RESEARCH ARTICLE

Mexican Breast Cancer Research Output, 2003-2012

Jose Luis Martin Perez-Santos[1], Maricruz Anaya-Ruiz[2]*

Abstract

The objetive of this study was to explore a bibliometric approach to quantitatively assess current research trends with regard to breast cancer in Mexico. Articles were analyzed by scientific output and research performances of individuals, institutes, and collaborative countries with Mexico. Data were retrieved from the Web of Science database from 2003 to 2012; this was searched using different terms related to breast cancer, including "breast cancer", "mammary ductal carcinoma" and "breast tumour". Data were then extracted from each file, transferred to Excel charts and visualised as diagrams. A total of 256 articles were retrieved. The institutions with the majority of publications were the National Autonomous University of Mexico (22.3%), the National Institute of Cancerology (21.9%), and Social Security Mexican Institute (20.3%); clinical observation studies were the dominant investigation type (64%), and the main types of research were metabolics (24.2%) and pathology (21.5%). This article demonstrates the usefulness of bibliometrics to address key evaluation questions and to establish priorities, define future areas of research, and develop breast cancer control strategies in Mexico.

Keywords: Breast cancer - research evaluation - Mexico

Asian Pac J Cancer Prev, **14 (10)**, 5921-5923

Introduction

Breast cancer is the most commonly diagnosed malignancy and leading cause of cancer mortality among women in the world (de la Vara-Salazar et al., 2011; Haghighat et al., 2012; Ferlay et al., 2013). The mortality rate in developing countries is even higher because of limited medical infrastructure and awareness (El-Basmy et al., 2012; Kutikhin et al., 2012; Siegel et al., 2012; Pandey and Chandravati, 2013). Since 2006, breast cancer has been the leading cause of cancer mortality in Mexican women, accounting for 14% of cancer-related deaths (Chavarri-Guerra et al., 2012; Justo et al., 2013). The government of Mexico has developed diverse efforts and initiatives to confront the rise in mortality due to said cause, including early detection, treatment and research strategies (Gonzalez-Robledo et al., 2010).

Research evaluation consists of monitoring of ongoing research initiatives to assess the efficiency and effectiveness with which they are being implemented, 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 Mexican share of published research in the field of breast cancer from 2003 to 2012. A bibliometric method was used to analyze breast cancer research trends and performances including international collaboration, distribution of institutes and author publications.

Materials and Methods

In this study, Web of Science, which covering nearly all fields of science, was used to produce statistics on the scientific production of the mexican researchers. Mexican papers (articles, research notes, and review articles) in the field of breast cancer were downloaded for the 10 publication years, 2003-2012. In order to approximate the overall number of published items on breast cancer, the following search strategy was employed; CU=mexico AND TS=[(phyllodes tumo$r$) OR (Cystosarcoma Phyllo$des) OR (Malignant Cystosarcoma Phyllodes) OR (breast invasive ductal carcinoma) OR (infiltrating duct carcinoma$) 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.

Document information included names of authors, titles, years of publication, source journals, contact addresses, and subject categories of journals. The records were downloaded using Microsoft Excel software, and additional coding was manually performed for the number of authors, origin countries and institutes of the collaborators. The papers were also classified by their research level (clinical observation or basic research) and main types of research (metabolics, diagnosis, epidemiology, genetics, pathology, prognosis, quality of

*[1]Vice-rectory of Research and Postgraduate Studies, Benémerita Universidad Autónoma de Puebla, [2]Laboratory of Cellular Biology, Centro de Investigación Biomédica de Oriente, Instituto Mexicano del Seguro Social, Puebla, México *For correspondence: manaya19@yahoo.com.mx.*

life, radiotherapy, screening and surgery).

Results

A total of 256 Mexican items published in Web of Science from 2003 to 2012 including the search words "breast cancer", "mammary ductal carcinoma" and "breast tumour", was counted (Figure. 1). A development trend was found for all documents and articles, which increased from 6 in 2003 to 50 publications in 2012. The 256 indexed items have been cited 2,206 times since 2003. Figure 1 demonstrates the parallel increase in the number of citations in conjunction with the increase in published items.

The collaboration with different countries was estimated by the location of the affiliation of at least one author of the published papers. Of all the 256 articles with author addresses, 185 (72.26%) were Mexico independent articles and 71 (27.73%) were internationally collaborative articles. Domination in collaborative country was the USA (63.38%) followed by France (7.04%), Spain (5.6%), and Germany (4.22%). Figure 2 demonstrates the parallel increase in the number of collaboration international total items in conjunction with the increase in collaboration USA items.

