J Data Sci. Info. Citation Studies., 2023; 2(3):223-232.
https://www.jcitation.org

Research Article

Tendencies in Tomosynthesis Research Output 2000-2020: Bibliometric Analysis

Kutty Kumar[1,*], **Raja Suresh Kumar Pitla**[2]

[1]Library and Information Science, University Library, Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh, INDIA.
[2]CMR Institute of Technology, Kandlakoya, Medchal Road, Hyderabad, Telangana, INDIA.

ABSTRACT

Mammography has reached near-universal adoption because of the established capabilities in detecting and diagnosing breast cancer. In addition to first being used in radiology, digital imaging has significantly impacted tomographic imaging. Future applications of this breast tomosynthesis technique may result in its usage instead of mammography for breast cancer screening. An in-depth discussion of the long-term development of breast tomosynthesis is presented in two papers. This imaging modality emphasizes medical physics elements that Research tends to focus on. This first paper will discuss the previously conducted Research in system design, geometry, and technique optimization when acquiring images, including scattering from X-rays and radiation dose. A companion paper on breast tomosynthesis imaging techniques will present an overview of the reconstruction process.

Keywords: Tomosynthesis, Publications, Bibliometric, VOSViewer, Sankey.

Correspondence:
Dr. Kutty Kumar
Assistant Professor, Library and Information Science,University Library, Sri Venkateswara Veternary University, Tirupati, Andhra Pradesh, INDIA.
Email: kumarkkutty@gmail.com

Received: 11-09-2023;
Revised: 02-10-2023;
Accepted: 04-12-2023.

INTRODUCTION

A new digital X-ray technique known as Tomosynthesis or "3D" mammography uses 3D-like imagery to produce 2D and 3D-style images of the breasts. This device helps mammography find early breast cancers, thus reducing the number of women "referred back" for further testing when a diagnosis was made but is not cancer. This exam's X-ray arm swoops around your breast in a slight arc, taking a series of low-dose X-ray pictures. Next, a computer turns your digital breast tissue into synthetic 2D and "3D" images. In addition to thin one-millimetre slices, these images include larger scans, making it possible to browse through pictures of the entire breast as if they were books. This allows the radiologist to zoom in for a more detailed examination. It helps a radiologist see-through breast tissue using"3D" images. Conventional digital mammography is similar to having overlapping flat images displayed in front of the radiologist. Sometimes cancers can be challenging to find because of the tissue overlap. Even overlapping areas may sometimes appear abnormal, but this happens because cancer may have been missed in the first place (so-called false positives).

DOI: 10.5530/jcitation.2.3.30

Several recent studies have revealed that the overall breast cancer detection rate rises by about 25% with the addition of "3D" mammography. This new technology reduces the number of false positives by about 15%. Screening mammograms are used on women with no breast symptoms or lumps. A diagnostic mammogram is done in women who have already undergone a screening mammogram or have a clinical breast symptom such as a lump. A "3D" mammogram is analogous to a conventional digital mammogram (both apply to the degree of compression of the breasts and the amount of time the breasts are compressed). Besides the X-ray arm moving in a curved arc over your breasts, the main difference is that it helps to reduce radiation exposure and promotes laminar tissue separation. It Decreases overlapping tissue (Qian, X., Rajaram, and others 2009). It helps improve the image's resolution or clarity, making details stand out, and making things stand out makes things easier to see. This can be used for screening and diagnostic mammograms for women undergoing these procedures. As a result, the synthetic 2D and "3D" radiation dose is the same as that for digital 2D mammograms in the USA. In a digital mammography system, the X-ray film is replaced by a solid-state device that changes X-rays into electrical signalling. Digital cameras use the same detection systems as these. (Boone and others 2001). A specialized piece of film called electronic mammography film, which produces images similar to conventional mammograms, is commonly used. Digital mammograms are seen as having the same function as traditional film-screen mammograms by patients.

REVIEW OF LITERATURE

Tomosynthesis-based breast imaging may have extraordinary potential, as suggested by research conducted by Good and others (2008), who sought to evaluate ergonomic and symptomatic performance-related outcomes related to the explanation of digital breast tomosynthesis-generated investigations with repurposed (FFDM) full-field digital mammography. Although progress has been made, much more must be done before its full potential in a clinical setting can be realised. The s-DBT system's 25-beam MBFEX root array, which was designed and built with careful consideration, was assessed for performance by Qian *et al*. (2009). To capture the source array's emergence of pleasing current, current dissimilarity, period, and pivotal section sizes, the s-DBT technique digitally triggers the multiple X-ray beams from contrasting observing angles without any mechanical movement. The 0.5X0.3 mm active focal point size was found to have an emanation current of up to 18 mA. The results proved the practicability of the proposed s-DBT scanner. Due to advancements in technology, DBT can now be imaged faster and with greater precision than ever before. It was experimentally confirmed that a scanning time of 11 seconds at full device resolution with 0.5X0.3 mm source resoluteness and no motion blur is not feasible with the current design of 25 views.

