

## RESEARCH ARTICLE

# A Bibliometric Analysis of Diets and Breast Cancer Research

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### Abstract

Breast cancer is the most common cancer among women worldwide. The primary aim of this work was to provide an in-depth evaluation of research publications in the field of diets and breast cancer. The impact of economic outcome on national academic productivity was also investigated. Data were retrieved using Pubmed for English-language publications. The search included all research for which articles included words relating to “diets and breast cancer”. Population and national income data were obtained from publicly available databases. Impact factors for journals were obtained from Journal Citation Reports® (Thomson Scientific). There were 2,396 publications from 60 countries in 384 journals with an impact factor. Among them, 1,652 (68.94%) publications were Original articles. The United States had the highest quantity (51% of total) and highest of mean impact factor (8.852) for publication. Sweden had the highest productivity of publication when adjusted for number of population (6 publications per million population). Publications from the Asian nation increased from 5.3% in 2006 to 14.6% in 2012. The Original article type was also associated with geography ( $p < 0.001$ ; OR=2.183; 95% CI=1.526-3.123), Asian countries produced more proportion of Original articles (82%) than those of rest of the world (67.6%). Diets and breast cancer-associated research output continues to increase annually worldwide including publications from Asian countries. Although the United States produced the most publications, European nations per capita were higher in publication output.

**Keywords:** Diets - breast cancer - publications - country distribution - impact factor

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### Introduction

Medical progress on scientific communication continues to increase annually. The scientific publication has increased due to the information explosion. Bibliometric studies are increasingly being used for research assessment by involving the application of statistical methods to obtain the bibliographics for topic of researcher's interest. These methods are mainly quantitative but are also used to make pronouncements about qualitative pictures of scientific activities around the world (Zyoud et al., 2014). Well-known databases for bibliographics analysis are PubMed, Scopus, Web of Science [i.e., Thomson Reuters Institute for Scientific Information (ISI)], and Google Scholar index international publications in biomedical sciences (Falagas et al., 2008).

PubMed is a database developed by the National Center for Biotechnology Information (NCBI) at the National Library of Medicine (NLM), one of the institutes of the National Institutes of Health (NIH). The database was designed to provide access to citations from biomedical

journals which include both Medline and non-Medline databases (<http://www.ncbi.nlm.nih.gov/pubmed>). They were many bibliometric researches in the field of oncology (Ugolini and Mela, 2003; Ugolini et al., 2007; Michon and Tummers, 2009; Chua et al., 2011). However, few studies have documented patterns of publications in clinical and basic science research involving breast cancer research output (Glynn et al., 2010; Perez-Santos and Anaya-Ruiz, 2013).

Breast cancer is the most common cancer among women in the world with an estimated 1.67 million new cancer cases diagnosed in 2012 accounting for 25% of all cancers and also ranks as the fifth cause of death from cancer overall (522,000 deaths) (Ferlay et al., 2013). In Asia, breast cancer has also been reported as the most common cancer among women and the second leading cause of death (12.8% of all cancer) (Ferlay et al., 2013). The role of diets is implicated in incidence of breast cancer (Parry et al., 2011). There was some evidences that the dietary intake of subjects in developing countries needs improvement such as fat intake should be changed to

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reduce risk of developing breast cancer (Esmailzadeh and Azadbakht, 2008). To affirm conclusions about diets and breast cancer, researchers would have to find association between those. The primary aim of this present work was to provide an in-depth evaluation of research publications in the field of diets and breast cancer using Pubmed, and other publicly available databases, and also examined global research productivity and trends in Asian countries.

## Materials and Methods

Data of publications were gathered using Pubmed database. The search terms using a combination of “diet and breast cancer” was used to extract English language publications. The impact factors for publications in 2012 were retrieved from Journal Citation Reports (Thomson Scientific). Citations were imported into the EndNote® bibliographic management software (Thomson Scientific). Review articles, Case reports, Letters to the editor and etc. were retrieved and categorized to spreadsheet. Country labels were individually collected from the “author address” field in EndNote for each publication. Publications from Northern Ireland, England, Scotland, and Wales were grouped as United Kingdom. Publications from Hong Kong were not grouped with China because there were different quantitative variables for the two regions. Country-specific data and income category were gathered from the World Bank List of Economies (<http://data.worldbank.org/country>). Briefly, 266 countries are classified by the World Bank according to 2012 Gross National Income per capita as Low income (\$875 or less), Lower middle income (\$876-\$3,465), Upper middle income (\$3,466-\$10,725), and High income (\$10,726). A complete description of this methodology and countries included is available on the World Bank website (<http://data.worldbank.org/country>). The data were then analyzed using SPSS statistical software version 11.5 statistical package with cross tabulations between individual databases and differences were considered statistically significant at  $p < 0.05$ .