The contributions of Mexican different institutes were estimated by the affiliation of at least one author. The 256 items were published by 58 Mexican institutes that collaborated with 74 foreing institutes. Of the 256 articles with Mexico author addresses, 133 (51.91%) were independent articles and 123 (48.09%) were inter-institutionally collaborations of two or more institutes. The top 10 institutes were ranked by the number of items (Table I). The National Autonomous University of Mexico had the most total (22.26%), followed by National Institute of Cancerology (21.87%), The Social Security Mexican Institute (20.31%), National Institute of Public Health (12.11%), and Center for Research and Advanced Studies (9.37%).

In total, 256 articles were published in 145 journals (data not shown). Salud Publica de Mexico published the most articles with 10 articles comprising 3.9% of all the articles, followed by Medical Oncology (3.5%), BMC Cancer (2.7%), Cancer Epidemiology Biomarkers and Prevention (2.7%), and Revista de Investigación Clínica (2.7%).

The clinical observation studies were the dominant study type with 164 items (64%), while the basic research studies had 92 items (36%). Figure 3 demonstrates the parallel increase in the number of clinical observation ítems in conjunction with the increase in basic research items. The main types of research are shown in Figure 3, metabolics and pathology dominate with 45.7% of the total output between them.

Finally, we examine the sources of funding for Mexican cancer research. Of total items only 73 (28.5%) had one or more explicit funding sources. National Council of Science and Technology funded the most total articles with 54 items (73.97%), followed by National Autonomous University of Mexico with 12 items (16.44%), Science and Technology Institute of Federal District with 10 items (13.70%), The Social Security Mexican Institute with 7 (9.59%), and National Institute of Health of USA with 7

Table 1. The Top 10 Most Productive Mexico Institutes on Breast Cancer Research

Institution	No. of items
National Autonomous University of Mexico	57
National Institute of Cancerology	56
Social Security Mexican Institute	52
National Institute of Public Health	31
Center for Research and Advanced Studies	24
National Institute of Medical Sciences and Nutrition	20
Autonomous University of Nuevo Leon	15
National Polytechnic Institute	13
University of Guadalajara	7-
University of Guanajuato	6

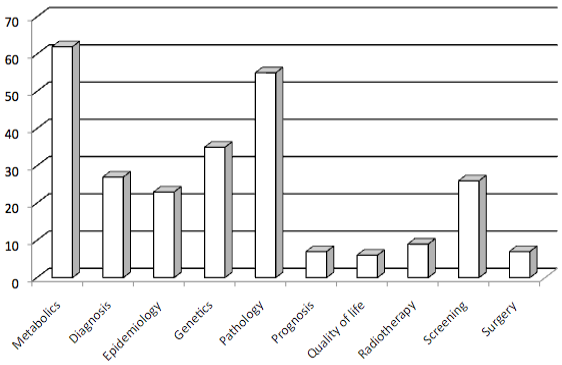

Figure 2. Mexican Breast Cancer Research Output by Research Types

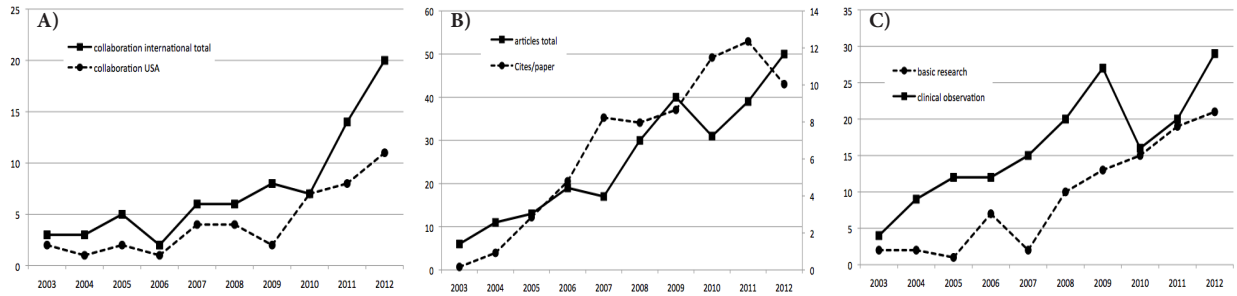

Figure 1. A) Internationally Collaborative Countries of Mexican Breast Cancer Research. Collaboration international total (solid line) and collaboration USA (dashed line); **B) Mexican Breast Cancer Research Outputs in the Web of Science.** Items (solid line) and cites per paper (dashed line) and; **C) Mexican Breast Cancer Research Outputs by Research Level.** Clinical observation (solid line) and basic research items (dashed line)

(9.59%). No industrial company was involved in authoring items.

Discussion

Breast cancer is an emerging public health problem globally, including Mexico. 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.