The study team, which was composed of (Bernardi and others 2012), investigated this issue. The Research examines the advantages and disadvantages of breast tomosynthesis for triage. Several doctors advise breast augmentation surgery or breast implants to treat breast cancer. While this is still a matter of ongoing debate, at this point, 3D mammography appears to be slightly more specific in tandem with Tomosynthesis. Our results show that adding 3D mammography to the standard 2D mammograms as a triage improves screening results overall. To determine whether a recall/assessment was needed, radiologists used a new 3D imaging technique, 3D mammography-based breast imaging. After the test, the subjects assessed each other. 21 out of 21 patients with breast cancer who used 3D triage were found to require assessment, and a return to determine them would have spared 74.4% of patients with negative/benign final results. The quality of 3D triage (which gauges the decrease in potential recalls) was affected by density. Still, a type of lesion was strongly linked to this metric (being highest for distortions, asymmetric densities, and lesions with ill-defined margins). This study has shown that using 3D mammography triage can improve breast screening specificity and the number of false alarms. Future studies will analyze 3D mammography's ability to reduce the number of recalls and to help reduce costs. Studies of Comprehensive bibliometric analysis of breast cancer were published in the health profession from 2009 to 2018 to reveal the field's tendencies, developments, and creative outputs (Poplack S. 2017). Shri Ram (2017) stated that 30.35% of Indian Publications on Cancer research are uninterruptedly growing and found that a hospital, Tata Memorial Hospital, participates veriny vigorous research programs in Breast cancer Research as compared to universities or research institutes.

The focus of the Research was to use mechanical methods to analyze bibliometric literature in the field of breast cancer diagnosis (Mandoul, C., and others 2019). Various characteristics such as publication categories, highly significant authors, most renowned journals, organizational affiliations, significant keywords, and so on were analyzed. This study could help emerging researchers by providing a quantitative assessment of research papers in detecting breast cancer employing machine learning. The Saguenay-Lac-Saint-Jean and Nord-du-Québec regions of Quebec are among the researchers for this study. In a population-based screening program, the number of time people spent reading the findings from FFDM and Tomosynthesis (Ren, B., and others 2010, March). The 2011 RSN ANE annual meeting will be held in Chicago. Every female participant signed a consent indicating that she had understood and agreed to the study procedures. Also offered with the standard dual-screen of DBT/FFDM, women attending the screening preprogram at 50 to 69 years of age were given a DBT/FFDM dual screen.

In the FFDM arm, independent double reading occurred for one reader; the other had CAD access. Four readers evaluated each exam in this way. A cancer risk scale that gave a possible score of five was used in the interpretation. Each test was assigned an interpretation time when the case report form was presented. The total time required for each test was recorded once the mouse was clicked to indicate the end of the exercise (Gennaro, G., and Houssami, N. 2018). All positive responses were discussed in a consensus meeting before any recalls were conducted. A review of breast cancer prediction methods using Machine Learning and a body fluid analysis dataset (Breast Cancer Coimbra Dataset [BCCD]), as well as a detailed summary of studies founded on the prediction of breast cancer using ML and patients' delicate needle consonant cytology data, were studied. Also, a detailed overview of studies based on the projection of breast cancer using ML and patients' light needle consonant cytology data (Wisconsin Breast Cancer Dataset [WBCD]) (Friedewald S. M. 2017).

Diekmann F., Bick U (2007). Full-field digital mammography has to transform more a more such popular as both screening and diagnostic. As the raiment of detection technologies currently exists, we can comprehend that their comparative advantages and disadvantages are varied (Yaffe, M. J., and Mainprize, J. G. 2014). It is the consensus of scientific opinion that digital mammography has equal or better diagnostic accuracy when compared to traditional film-screen mammography for all population groups. Because digital mammography can focus on the dense parenchyma of the breast without wasting contrast elsewhere, it is preferable to digital mammography for women with dense breasts. A genetic predisposition to breast cancer also benefits women in their mid-to-late 30s because earlier screening programs must begin. Breast cancer detection may be aided by image processing and computer-aided diagnosis, which is an improvement. Because there is no agreement there is no agreement among radiologists about which digital mammogram methods work best. Currently, there is no broad level of interoperability between image processing tools. The assessment aims to collect and summarise all relevant information on how digital mammography affects workflow and breast cancer diagnosis (Bernardi, D., and others 2012).

Felix Diekmann, the study's cognitive content was to observe whether contrast-enhanced digital mammography (CEDM) could facilitate the diagnostic accuracy of formulaic mammography. I used the 70 patients' medical records, all of whom had 80 skin wounds, to examine this issue (30 malignant and 50 benign). The system was adapted so that an iodine contrast medium could be used to make a periodical of contrast-enhanced appearance from each patient. 1 mL of the solution of contrast was given to each body weight of kg, which was preceded by the injection of the balance of the solution. Every 1 minute, three contrasting images were recorded using the craniocaudal projection plane. The contrast-enhanced image was deducted from the logarithmic-processed image to make over a picture of masks on plain white paper. To demeanour, a ROC analysis utilized.