## Results

The results showed that there were 2,396 research publications produced from 1994 to 2012. The number of publication was increased over the timeline (Figure 1). These publications were represented by authors from 60 countries. Among the 60 countries represented in the database, 24 had 10 or more publications (Table 1). These countries accounted for 2,278 of the total 2,396 publications (95%). The United States had the highest 1,243 publications (52%), whereas publication from Asia countries contributed 217 publications (9%). Original articles constituted a majority of the publications (1,652 of 2,396; 69%). Whereas Review article were next at 24%, followed by Letters to the editor (2%) (Table 2). The country with the highest number of Original article was United States 844 (67.9%), followed by Canada 112 (77.2%) and Italy 77 (68.1%). Impact factor information was available for 384 journals from the Journal Citation Reports. The mean impact factor for all publications

**Table 1. Country Representation**

Country	Publications	Population (millions)	Publications per millions	Mean IF	Income categories
USA	1243	314	3.95	5.85	High
Canada	145	34.9	4.15	4.86	High
UK	145	63.2	2.29	4.84	High
Italy	113	60.9	1.85	4.36	High
France	77	65.7	1.17	2.93	High
Japan	62	128	0.48	3.19	High
Sweden	58	9.52	6.09	5.63	High
Spain	51	46.2	1.1	3.15	High
Germany	45	81.9	0.54	4.28	High
Australia	41	22.7	1.8	4.77	High
China	41	1350	0.03	2.41	Upper middle
Netherlands	39	16.8	2.32	5.35	High
Denmark	32	5.59	5.72	4.97	High
Finland	32	5.41	5.91	4.24	High
Korea	32	50	0.64	2.77	High
India	19	1240	0.01	2.31	Lower middle
Greece	18	11.3	1.59	3.32	High
Mexico	17	121	0.14	2.49	Upper middle
Israel	13	7.91	1.64	1.86	High
Norway	13	5.02	2.59	3.95	High
Hong Kong	11	7.16	1.53	3.52	High
Taiwan	11	23.3	0.47	3.03	High
Brazil	10	199	0.05	1.6	Upper middle
Malaysia	10	29.2	0.34	1.37	High

\*IF=Impact factor

**Table 2. Types of Articles**

Article type	Frequency	%
Original article	1652	68.9
Review articles	563	23.5
Letters to the editor	46	1.9
Meta-analyses	34	1.4
Editorial	31	1.3
Case reports	9	0.4
Book	2	0.1
Miscellaneous	59	2.5
Total	2396	100

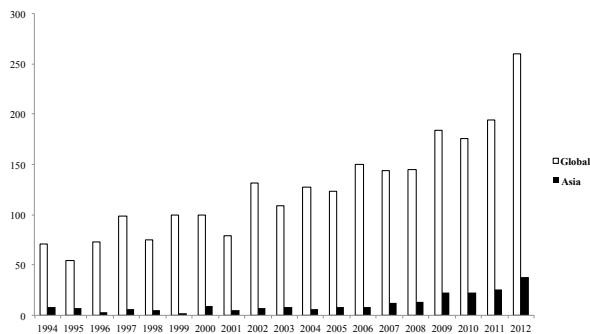
**Table 3. Countries and Types of Research Publications**

Type of publications	Countries		P-value*	Odds ratio	95%CI**
	Asian	Non-Asian			
Research articles	178 (82)	1474 (67.6)	<0.01	2.18	1.52-3.12
Non- research articles	39 (18)	705 (32.4)			
Total	217 (100)	2179 (100)			

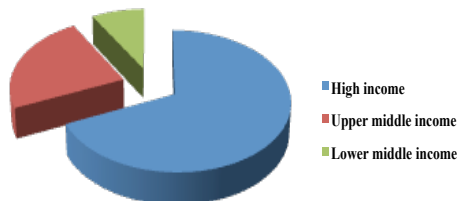
\*P-value by Chi-square test, \*\*Confidence interval

was 4.63. Among the 24 countries with more than 10 publications, publications from United States had the highest mean impact factor (5.85). Most of the research publication was produced from High income country (41 of 60; 68%). Upper middle income were next at 24%, followed by Lower middle income (8%) (Figure 2).