In this study dealing with breast lung cancer Web of Science journal papers, we obtained some significant points on Mexican breast cancer research trends and performances from 2003 to 2012. Our findings suggest a growing interest in breast cancer research in Mexico as shown by the increased number of ítems each year. With respect to scientific collaboration, the USA ranked first in internationally collaborative items with Mexico. The National Autonomous University of Mexico was the leader in breast cancer research in Mexico, distinctly followed by National Institute of Cancerology and the Social Security Mexican Institute. Finally, the distribution by research type is similar to that of the rest of the world.

Several papers have examined cancer research in individual countries: in Canada (Campbell et al., 2010), Japan (Ho et al., 2010), and Puerto Rico (Calo et al., 2010). Particularly, there is a study related to portuguese breast cancer research (Donato and De Oliveira, 2006). As these studies, the results of this present analysis are consistent with other studies that have demonstrated an increase in breast cancer research publications worldwide (Glynn et al., 2010; Healy et al., 2011).

This work represents the first bibliometric assessment of Mexican breast cancer research. Breast cancer research in Mexico is still developing, although some research has attained an international level. The findings of this study should provide useful information for those who will be performing research and studying breast cancer for Mexican.

Acknowledgements

This work was supported by a grant from Social Security Mexican Institute Grant FIS/IMSS/PROT/G11/974 for the Laboratory of Cellular Biology, Biomedical Research Center East, Social Security Mexican Institute.

References

Calo WA, Suarez-Balseiro C, Suarez E, et al (2010). Assessing the scientific research productivity of Puerto Rican cancer researchers: bibliometric analysis from the science citation index. *Puerto Rico Health Sci J*, **29**, 250-5.

Campbell D, Picard-Aitken M, Cote G, et al (2010). Bibliometrics as a performance measurement tool for research evaluation: The case of research funded by the National Cancer Institute of Canada. *Am J Evaluation*, **31**, 66-83.

Chavarri-Guerra Y, Villarreal-Garza C, Liedke P, et al (2012). Breast cancer in Mexico: a growing challenge to health and the health system. *Lancet Oncol*, **13**, 335-46.

de la Vara-Salazar E, Suárez-López L, Angeles-Llerenas A, et al (2011). Breast cancer mortality trends in Mexico, 1980-2009. *Salud Publica Mex*, **53**, 385-93.

Donato HM, De Oliveira CF (2006). Breast pathology: evaluation of the Portuguese scientific activity based on bibliometric indicators. *Acta Medica Portuguesa*, **19**, 225-34.

El-Basmy A, Al-Mohannadi S, Al-Awadi A (2012). Some epidemiological measures of cancer in Kuwait: national cancer registry data from 2000-2009. *Asian Pac J Cancer Prev*, **13**, 3113-8.

Ferlay J, Steliarova-Foucher E, Lortet-Tieulent J, et al., (2013). Cancer incidence and mortality patterns in Europe: estimates for 40 countries in 2012. *Eur J Cancer*, **49**, 1374-1403.

Glynn RW, Scutaru C, Kerin MJ, Sweeney KJ (2010). Breast cancer research output, 1945-2008: a bibliometric and density-equalizing analysis. *Breast Cancer Res*, **12**, 108.

González-Robledo LM, González-Robledo MC, Nigenda G, et al. (2010). Government actions for the early detection of breast cancer in Latin America. *Salud Publica Mex*, **52**, 533-43.

Haghighat S, Akbari M, Ghaffari S (2012). Standardized breast cancer mortality rate compared to the general female population of Iran. *Asian Pac J Cancer Prev*, **13**, 5525-8.

Healy NA, Glynn RW, Scutaru C, et al (2011). The h index and the identification of global benchmarks for breast cancer research output. *Breast Cancer Res Treatment*, **127**, 845-51.

Ho Y-S, Satoh H, Lin S-Y (2010). Japanese lung cancer research trends and performance in science citation index. *Int Med*, **49**, 2219-28.

Justo N, Wilking N, Jönsson B, et al (2013). A review of breast cancer care and outcomes in Latin America. *Oncologist*, **18**, 248-56.

Kutikhin AG, Yuzhalin AE, Brailovskiy VV, et al (2012). Analysis of cancer incidence and mortality in the industrial region of South-East Siberia from 1991 through 2010. *Asian Pac J Cancer Prev*, **13**, 5189-93.

Pandey S, Chandravati (2013). Breast screening in north India: a cost-effective cancer prevention strategy. *Asian Pac J Cancer Prev*, **14**, 853-7.

Siegel R, Naishadham D, Jemal A (2012). Cancer statistics, 2012. *CA Cancer J Clin*, **62**, 10-29.