Information Management and Business Review (ISSN 2220-3796)
Vol. 15, No. 2, pp. 215-225, June 2023 (SI)

Breast Cancer Management Research Trends: A Bibliometric Analysis

Nor Intan Shamimi Abdul Aziz[1, 2*], Mass Hareeza Ali[1], Ahmad Taufik Jamil[3] & Yuhanis Ab Aziz[1]
[1]School of Business and Economics, Universiti Putra Malaysia, Serdang, Selangor, Malaysia
[2]Faculty of Business and Management, Universiti Teknologi Mara Puncak Alam, Selangor, Malaysia
[3]Faculty of Medicine, Universiti Teknologi Mara Sungai Buloh, Sungai Buloh, Selangor, Malaysia
*intanaziz72@gmail.com, mass@upm.edu.my, atjamil@gmail.com, yuhanis@upm.edu.my

Abstract: Breast cancer is the most prevalent type of cancer in women and has a significant economic impact worldwide. Consequently, there is a need to analyze the disease's research trend academically to determine the breast cancer publishing trend based on a certain period of its collection properties. Bibliometric analysis is used to examine the research trend in breast cancer care through time using various data. Several tools, including the PRISMA flow diagram, Microsoft Excel for frequency analysis, Harzing's Publish or Perish for citation metrics and other pertinent analyses, and VOSviewer for image visualization and bibliometric networks, were used to study this article. Using the TITLE search strategy and the Scopus database, 3,532 articles were located. It was discovered that the trends in research publications rose steadily from one year to the next. Between 1932 and 2021, 3,532 publications will be produced with a total of 61,274 citations, which breaks down to 688.47 citations per year, 17.35 citations per cited paper, and 4.02 citations per author. The United States, Italy, and the United Kingdom have produced the most co-authored works in this discipline. Even though the annual incidence rate of breast cancer remains high, these findings appear promising for determining the most effective treatments, procedures, and management strategies. The guideline standard requires further attention at a higher level.

Keywords: *Breast cancer, Cancer, Management, Bibliometric analysis, Trend.*

1. Introduction and Background

Breast cancer is the most common cancer in women, in which the cells start to grow out of control. A lump is one of the common symptoms associated with cancer. Some of the areas involved are milk ducts, mammary glands, and breast tissue (American Cancer Society, 2021). The prevalence of breast cancer has increased since decades ago. Many factors influenced the prognosis of patients, such as the patient's clinical conditions (such as age, tumor size, histological grade, lymph node status, and menopausal status), the expression of estrogen and progesterone receptors, and the expression of human epidermal growth factor receptor 2 (c-erbB-2) (Chang et al., 2022). Over the years, the morbidity and mortality of breast cancer among women have increased, and thus it has been acknowledged as a burden for public health management. It involved huge health expenditures from the individuals as well as from the government to pay for the treatment. Most of the cases are from low- and middle-income countries that affect women and their families, and obviously, financial catastrophe is a direct consequence of paying for the treatment (Koboto et al., 2020). Nevertheless, breast cancer incidence is expected to grow in the future at an alarming rate around the globe (Sajahan & Omar, 2018).

Furthermore, the International Agency for Research on Cancer has come out with a new estimate that 1 in 5 people will develop cancer in their lifetime, while 1 in 8 men and 1 in 11 women will die from the disease (Union for International Cancer Control, 2020). The top 10 countries with the highest incidence rate for breast cancer are Belgium (113.2), the Netherlands (100.9), New Caledonia (99.0), France (99.1), Luxembourg (99.8), Denmark (98.4), Australia (96.0), New Zealand (93.0), the United States of America (90.3), and Finland (92.4) (Global Cancer Observatory, 2021a). The Global Cancer Observatory (2021b) has analyzed an estimation from 2020 to 2040 that breast cancer incidence will grow from 2,261,419 to 3,025,471 with an additional 33.8% of cases. By using a specific method of bibliometric analysis presented in this article, there will be a way to measure the properties of the collection of articles in a database for a narrow topic chosen. This study presents a trend in breast cancer management research, giving insights into the trend in topic articles with their basic properties and metadata, such as publisher name, type of document and title of the article.

Author's name, affiliations, country of the authors, abstract, keyword, and references (Ahmi, 2021). Specifically, this research will benefit academic and nurse researchers by providing a different perspective on the evolution of breast cancer fields and directing the researchers from a micro to a macro focus since its capabilities include discovering the underlying structure of this field. This method is not going to replace the traditional way of meta-analysis review, but it is more likely to complement it by providing useful information for the researchers to publish articles (Zupic & Čater, 2015). Furthermore, a scientific image visualization was also used together with the bibliometric method to map and examine collaborations and co-citation relations (Özen Çınar, 2020). Using this shows that generating scientific literacy is important to help more with the knowledge and information understanding needed to increase research publication every year (Effendi et al., 2021).