The Asia countries produced low (217 of 2,396; 9%) publications each year when compared with global publications. However, publications from the Asia countries continues to increased annually from 6.5% in 2005 to 14.6% in 2012 in the last seven year same as the global trend. Sweden had the most publications per capita, which was 6 publications per million people. Among the top 24 countries with 10 or more publications, the 24 high income countries published a median of 1.6 manuscripts per million people (range 0.02 [India] to 6.1 [Sweden]).



**Figure 1. Research Publications Produced from 1994 to 2012**



**Figure 2. Research Publication was Produced from High Income Country, Upper Middle, Followed by Lower Middle Income**

The 19 countries not classified as high income nations published a median of 1.0 manuscripts per million people (range 0.01 [Nigeria, Pakistan] to 2.7 [Uruguay]). Original articles was associated with countries distribution (Pearson Chi-Square =19.07, df=1,  $p < 0.01$ ; OR=2.18) (Table 3). Asian countries produced more proportion of Original article (82%) than those of non-Asian countries (67.6%).

## Discussion

An increase in the publication of scientific literature indicates the speed of progress of science and technology. The current study found that the number of diets and breast cancer articles published totally increased between 1994 and 2012, indicating an important rapid development in the field of diets and breast cancer. The United States had the most number of article publications. Although the overall productivity of research publication was highest for the United States, but per capita productivity was higher in Western European countries such of Sweden. It can be caused by economic development which had a significant impact on research productivity, with higher income nations likes the United States contributing to a majority of publications which supported by the previous studies (Glynn et al., 2010; Perez-Santos et al., 2013).

The United States and Western Europe had the highest mean impact factor of their publications when compared with other parts of the world, which likely reflects the relatively high research citations. An influence of journals' countries of origin and the languages used may influence higher impact factor such as journals originating in North America tend to have a higher impact factor, followed by journals from Northern and Western Europe (Karageorgopoulos et al., 2011). A greater share of articles in English might improves international recognitions and Result in higher impact factor.

This analysis has also demonstrated the leading role which the United States plays in breast cancer research, a finding previously noted in other scientific disciplines amount of money spent on the management of breast cancer. Although research publication was increasingly year by year, there was an annually the dramatic underrepresentation of article publication from South America, Africa, and to a lesser extent, Asia (van Rossum et al., 2007; Klar et al., 2009). A publication produced from Asian countries was relatively low and might be the results of the low level of annual spending on Research and Development (R&D) such as in Arab states which is just 0.2% of the gross national product compared to the world average of 1.4% and moreover, majority of researchers and scientists from other Asian countries is also immigrating to other countries which may creates a gap between Asian publications and global publications (McKee et al., 2012). The countries responsible for most publications in Asian countries were Japan, China, Korea, India, Israel, Hong Kong, Taiwan, and Malaysia. This may due to the fact that they spending more on R&D and generating more in research outcomes (Meo et al., 2013). Moreover, authors from Asian countries might be more likely to publish non-English articles to choose his native language for publication (Diekhoff et al., 2013).

This study, Low and Middle income countries produced low number of research publication. Several potential reasons is among Low-and Middle-income countries were limited governmental or non-governmental funding, lack of health research strategy, lack of political that engage health research, or ongoing conflict (McKee et al., 2012). Countries categorized by the World Bank as "High income" dominated research productivity, consistent with previous reports linking economic development with scientific output (Monge-Najera and Nielsen, 2005; Michalopoulos and Falagas, 2005; Rosmarakis et al., 2005). In this study dealing with diets and breast cancer, suggesting a growing interest in diets and breast cancer research worldwide including Asian countries as shown by the increased number of publications each year especially during the last 7 years. Breast cancer as a specialty interacts with many disciplines. This enables scientists in the field of nutrition can collaborate in breast cancer research. Consequently, the opportunities for publication extend to a broad range of journals. A previous meta-analysis has shown the influence of diets as a modifiable risk factor on breast cancer risk, and it is estimated that approximately one-third of cases could be prevented by dietary modification (Brennan et al., 2010).

This study has several limitations related to the search methodology and databases used. This study included only English-language publications because English is the language with the widest readership and global reach (Villar, 1988). This study also included publications only from 1994 onwards, when electronic submissions in major journals made it easier to track author affiliations. This study can concluded that breast cancer research in Asian is still developing. The findings of this study should provide useful information for those who will be performing research and studying diets and breast cancer. Although the United States leads in academic productivity, a European

nation is higher in scientific output per capita. Economic development is closely linked to national research productivity with high income nations dominating global research publications.

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