF. "Breast pathology: evaluation of the Portuguese scientific activity based on bibliometric indicators". Acta Medica Portuguesa 19.3 (2006): 225-234.

[15] Kotepui M., et al. "A bibliometric analysis of diets and breast cancer research". Asian Pacific Journal of Cancer Prevention 15.18 (2014): 7625-7628.

[16] Moghimi M., et al. "A scientometric analysis of 20 years of research on breast reconstruction surgery: a guide for research design and journal selection". Archives of Plastic Surgery 40.2 (2013): 109-115.

[17] Ha R., et al. "Global trend in breast cancer imaging research 1992-2012: bibliometry study". American Journal of Roentgenology 202.3 (2014): 696-697.

[18] Anaya-Ruiz M and Perez-Santos M. "Innovation status of gene therapy for breast cancer". Asian Pacific Journal of Cancer Prevention 16.9 (2015): 4133-4136.

[19] Canongia., C. "Synergy between Competitive Intelligence (CI), Knowledge Management (KM) and Technological Foresight (TF) as a strategic model of prospecting—The use of biotechnology in the development of drugs against breast cancer". Biotechnology Advances 25.1 (2007): 57-74.

Citation: **Martin Perez-Santos, Landeta G, Carla de la Cerna Hernandez, Azucena Monge-Lopez, Jesus Leal-Rojas**. *Patent and Publications Trends in Breast Cancer Chemotherapy. Archives of Oncology and Cancer Therapy. 2018; 1(1): 32-36.*