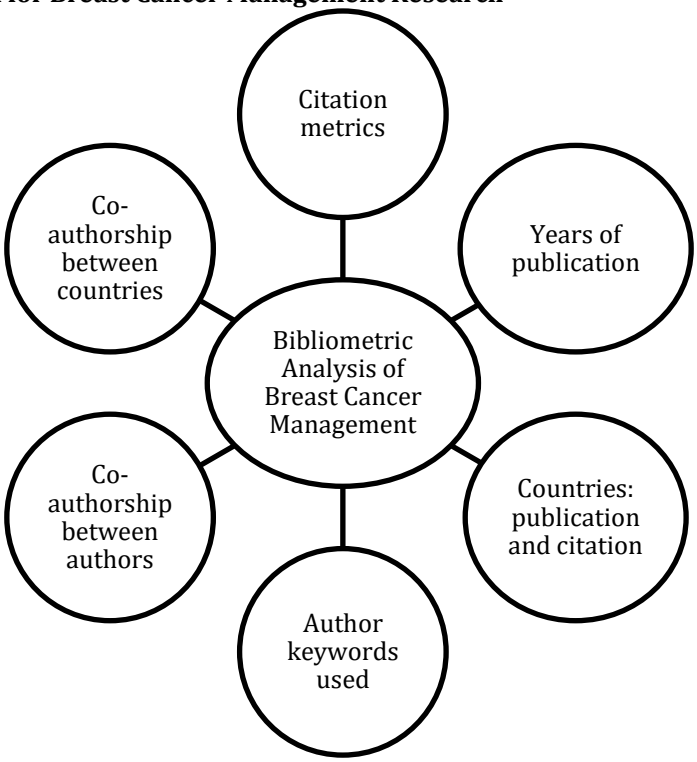
2. Literature Review

The advancement of healthcare requires the dissemination of knowledge derived from scientific study. Priority must be given to investigations carried out with acceptable methods and safe other than trustworthy sources of information, which are also crucial. Recent advancements in the detection and treatment of breast cancer, as well as the consolidation of novel therapeutic approaches, have all been made possible by scientific research in the field (Nascimento et al., 2021). In addition, publication in breast cancer research is piling up around the globe, especially in Western countries, due to the high number of research articles and citations. This is strengthened by the new collaborative effort made between the World Health Organization, UN agencies, and partner organizations called the Global Breast Cancer Initiative, to reduce mortality by 2.5% every year before reaching 2040. Through this initiative, three pillars are introduced, such as health promotion, timely diagnosis with comprehensive treatment, and a great social support system (Brunier & Muchnik, 2021). It is said that inadequate access to early detection and treatment is still a major contributing cause of greater breast cancer mortality among women in developing countries (Kashyap et al., 2022).

Bibliometric analysis is a statistical analysis and quantitative tool to analyze research publication performance over 0a period of time (Xiong et al., 2021). Bibliometrics is the application of mathematical, statistical, and other approaches to books and other forms of communication, according to Alan Pritchard, a pioneering researcher in this field who coined the term in 1969. A few measures, including the volume measure, journal impact measure, citation-based indicators, composite indicators, and distribution-based techniques are employed in bibliometric analysis to gauge research trends (Ismail et al., 2009). While this form of the study had benefits, including the use of computerized data gathered, a substantial number of publications in a field have been published to support additional research, and there has been a significant rise in the number of publications in this sector in recent years (Ellegaard & Wallin, 2015), some further concerns regarding this analysis were identified. First, a suite of indicators may be needed to quantify the quality of research because some indicators do not always accurately reflect research quality because there is no logical relationship between them.

Additionally, it takes a lot of time to gather accurate publications because some articles in scientific databases aren't available in full-text format. Lastly, it can be challenging to define appropriate fields of study for interdisciplinary research because of the differences between these fields, which can have a significant impact on the analysis that is performed (Ismail et al., 2009). For cancer, some bibliometric analysis reported about cancer literature focuses on specific sites like cervical and oral (mouth), specific countries (Ahmad et al., 2021; Ram, 2017), treatment (Franco et al., 2023; Teles et al., 2022), pain (Wu et al., 2021), and diet (Kotepui et al., 2014). Even though breast cancer research has been published for nearly 90 years, there is little evidence that any bibliometric analysis has been published to assess the trend of breast cancer research from the standpoint of management. Thus, to fill the gap, there is a need to analyze the contributions of authors in the publication of breast cancer management research between 1971 and 2021 through an established database. The goal of this paper is to examine the trend of breast cancer management research from several metadata, as shown in Figure 1 below.