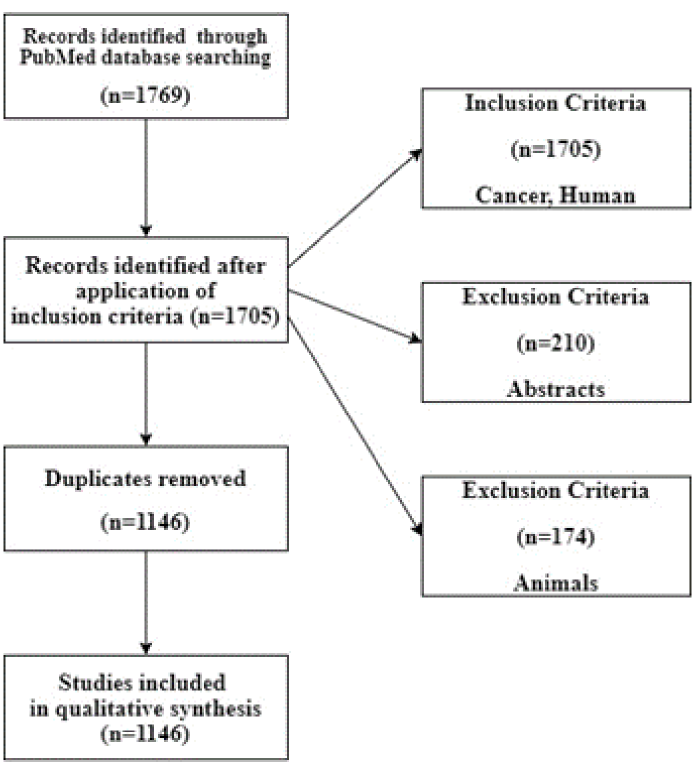

Figure 1: Flow chart according to the PRISMA protocol.

METHODOLOGY

The keywords used were: Tomosynthesis (OR "Thomo synthesis" OR "3D Mammography" OR "2D Mammography" OR "Digital Mammography" OR "Cancer" OR "Breast Cancer" OR "Detection of Breast Cancer"). The elite keywords echoic the aim of this review which was to compare the variation in conception across various mediums of documentary content and written books, were all searched for in the PubMed database on June 27, 2021, using the keyword search tool known as PubMed. We restricted the search to studies from peer-reviewed journals and dissertation studies starting from 2001 to 2020. The dataset was enriched by including other characteristics, such as document type, language, and duplication (Data Retrieved from PubMed Database). We constrained ourselves to dissertation studies and excepted conference presentations due to apprehensions over quality. The dataset contained information about authors, document type, publication, institution, nation, and citations. R (Aria, M., and Cuccurullo, C. (2017) and VOSviewer (Van Eck, and Waltman (2010) software were used to export the data and complete the citation analysis. I've utilized the above data to draw a visualization mapping that displays co-authorship, co-occurrence author keywords, and co-organization sources. The author's keywords mapping, co-occurrence keywords, and collaboration items were created. This depicts the publications that were used in the compilation. Several phases of this study have been studied and analyzed.

Additionally, the database was haunted. This situation calls for a database such as PubMed, which contains pertinent literature and JCR data from which Citation Reports (a set of citation ranking metrics) are sourced. Searching the scientific literature yielded a significant number of results; we trailed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) procedures and measures for accompanying this review (Moher *et al.*, 2009). with about 2,200 documents containing the search terms. During the search, 1705 documents of various kinds were generated. Of the initial 1437 patients, 1146 remained after following the PRISMA (Figure 1) protocol. The present study was finally completed with the assistance of these documents. Additionally, all existing medical publication data in PubMed, except for 2001-2020, was considered for inclusion criteria. Notably, we've added literature appearing in PubMed as an additional criterion.

DATA ANALYSIS AND DISCUSSION

The annual Growth rate is 16.97% R^2 = 0.91, 5.63% average publications per year

Figure 2 shows the growth of PubMed publications on tomosynthesis research over the 2001 to 2020 study period. The rate of publications is rising—80% of publications by the end of the second decade (2010 to 2020). (2011 to 2020). Most