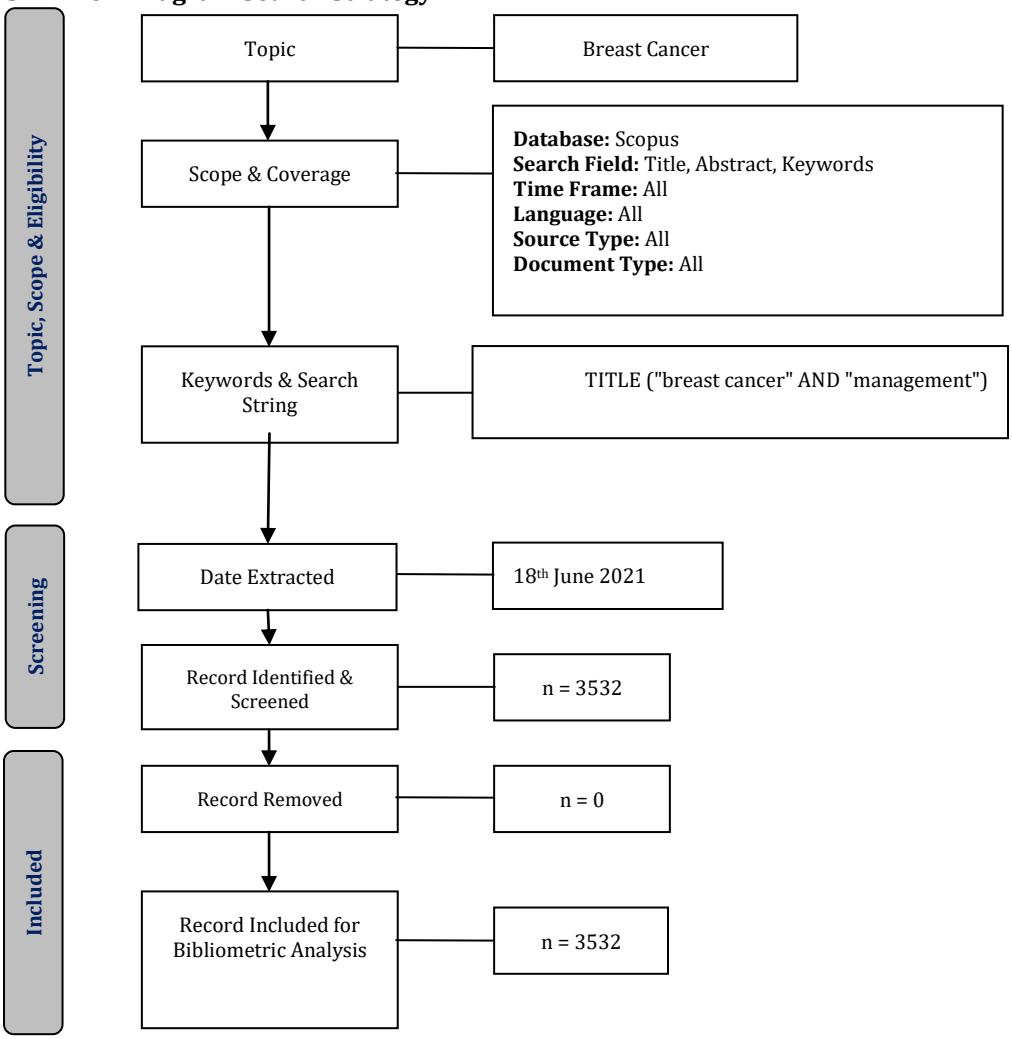
Figure 1: Metadata for Breast Cancer Management Research



3. Research Methodology

The Scopus database was used for the purpose of this analysis as of June 2021. To identify articles that are relevant to the keyword that was used, start your search using TITLE, then add the terms "breast cancer" and "management" to the end of the phrase. The word "TITLE" was selected because the majority of authors scan only the article's title before moving on to the body of the content (Zakaria et al., 2021). Figure 2 is a flow diagram that the researchers presented as an explanation of the search approach. As a result of the search, the researchers concluded that each of the article results appeared to be suitable for being included in the study; hence, no articles have been removed. After the articles have been chosen, the next step is to implement a plan involving the usage of applications and tools such as Microsoft Excel, Harzing's Publish or Perish, and VOSviewer. Microsoft Excel was used to determine percentages and frequencies for the articles that were chosen. Harzing's Publish or Perish was used to calculate article citation metrics and other related metadata, and VOSviewer was used to present a network visualization of the articles. Researchers describe each and every outcome in the next section.

Figure 2: The PRISMA Flow Diagram Search Strategy



Source: Zakaria et al., 2021.

4. Results

Citation Metrics Analysis: Table 1 shows a summary of citation metrics for breast cancer management studies published during the last 89 years, from 1932 to the present. During this time, 3,532 articles were published worldwide, with a total of 61,274 citations. When the quality of the author's article is considered, the citation per author is 4.02 based on the author's work.

Table 1: Citations Metrics

Metrics	Data
Publication years	1932-2021
Citation years	89 (1932-2021)
Papers	3,532
Number of Citations	61,274
Years	89
Citation per Year	688.47
Citation per cited Paper	17.35
Citation per Author	4.02

Yearly Publication Trend: Breast cancer management research began in 1932, and the number of publications has gradually increased over the previous several decades. Table 2 shows the pattern of how the study raised its total publication (TP) contribution from one article per year to more than one hundred publications per year. The year with the most publications was 2020, with a total of 250 articles published, whereas the year with the fewest publications was below 1971, before progressively increasing beginning in 1974. This table also displays the total number of citations (TC) for each year of publication. From 1964 to the present, the citation pattern proved to be good, with numerous other authors citing articles from the study. The lowest citation was discovered in the earlier times between 1932 and 1963, but the number of citations has climbed dramatically, with the highest citation reported in 2015 being 3,658.

Table 2: Years of Publication

Year	TP	%	NCP	TC	C/P	C/CP	h	g
2021	106	3.00%	23	49	0.46	2.13	4	4
2020	250	7.08%	144	495	1.98	3.44	8	14
2019	141	3.99%	111	598	4.24	5.39	12	15
2018	162	4.59%	125	1,253	7.73	10.02	18	28
2017	130	3.68%	110	1,322	10.17	12.02	20	29
2016	154	4.36%	118	1,393	9.05	11.81	20	29
2015	147	4.16%	122	3,658	24.88	29.98	25	57
2014	154	4.36%	120	2,145	13.93	17.88	26	41
2013	136	3.85%	108	2,651	19.49	24.55	29	48
2012	103	2.92%	84	2,518	24.45	29.98	24	48
2011	143	4.05%	109	2,784	19.47	25.54	31	49
2010	124	3.51%	90	2,801	22.59	31.12	25	51
2009	104	2.94%	77	2,559	24.61	33.23	27	49
2008	99	2.80%	77	3,215	32.47	41.75	30	56
2007	111	3.14%	94	3,018	27.19	32.11	28	52
2006	103	2.92%	79	3,094	30.04	39.16	28	55
2005	94	2.66%	73	2,337	24.86	32.01	25	47
2004	84	2.38%	63	1,507	17.94	23.92	21	37
2003	66	1.87%	49	1,782	27.00	36.37	22	42
2002	69	1.95%	53	1,323	19.17	24.96	16	35
2001	69	1.95%	57	2,127	30.83	37.32	19	45
1991 - 2000	502	0.1422	379	10,712	205.01	272.83	15.2	30.9
1981 - 1990	245	0.0694	157	4,920	202.4	313.91	8.2	19.8
1971 - 1980	163	0.0461	94	2,693	141.18	255.57	4.9	12.4
1961 - 1970	54	0.0152	33	287	69.28	95.6	2.2	3.3
1932 - 1960	19	0.0054	5	33	13.33	28	0.4	0.9

Notes: TP = total number of publications; NCP = number of cited publications; TC = total citations; C/P = average citations per publication; C/CP = average citations per cited publication; h = h-index; and g = g-index.

Contribution of Countries in Publication and Citation: Breast cancer management research has been studied by authors from all over the world. The table below shows the top ten countries in terms of publishing impact that contributed to the study, including the number of cited publications, total citations, citations per publication, and citations per cited paper, h-index, and g-index (Table 3). The United States leads the way in terms of publication, with 1299 total publications, followed by the United Kingdom, which comes in second with 463 publications. The United States has a significant advantage over the other top ten countries in total publication, number of cited publications, total citation, citations per publication, and citations per cited publication, which include the United Kingdom, Italy, France, Australia, Germany, Canada, Spain, Belgium, and India. As a result of all of these factors, they have the highest h index (83) and g index (142). With 81 publications, 1058 citations, an h index of 16, and a g index of 31, India is the only Asian country in the top ten for its contribution to the publication of breast cancer management research. The quality of publications by writers from this country can help to improve these indicators.

Table 3: Top 10 Countries Contributed to the Publications

Country	TP	NCP	TC	C/P	C/CP	H	G
United States	1299	1026	32385	24.93	363.88	83	142
United Kingdom	463	388	11148	24.08	195.58	50	91
Italy	227	172	6344	27.95	134.98	35	76
France	211	150	5118	24.26	106.63	29	69
Australia	160	138	3765	23.53	73.82	28	57
Germany	150	116	3969	26.46	84.45	26	61
Canada	123	105	4122	33.51	89.61	30	63
Spain	95	75	2575	27.11	80.47	23	50
Belgium	82	70	4298	52.41	104.83	27	65
India	81	63	1058	13.06	25.80	16	31

Notes: TP=total publications; NCP=number of cited publications; TC=total citations; C/P=citations per publication; C/CP=citations per cited publication; h=h-index; and g=g-index.

Author Keywords Used: The most frequently used author keywords were determined in this study by mapping the network visualization with VOSviewer software. The criteria were met by 182 keywords out of 2653. Figure 3 illustrates nine color clusters used to identify keywords: cluster 1 (red), cluster 2 (green), cluster 3 (blue), cluster 4 (yellow), cluster 5 (purple), cluster 6 (light blue), cluster 7 (orange), cluster 8 (magenta) and cluster 9 (yellow) (light purple). The phrase "breast cancer" is the most frequently used by authors, with 721 occurrences and a total link strength of 1209, followed by "chemotherapy," with 60 occurrences and a total link strength of 187. In comparison to the keyword "breast cancer," the keyword "breast neoplasms" is employed by authors substantially less frequently, with only 53 occurrences and 89 total link strength.