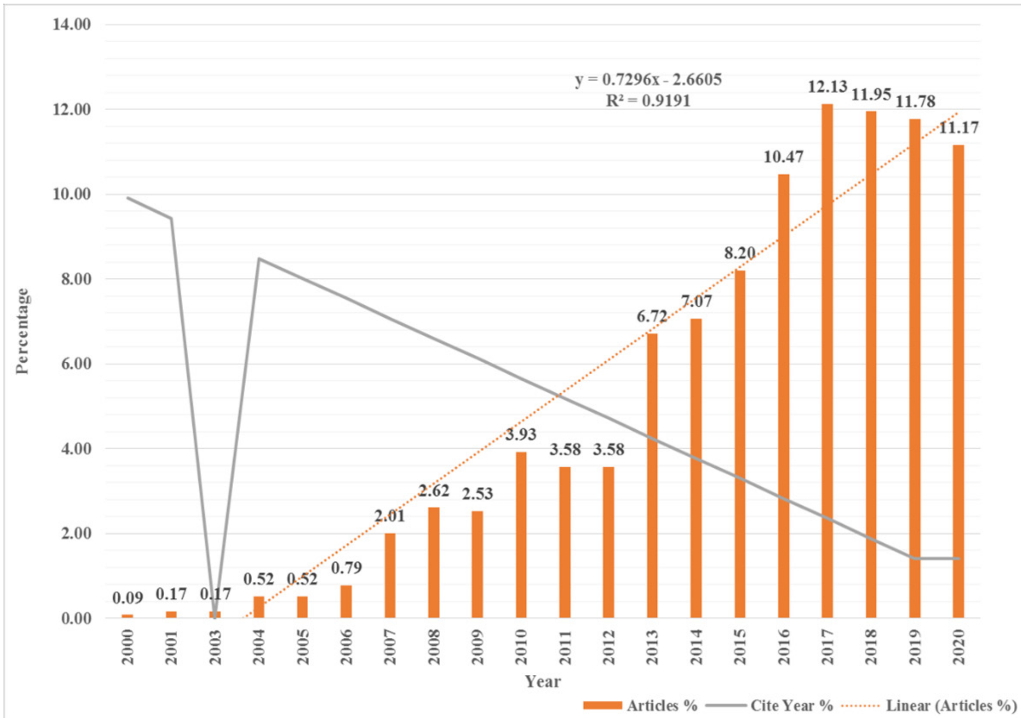

Figure 2: Growth of Tomosynthesis Research

articles published in 2017 (Ahmad, Shakil, and others 2021) had to be within the range of 12.13% of the maximum. The number of publications published from 2013 to 2020. (Ahmad and Others 2021) stated that Cancer research was increased bustle observed during six years (2015– 2020), showing that health-related Research on Tomosynthesis began in earnest after 2007. New and noteworthy advancements have been made over the decade spanning 2010 to 2020 concerning Tomosynthesis. The log-log plot of author contribution and percentage provided a straight line fit to Lotka's law. Although the average increase of publications was only 5.63% in the study period, the growth rate was much higher in the second decade, and the annual growth rate was 16.97% in the first decade; the growth rate was 12.02%. As illustrated in the chart above, there was no citation in 2003, but a notable increase in sources occurred in 2001, and from there on, citation levels steadily decreased to the year 2019. From 2020 on, however, there was a notable increase in citations. A potential conclusion is that the authorities were raised in 2020. While the number of publications was fixed over a moment in linear regression analysis, an enhanced fit was pragmatic for an exponential curve (coefficient of determination for exponential fit, R^2= 0.91).

Table 1 reveals the presentation of the top ten dynamic authors based on their publications, citations, and h-index. Among the numerous publications in the publication count (McKinley and others 2005), Houssamin N had 52 (4.54%) titles with a 72H Index, a high position in the rankings. and Bth M had 19 (1.66%) with 178H Index position.

Figure 3 presents the top researcher and its cluster in the Co-Authorship of Tomosynthesis Research. There were ten leading groups of authorships: Houssami and Nehmat., Chan and Heang-ping., Conant and Emily F., Lehman and Constance D., Gur and David., Moy and Linda., young and Kenneth C., Weinstein and Susan P., and Rafferty Elizabeth A. Houssami and Nehmat, authors, have become leaders among all clusters. On the other hand, Chen and Heang-ping were the most influenced co-authors on Tomosynthesis from 2001-2020, shown by an enormous circle.

Using the Three Fields Plot, a Sankey diagram showed how relationships between authors, keywords, and countries were depicted (Waghmare 2021). When colours were used in the chart, different shapes represented the elements. The greater the sum of the relations the rectangle describes, the higher the rectangle's sum height (one of the elements in the authors, countries, and title). Having more relations helped the rectangle that represented it to be taller. This image demonstrates that the United States has a strong connection with the keywords "Breast", "Italy", and "Korea." To find breast-related terms that begin with "all countries" as well as "digital," "tomosynthesis," "mammography," and "cancer," we looked at every document in our system that uses the keyword breast.

A list of the top ten publications of PubMed related to Tomosynthesis is included in Table 1. It was evident from Table 2 and Figure 4 the number of documents from 2001 to 2020 that the USA was the leading Country (Naveed, 2021) (Patra, 2005). The US has made the maximum involvement in Research

Table 1: Top Ten Authors' Productivities.

Sl. No.	Author	Articles	%	H-Index
1	Houssami N	52	4.54	72
2	Conant EF	36	3.14	47
3	Chan HP	29	2.53	76
4	Sechopoulos I	23	2.01	29
5	Lo JY	22	1.92	47
6	Bernardi D	20	1.75	13
7	Zackrisson A	20	1.75	16
8	Bth M	19	1.66	178
9	Helvie MA	19	1.66	62
10	Kopans DB	19	1.66	60

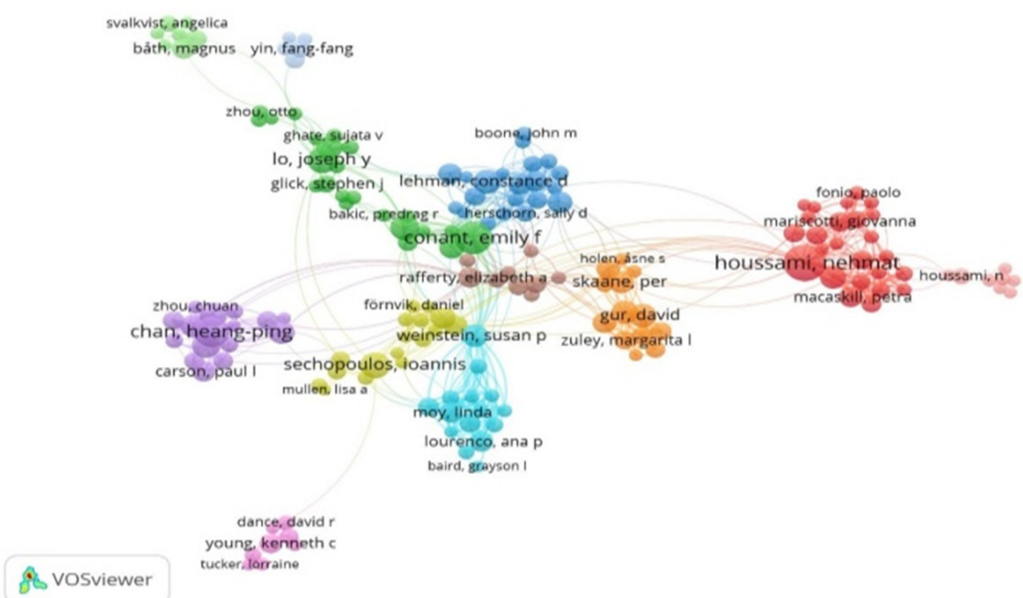

Figure 3: Co-Authorship of Tomosynthesis Research.

regarding the comorbidity of cancer and pain (Wu, Cheng-Cheng 2021) as it had 781(68.15%) of the documents. He contributed to Italy. For example, 502 papers (43.80% of the total), 302 (26.35% of the total), 212 (18.50% of the total), and 178 (15.53% of the total) each contributed to South Korea, China, and Australia, and also added documents to this topic, each contributing 176 (15.36% of the total) Sweden, 163 (14.22% of the total) Germany contributed, 158 (13.79% of the total) Germany contributions, while 158 (13.79% of the total) Japan, with 127 (11.08% of the total) Netherlands contributions and France contributed the other 98 contributions, making up 8.55% of the total contributions on the Research of Tomosynthesis.

We used VOSviewer for our analysis, and Figure 5 is meant to be reference images. Selected keywords in the title and abstracts of scientific publications related to Tomosynthesis included "digital breast tomosynthesis", mammography, and Tomosynthesis.

Table 3 illustrates the top 10 sources of Research on Tomosynthesis. Medical Physics was the most important source that contained articles about Tomosynthesis. Meanwhile, Radiology, American Journal of Roentgenology AJR, European radiology, Physics in Medicine and Biology, and Academic Radiology were the leading journals covering these topics in their content. The remaining journals were The British Journal of Radiology, the European Journal of Radiology, the Journal of the American College of radiology JACR, and Radiation Protection Dosimetry. Advances in digital mammography derivatives have recently been covered in a news article. A digital breast tomosynthesis experiment is underway (Zhou, J., Zhao, B., and Zhao, W. 2007). In addition, digital mammography, contrast-enhanced digital mammography, and combination imaging systems are all named as different options for mammography (Dobbins III, J. T. 2009). As early results from the clinical trials are confirmed, this promises to make significant advances in cancer detection and characterization.

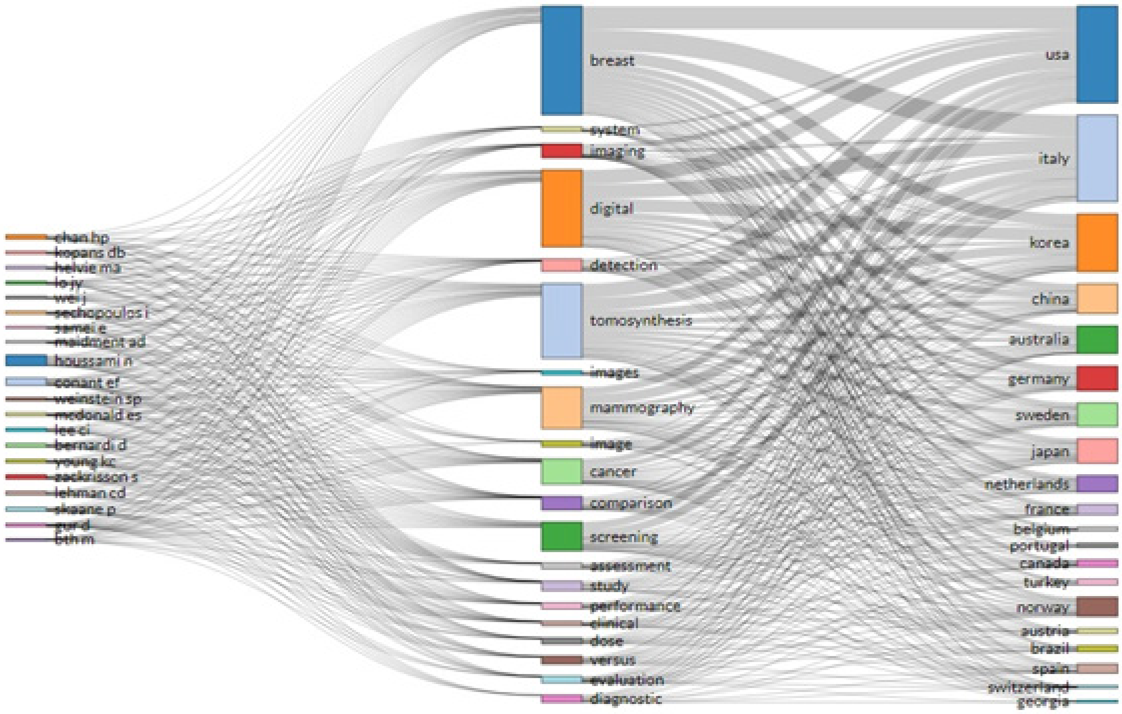

Figure 4: Sankey Diagram of Author, title with the country of publication.

Table 2: Top Ten Publication Countries.

Sl. No.	Country	Articles	%
1	USA	781	68.15
2	Italy	502	43.80
3	South Korea	302	26.35
4	China	212	18.50
5	Australia	178	15.53
6	Sweden	176	15.36
7	Germany	163	14.22
8	Japan	158	13.79
9	Netherlands	127	11.08
10	France	98	8.55

Table 3: Most Sources of Tomosynthesis Research.