Figure 3: Network Visualisation Map of the Author Keywords

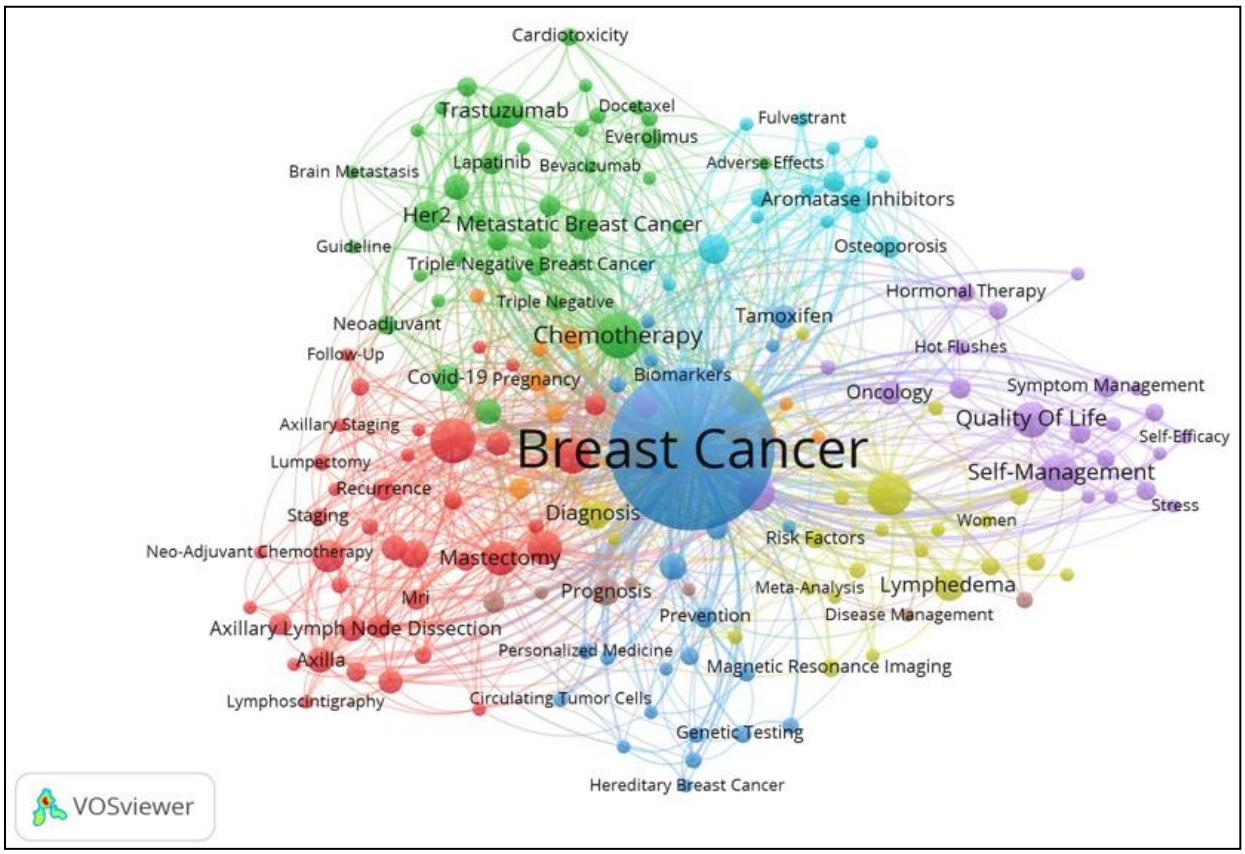
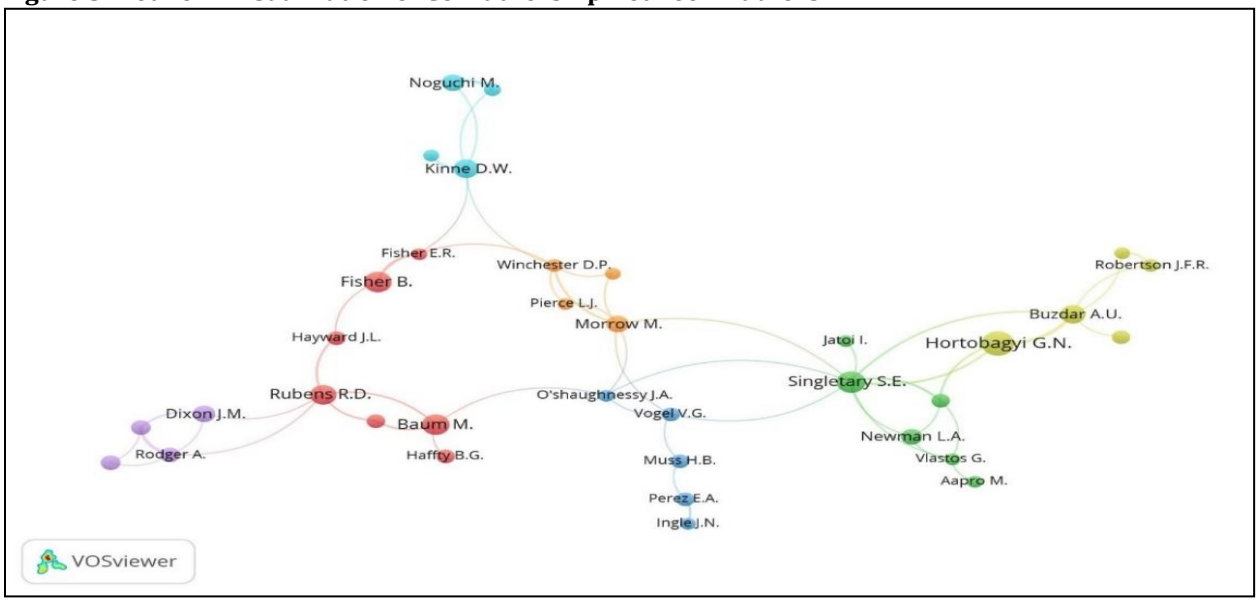


Figure 4: Word Cloud for Top 10 Keywords Used

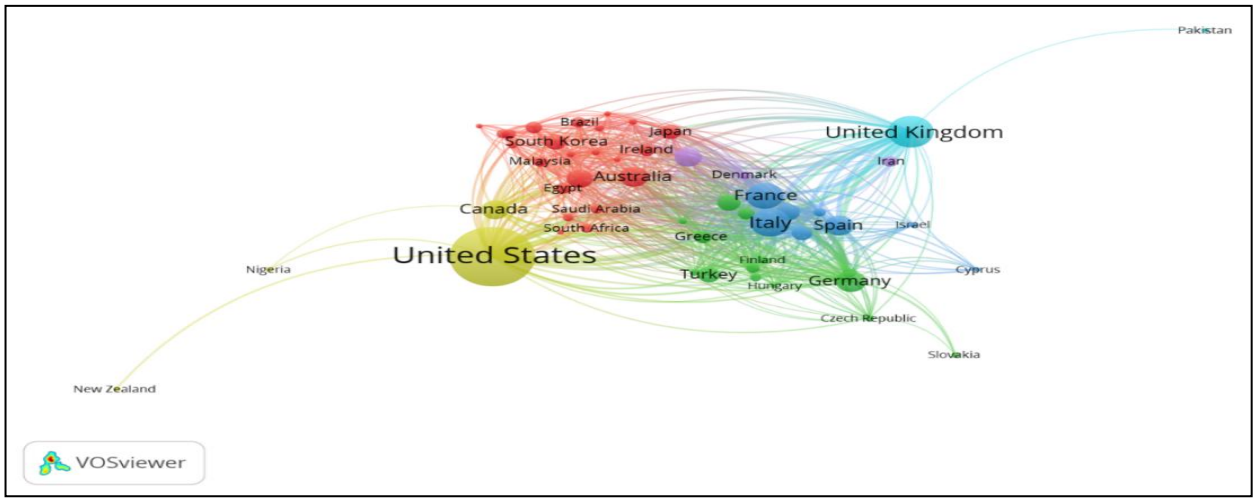
Co-Authorship between Authors: Figure 4 depicts the collaboration of authors in the field of breast cancer management research. The partnership is broken down into seven categories. Cluster 1 is red, Cluster 2 is green, Cluster 3 is blue, Cluster 4 is yellow, Cluster 5 is purple, Cluster 6 is light blue, and Cluster 7 is light blue (orange). Co-authorship analysis was performed on VOSviewer using the full-counting approach, with the author serving as the unit of analysis. According to the publication, author Hortobagyi, G.N. is the first top author, having created 22 papers, 1684 citations, and a total link strength of 12. Author Singletary S.E, on the other hand, became the first author with total link strength of 14, 17 publications, and 883 citations. The network is then generated automatically as seen below.