Sl. No.	Sources	Articles	%	Impact Factor
1	Medical Physics	138	12.04	3.317 (2018)
2	Radiology	85	7.42	7.931 (2019)
3	American Journal of Roentgenology AJR	64	5.58	3.013 (2019)
4	European Radiology	63	5.50	4.101 (2019)
5	Physics in Medicine and Biology	63	5.50	3.030 (2018)
6	Academic Radiology	50	4.36	2.488 (2019)
7	The British Journal of Radiology	36	3.14	2.196 (2019)
8	European Journal of Radiology	32	2.79	1.025 (2020)
9	Journal of the American College of Radiology: JACR	29	2.53	4.268 (2019)
10	Radiation Protection Dosimetry	26	2.27	0.773 (2019)

The top ten affiliations of tomosynthesis research are listed in the Table 4. The University of Pennsylvania was the majority that contains articles about Tomosynthesis. Meanwhile, Lund University, Massachusetts General Hospital, University of Sydney, University of Michigan, Duke University, Harvard Medical School, Duke University of Medical Center, University of California, and Oslo University Hospital are the leading institutes contributing to the tomosynthesis research.

For further illustration, in Figure 6, Involving other companies in your project can help you take your company to new heights. These days, collaboration networks will increase in prominence, and you should start thinking about building your own. Instead of hiring an expert to solve a problem, some companies work directly with their networks. In many cases, it is preferable to have a collection of smaller, more agile companies rather than one large, established organization.

An even distribution of Tomosynthesis-related studies was revealed by the most-cited articles. Multiple sources detail how Tomosynthesis can be used in the diagnosis and treatment of breast cancer. Based on the data presented in Table 5, Marinovich *et al*. (2018) and Gennaro *et al*. (2018) share first place with 120 and 62 citations, respectively, since publication. Third-placed

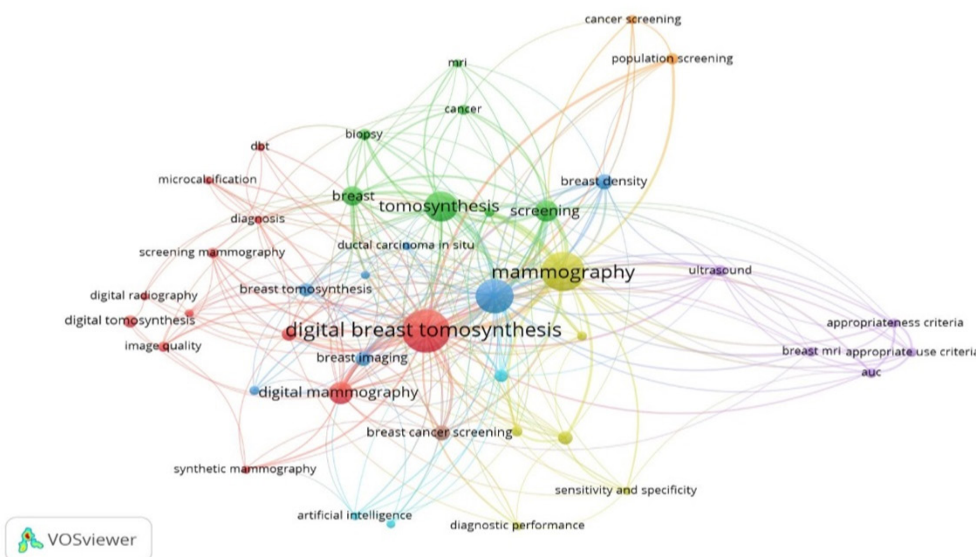

Figure 5: Most Occurrences of Words in Tomosynthesis Research.

Table 4: Most Affiliations of Tomosynthesis Research.

Sl. No.	Affiliations	Articles	%
1	University of Pennsylvania	104	9.08
2	Lund University	88	7.68
3	Massachusetts General Hospital	85	7.42
4	University of Sydney	78	6.81
5	University of Michigan	76	6.63
6	Duke University	65	5.67
7	Harvard Medical School	59	5.15
8	Duke University Medical Center	56	4.89
9	University of California	54	4.71
10	Oslo University Hospital	53	4.62

Table 5: **Top Ten Most Cited Articles for Tomosynthesis Research.**

Rank	Article	No of Cite
1	Marinovich, M. L., Hunter, K. E., Macaskill, P., and Houssami, N. (2018). Breast Cancer Screening Using Tomosynthesis or Mammography: A Meta-analysis of Cancer Detection and Recall. Journal of the National Cancer Institute, 110(9), 942–949. https://doi.org/10.1093/jnci/djy121.	120
2	Gennaro, G., Bernardi, D., and Houssami, N. (2018). Radiation dose with digital breast tomosynthesis compared to digital mammography: per-view analysis. European radiology, 28(2), 573–581. https://doi.org/10.1007/s00330-017-5024-4.	62
3	Chong, A., Weinstein, S. P., McDonald, E. S., and Conant, E. F. (2019). Digital Breast Tomosynthesis: Concepts and Clinical Practice. Radiology, 292(1), 1–14. http://doi.org/10.1148/radiol.2019180760.	49
4	Diekmann F, Bick U. Breast tomosynthesis. Seminars in Ultrasound, CT, and MR. 2011 Aug;32(4):281-287. http://doi.org/10.1053/j.sult.2011.03.002.	43
5	Yaffe, M. J., and Mainprize, J. G. (2014). Digital Tomosynthesis: technique. Radiologic clinics of North America, 52(3), 489–497. https://doi.org/10.1016/j.rcl.2014.01.003.	30
6	Friedewald S. M. (2017). Breast Tomosynthesis: Practical Considerations. Radiologic clinics of North America, 55(3), 493–502. https://doi.org/10.1016/j.rcl.2016.12.004.	18
7	Poplack S. (2017). Breast Tomosynthesis: Clinical Evidence. Radiologic clinics of North America, 55(3), 475–492. https://doi.org/10.1016/j.rcl.2016.12.010.	12
8	Mandoul, C., Verheyden, C., Millet, I., Orliac, C., Pages, E., Thomassin, I., and Taourel, P. (2019). Breast tomosynthesis: What do we know and where do we stand? Diagnostic and Interventional Imaging, 100(10), 537–551. http://doi.org/10.1016/j.diii.2019.07.012.	8
9	Rocha García, A. M., and MeraFernández, D. (2019). Breast tomosynthesis: state of the art. Tomosíntesis de la mama: estado actual. Radiologia, 61(4), 274–285. https://doi.org/10.1016/j.rx.2019.01.002.	8
10	Choudhery, S., and Anderson, T. (2020). Tomosynthesis-guided breast and axillary localizations: tips and tricks. The British Journal of Radiology, 93(1114), 20200495. http://doi.org/10.1259/bjr.20200495.	1