Figure 5: Network Visualization of Co-Authorship Between Authors



Co-Authorship between Countries: The following explains how different countries collaborate on co-authorship in breast cancer management research. Out of 131 countries, 54 have met the threshold using the VOS viewer network visualization. This resulted in six clusters (red, green, blue, yellow, purple, and turquoise); the wider the circle, the greater the collaboration of publications. The link drawn between two distinct countries indicates that the institutions in those countries collaborated on the work. The top three countries in terms of publication, citation, and total link strength were the United States (651:10283:391), Italy (141:3607:314), and the United Kingdom (185:4241:308).

Figure 6: Network Visualization of Co-Authorship between Countries



Discussion

This bibliometric analysis study provides global research participation by numerous authors from several countries, all of whom are engaged in the creation of breast cancer management-related studies. This database was compiled from the Scopus database between 1932 and June 2021 to illustrate the development of trends in this field. For over ninety years, the research trend in breast cancer care has evolved and become an annual publishing priority. It began with a small number of publications in its early years, before 1971. Consequently, the total number of published papers increased from double digits to triple digits as additional authors contributed articles. This is consistent with the present trend of breast cancer, which, due to its high incidence and societal implications, has led to an increase in research focused on breast cancer to suggest more effective treatment techniques that have no impact on the clinical outcome of patients (Ahmad et al., 2021; Teles et al., 2022). Now, research in breast cancer management is exploding, with over 200 publications and 3500 citations per year. While the world is now experiencing an increase in the number of occurrences of breast cancer (Özen Çınar, 2020), the authors were also interested in publishing on this topic. The United States, the United Kingdom, and Italy have dominated the field of breast cancer management in terms of total publications, total citations, h-index, and g-index contributions. This is because the incidence rates in highly developed countries were significantly higher than in emerging countries such as Iran, China, and Mexico. It is emphasized that epidemiological and demographic shifts have led to an increase in breast cancer incidence rates. Reduced fertility, increased use of hormonal menopause therapy, decreased nursing, and obesity were identified as risk factors for this cancer (Lei et al., 2021).

Due to the aforementioned factors, these three countries also rank highly for breast reconstruction after mastectomy publishing (Zhang et al., 2023). 'Breast cancer' and 'chemotherapy' are two of the most commonly utilized author keywords in breast cancer research management studies. These words were highlighted the most in the author's publication pertaining to this study due to the numerous benefits that the keywords provided, such as the ability to detect both past and present research trends and the fact that bibliometric keyword analysis can help answer further questions. The most prevalent study subject in this publication is among the linked questions. Are particular keywords associated with the probability of an article getting cited? And whether keyword usage can increase or decrease with time (Pesta et al., 2018). Mapping the co-authorship between authors has highlighted the strategic position of authors in the same field of breast cancer, despite the fact that they generated publications with divergent interests, as demonstrated by mapping the co-authorship between authors. Based on the color cluster in Figure 5, it was determined that two famous authors, Hortobagyi G.N. and Singletary S.E., worked in this field despite having differing research interests in breast cancer trends. Using Harzing's Publish or Perish tool, "Integrating comparative effectiveness design elements and endpoints for a phase III, randomized clinical trial (SWOG S1007) evaluating Oncotype DX-guided management for women with breast cancer involving lymph nodes" (2013) was identified as one of Hortobagyi G.N.'s most significant works.

In the meantime, author Singletary S.E. has a variety of research interests in breast cancer, including the number-one ranked article "Breast cancer management: the route to today" (2008). They have collaborated on at least three articles, including "Locoregional Treatment Outcomes After Multimodality Management of Inflammatory Breast Cancer," "Management of breast cancer during pregnancy utilizing a standardized protocol," and "Surgical and medical management of local-regional treatment failures in advanced primary breast cancer." Collaboration research can facilitate the interchange of ideas within the same discipline, the acquisition of new skills, access to research funding, and the publication of high-quality research with significant benefits (Bansal et al., 2019). Figure 6 displays the United States as the leader in breast cancer management research and international collaborations with countries such as the United Kingdom, Italy, France, and Germany. In response to the expansion of higher education and the advancement of knowledge, as well as the professionalization and specialization of science, the number and significance of international research collaborations have grown. In addition, there are rising investments, improved access to resources, an association with the scientific elite, reciprocal intellectual or social influences, and a rise in scientific productivity (Dusdal & Powell, 2021).