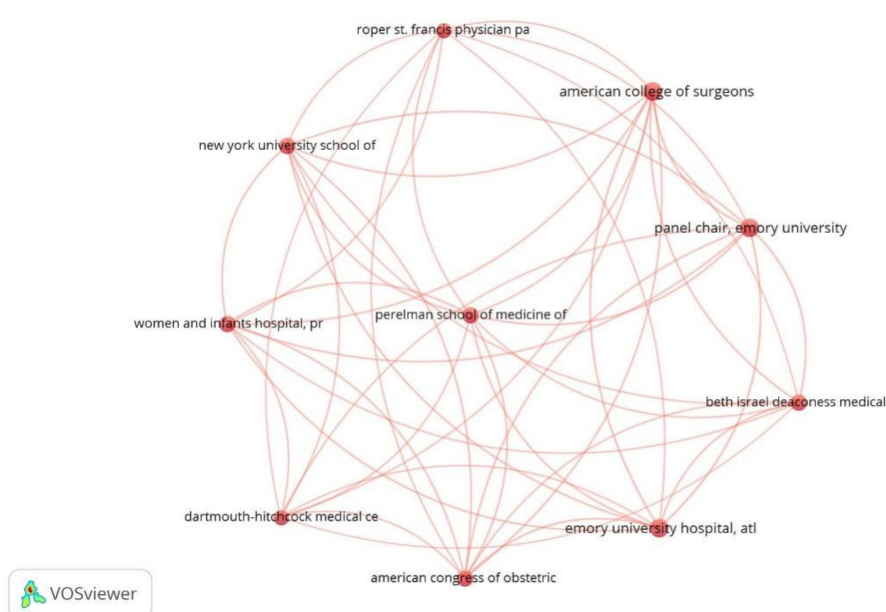

Figure 6: Collaboration Network of Different Organizations.

Chong *et al*. (2019) has a citation rate of 49. The study of citations gains depth through the assessment of the citation rate over time.

The findings from both studies concluded that the degree, closeness, and betweenness centralities of each affiliation were very similar between China and Australia. The centrality of several affiliated institutions in China, including Peking Union Medical College Hospital, Fudan University, PLA General Hospital, and Capital Medical University, followed them. Both of these universities had relatively high counts of papers. Still, due to their lack of cooperation with other organizations, they had zero centrality in the network of Research on breast imaging. Sydney University was central to the Australian educational network, with Melbourne, Western Australia, Queensland, and Monash coming next.

Compared to the Chinese network, the centrality of degree and betweenness in the Australian network was much higher. Due to the lack of connectivity between the vast majority of nodes, the normalized closeness centralities in both networks were very low. Centralities are usually defined as equal to the total number of nodes in the network when modelling a computer Network (N).

CONCLUSION

Low-dose X-ray tomography is a computerized process that generates three-dimensional images of the breasts (DBT). The use of breast tomosynthesis helps the early detection and diagnosis of breast disease. Diagnostic tests, like X-rays (radiographs), use noninvasive methods to aid diagnosis and treatment. X-rays are taken from inside the body after exposure to a small amount of ionizing radiation. Even though it is about one hundred years old, X-rays are still commonly used in medical imaging. Currently available screenings for breast cancer, such as mammography, are ineffective at detecting numerous other diseases. However, it is only available in a minority of imaging facilities. The most common mammogram, or breast X-ray Tomos, is frequently referred to as a mammogram. A mammography unit, known as a breast compression device, is used to apply better and compress the breast. While acquiring breast images with compression helps, this may obscure abnormal tissue, which can cause incorrect interpretation of the normal tissue. A breast tomosynthesis image is produced by using multiple tomosynthesis images to construct it. Digital image processing includes getting the photos, processing them, and converting them into three-dimensional models. New approaches for 3D image sets that improve overlap between tumour and typical tissue yield higher detection probabilities, as demonstrated by Bagrowsky.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ORCID ID

https://orcid.org/0000-0002-3510-5924

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

Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. Journal of Informetrics. Elsevier, 11(4), 959–975. https://doi.org/10.1016/j.joi.2017.08.007

Bernardi, D., Ciatto, S., Pellegrini, M., Tuttobene, P., Fanto', C., Valentini, M., Michele, S. D., Peterlongo, P., & Houssami, N. (2012). Prospective study of breast tomosynthesis as a triage to assessment in screening. Breast Cancer Research and Treatment, 133(1), 267–271. https://doi.org/10.1007/s10549-012-1959-y

Bick, U., & Diekmann, F. (2007). Digital mammography: What do we and what don't we know? European Radiology, 17(8), 1931–1942. https://doi.org/10.1007/s00330-007-0586-1