Research Implication: The bibliometric analysis method is gaining popularity in the healthcare profession, particularly in cancer research hubs (Ahmad et al., 2021; Franco et al., 2023; Glynn et al., 2010; Kotepui et al., 2014; Wu et al., 2021). This is a result of the method's capacity to extract meaningful data from databases to determine the trend or performance of a specific research field. Using this strategy, the researchers have emphasized pertinent information to observe the trend in the management of breast cancer research from various perspectives of metadata. As a result, this study was able to contribute to the evolution of breast cancer management by establishing an annual increase in the publication of research on breast cancer treatment trends. The number of total publications cited publications, total citations, average citations per publication, average citations per cited publication, h-index, and g-index increased. In addition, a list of countries that actively participated in this study sector was displayed. Countries such as Germany, Australia, India, Spain, Canada, Belgium, and France are among those represented.

This strategy can also assist researchers in determining which keywords are ideal for this particular breast cancer research study. For instance, in this study, breast cancer and chemotherapy were the most often used terms in research articles. Next, we will discuss co-authorship searches. With the VOSViewer software application, the bibliometric approach can identify this data, which is vital for expanding the number of publications. It can inform the researcher about the collaboration between authors and countries, and based on this information, future researchers can forecast how to improve the publication with the authors mentioned and well-known countries for this topic. The study's key strength is that it analyzed the global research trend in breast cancer management for nearly 90 years, from 1932 to June 2021. Scopus, a well-known scientific database, was used to extract all the data, which is unquestionably a credible source for academic publication. This investigation yielded 3,532 publications, which contribute to this analysis of the breast cancer management research trend. This study, however, has a limitation. This analysis only used data from one source, and it has been confirmed that using additional databases will yield a different conclusion.

5. Conclusion

Breast cancer has been recognized in women since ancient times, even before the 19th century, when Hippocrates referred to it as a systemic disease (Ben-Dror et al., 2022). Albert Soiland wrote the first article on breast cancer with the title "The Management of Breast Cancer" on March 5, 1932. It was named "The Management of Breast Cancer," and it was a success. Subsequently, the evolution of the study has increased annually and involved numerous authors and countries, mainly the United States. The United States, the United Kingdom, and Italy contributed the most to breast cancer management research. Additionally, these countries dominated co-authorship between countries. Breast cancer and chemotherapy were two of the most frequently used keywords by authors. Hortobagyi, G.N., and Singletary, S.E., are the co-authors who have collaborated with most other authors on this subject, establishing them as the most well-known. Future researchers will be able to use the results of this study as a starting point for further research on important breast cancer management topics and publication of the resulting article, with a high likelihood of collaboration with other authors from leading countries specializing in this field.

References

Ahmad, S., Ur Rehman, S., Iqbal, A., Farooq, R. K., Shahid, A. & Ullah, M. I. (2021). Breast Cancer Research in Pakistan: A Bibliometric Analysis. *SAGE Open*, 11(3). https://doi.org/10.1177/21582440211046934

Ahmi, A. (2021). Bibliometric Analysis for Beginners (1st ed.). Universiti Utara Malaysia.

American Cancer Society. (2021). Where Breast Cancer Starts. American Cancer Society. https://www.cancer.org/cancer/breast-cancer/about/what-is-breast-cancer.html

Bansal, S., Mahendiratta, S., Kumar, S., Sarma, P., Prakash, A. & Medhi, B. (2019). Collaborative research in the modern era: Need and challenges Seema. *Indian Journal of Pharmacology*, 51(3), 137–139. https://doi.org/10.4103/ijp.IJP

Ben-Dror, J., Shalamov, M. & Sonnenblick, A. (2022). The History of Early Breast Cancer Treatment. *Genes*, 13(6). https://doi.org/10.3390/genes13060960

Brunier, A. & Muchnik, A. (2021). New global breast cancer initiative highlights renewed commitment to improve survival. World Health Organization. https://www.who.int/news/item/08-03-2021-new-global-breast-cancer-initiative-highlights-renewed-commitment-to-improve-survival

Chang, C. C., Ho, T. C., Lien, C. Y., Shen, D. H. Y., Chuang, K. P., Chan, H. P., Yang, M. H. & Tyan, Y. C. (2022). The Effects of Prior Mammography Screening on the Performance of Breast Cancer Detection in Taiwan. *Healthcare (Switzerland)*, 10(6), 1–9. https://doi.org/10.3390/healthcare10061037

Dusdal, J. & Powell, J. J. W. (2021). Benefits, Motivations, and Challenges of International Collaborative Research: A Sociology of Science Case Study. *Science and Public Policy*, 48(2), 235–245. https://doi.org/10.1093/scipol/scab010

Effendi, D. N., Irwandani, Anggraini, W., Jatmiko, A., Rahmayanti, H., Ichsan, I. Z. & Rahman, M. M. (2021). Bibliometric analysis of scientific literacy using VOS viewer: Analysis of science education. *Journal of Physics: Conference Series*, 1796(1). https://doi.org/10.1088/1742-6596/1796/1/012096

Ellegaard, O. & Wallin, J. A. (2015). The bibliometric analysis of scholarly production: How great is the impact? *Scientometrics*, 105(3), 1809–1831. https://doi.org/10.1007/s11192-015-1645-z

Franco, P., De Felice, F., Jagsi, R., Nader Marta, G., Kaidar-Person, O., Gabrys, D., Kim, K., Ramiah, D., Meattini, I. & Poortmans, P. (2023). Breast cancer radiation therapy: A bibliometric analysis of the scientific literature. *Clinical and Translational Radiation Oncology*, 39(December 2022), 100556. https://doi.org/10.1016/j.ctro.2022.11.015

Global Cancer Observatory. (2021a). Cancer Today. World Health Organization. https://gco.iarc.fr/today/online-analysis-map?v=2020&mode=population&mode_population=continents&population=900&populations=900&key=asr&sex=2&cancer=20&type=0&statistic=5&prevalence=0&population_group=0&ages_group%5B%5D=0&ages_group%5B%5D=17&nb_items=10&gr

Global Cancer Observatory. (2021b). Cancer Tomorrow. World Health Organization. https://gco.iarc.fr/tomorrow/en/dataviz/bars?mode=cancer&group_populations=1&multiple_cancers=1&sexes=2&types=0&cancers=20

Glynn, R. W., Scutaru, C., Kerin, M. J. & Sweeney, K. J. (2010). Breast cancer research output, 1945-2008: A bibliometric and density-equalizing analysis. *Breast Cancer Research*, 12(6). https://doi.org/10.1186/bcr2795

Ismail, S., Nason, E., Marjanovic, S. & Grant, J. (2009). Bibliometrics as a tool for supporting prospective R&D decision-making in the health sciences: Strengths, Weaknesses and Options for Future Development. In The RAND Corporation. https://www.rand.org/content/dam/rand/pubs/technical_reports/2009/RAND_TR685.pdf

Kashyap, D., Pal, D., Sharma, R., Garg, V. K., Goel, N., Koundal, D., Zaguia, A., Koundal, S. & Belay, A. (2022). Global Increase in Breast Cancer Incidence: Risk Factors and Preventive Measures. BioMed Research International, 2022. https://doi.org/10.1155/2022/9605439

Koboto, D. D., Deribe, B., Gebretsadik, A., Ababi, G., Bogale, N., Geleta, D., Gemechu, L. & Mengistu, K. (2020). Quality of life among breast cancer patients attending Hawassa University comprehensive specialized hospital cancer treatment center. *Breast Cancer: Targets and Therapy*, 12, 87–95. https://doi.org/10.2147/BCTT.S252030

Kotepui, M., Wannaiampikul, S., Chupeerach, C. & Duangmano, S. (2014). A bibliometric analysis of diets and breast cancer research. *Asian Pacific Journal of Cancer Prevention*, 15(18), 7625–7628. https://doi.org/10.7314/APJCP.2014.15.18.7625

Lei, S., Zheng, R., Zhang, S., Wang, S., Chen, R., Sun, K., Zeng, H., Zhou, J. & Wei, W. (2021). Global patterns of breast cancer incidence and mortality: A population-based cancer registry data analysis from 2000 to 2020. *Cancer Communications*, 41(11), 1183–1194. https://doi.org/10.1002/cac2.12207

Nascimento, S., Rahal, R. M. S., Soares, L. R., de Souza Pimentel, H. J., Kamimura, T. O. & Freitas-Junior, R. (2021). Publication rate of scientific papers presented at the largest event on breast cancer research in Latin America. *Ecancermedicalscience*, 15, 1–12. https://doi.org/10.3332/ECANCER.2021.1259

Özen Çınar, İ. (2020). Bibliometric analysis of breast cancer research in the period 2009–2018. *International Journal of Nursing Practice*, 26(3), 1–12. https://doi.org/10.1111/ijn.12845

Pesta, B., Fuerst, J. & Kirkegaard, E. O. W. (2018). Bibliometric keyword analysis across seventeen years (2000–2016) of intelligence articles. *Journal of Intelligence*, 6(4), 1–12. https://doi.org/10.3390/jintelligence6040046

Ram, S. (2017). Indian contribution to breast cancer research: A bibliometric analysis. *Annals of Library and Information Studies*, 64(2), 99–105.

Sajahan, M. S. & Omar, A. (2018). Common issues and challenges of breast cancer awareness in Malaysia: A contemporary Scenario. *Pertanika Journal of Social Sciences and Humanities*, 26(1), 21–40.

Teles, R. H. G., Hiroki, C. T. & Freitas, V. M. (2022). Bibliometric analysis of an important diagnostic technique for the treatment of breast cancer. *Translational Cancer Research*, 11(10), 3440–3442. https://doi.org/10.21037/tcr-22-2120

Union for International Cancer Control. (2020). GLOBOCAN 2020: New Global Cancer Data. https://www.uicc.org/news/globocan-2020-new-global-cancer-data#

Wu, C. C., Wang, Y. Z., Hu, H. Y. & Wang, X. Q. (2021). Bibliometric Analysis of Research on the Comorbidity of Cancer and Pain. Journal of Pain Research, 2021, 213–228. https://doi.org/10.1155/2021/6655211

Xiong, H. Y., Zhang, Z. J. & Wang, X. Q. (2021). Bibliometric Analysis of Research on the Comorbidity of Pain and Inflammation. Pain Research and Management, 2021. https://doi.org/10.1155/2021/6655211

Zakaria, R., Ahmi, A., Ahmad, A. H. & Othman, Z. (2021). Worldwide melatonin research: a bibliometric analysis of the published literature between 2015 and 2019. *Chronobiology International*, 38(1), 27–37. https://doi.org/10.1080/07420528.2020.1838534

Zhang, H., Gao, Y., Ying, J. & Yu, H. (2023). Bibliometric analysis of global research on breast reconstruction after mastectomy for breast cancer from 2011 to 2021. October 2022, 1–12. https://doi.org/10.1111/jocd.15683

Zupic, I. & Čater, T. (2015). Bibliometric Methods in Management and Organization. *Organizational Research Methods*, 18(3), 429–472. https://doi.org/10.1177/1094428114562629