Boone, J. M., Nelson, T. R., Lindfors, K. K., & Seibert, J. A. (2001). Dedicated breast CT: Radiation dose and image quality evaluation. Radiology, 221(3), 657–667. https://doi.org/10.1148/radiol.2213010334

Chong, A., Weinstein, S. P., McDonald, E. S., & Conant, E. F. (2019). Digital breast tomosynthesis: Concepts and clinical practice. Radiology, 292(1), 1–14. https://doi.org/10.1148/radiol.2019180760

Choudhery, S., & Anderson, T. (2020). Tomosynthesis-guided breast and axillary localizations: Tips and tricks. British Journal of Radiology, 93(1114), 20200495. https://doi.org/10.1259/bjr.20200495. https://pubmed.ncbi.nlm.nih.gov

Diekmann, F., & Bick, U. (2011). Breast tomosynthesis. Seminars in Ultrasound, CT, and MR, 32(4), 281–287. https://doi.org/10.1053/j.sult.2011.03.002

Dobbins III, J. T. (2009). Tomosynthesis imaging: At a translational crossroads. Medical Physics, 36(6), 1956–1967. https://doi.org/10.1118/1.3120285

Friedewald, S. M. (2017). Breast tomosynthesis: Practical considerations. Radiologic Clinics of North America, 55(3), 493–502. https://doi.org/10.1016/j.rcl.2016.12.004

Gennaro, G., Bernardi, D., & Houssami, N. (2018). Radiation dose with digital breast tomosynthesis compared to digital mammography: Per-view analysis. European Radiology, 28(2), 573–581. https://doi.org/10.1007/s00330-017-5024-4

Good, W. F., Abrams, G. S., Catullo, V. J., Chough, D. M., Ganott, M. A., Hakim, C. M., & Gur, D. (2008). Digital breast tomosynthesis: A pilot observer study. AJR. American Journal of Roentgenology, 190(4), 865–869. https://doi.org/10.2214/AJR.07.2841

Mandoul, C., Verheyden, C., Millet, I., Orliac, C., Pages, E., Thomassin, I., & Taourel, P. (2019). Breast tomosynthesis: What do we know and where do we stand? Diagnostic and Interventional Imaging, 100(10), 537–551. https://doi.org/10.1016/j.diii.2019.07.012

Marinovich, M. L., Hunter, K. E., Macaskill, P., & Houssami, N. (2018). Breast cancer screening using tomosynthesis or mammography: A meta-analysis of cancer detection and recall. Journal of the National Cancer Institute, 110(9), 942–949. https://doi.org/10.1093/jnci/djy121

McKinley, R. L., Tornai, M. P., Samei, E., & Bradshaw, M. L. (2005). Initial study of quasi-monochromatic X-ray beam performance for X-ray computed mammotomography. IEEE Transactions on Nuclear Science, 52(5), 1243–1250. https://doi.org/10.1109/TNS.2005.857629

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group. (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA statement. PLOS Medicine, 6(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097

Muhammad, N., Sanila, A., Nusrat, A., & Nadeem, S.. Research Visualization of Journal of Library Administration. (2005–20). A bibliometric study. Library Philosophy and Practice (e-journal), 2021, 5696. https://digitalcommons.unl.edu/libphilprac/5696

Patra, S. K., & Bhattacharya, P. (2005). Bibliometric study of cancer research in India. DESIDOC Bulletin of Information Technology, 25(2), 11–18. https://doi.org/10.14429/dbit.25.2.3650

Poplack, S. (2017). Breast Tomosynthesis: Clinical evidence. Radiologic Clinics of North America, 55(3), 475–492. https://doi.org/10.1016/j.rcl.2016.12.010

Qian, X., Rajaram, R., Calderon-Colon, X., Yang, G., Phan, T., Lalush, D. S., Lu, J., & Zhou, O. (2009). Design and characterization of a spatially distributed multibeam field emission X-ray source for stationary digital breast tomosynthesis. Medical Physics, 36(10), 4389–4399. https://doi.org/10.1118/1.3213520

Ren, B., Ruth, C., Wu, T., Zhang, Y., Smith, A., Niklason, L., Williams, C., Ingal, E., Polischuk, B., & Jing, Z. (2010). A new generation FFDM/tomosynthesis fusion system with selenium detector. SPIE Proceedings, 7622, 76220B. https://doi.org/10.1117/12.844555

Rocha García, A. M., Mera Fernández, D., . . . Mera Fernández, D. (2019). Breast tomosynthesis: State of the art. Tomosíntesis de la mama: estado actual. Radiologia, 61(4), 274–285. https://doi.org/10.1016/j.rx.2019.01.002

Shakil, A., Saghir, M., Nadeem, S., & Khan, A. M. (2021). Global research on andragogy: A bibliometric analysis. Library Philosophy and Practice (e-journal). https://digitalcommons.unl.edu/libphilprac/5575, 5575.

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

Van Eck, N. J., & Waltman, L. VOSViewer: Visualizing scientific landscapes [Software]. (2010). https://www.vosviewer.com

Waghmare, P. (2021). Bibliometric Analysis of Global Research Trends on E-Waste Management from Scopus Database seen through Biblioshiny. Library Philosophy and Practice (e-journal). https://digitalcommons.unl.edu/libphilprac/5592, 5592.

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, 14, 213–228. https://doi.org/10.2147/JPR.S291741

Yaffe, M. J., & Mainprize, J. G. (2014). Digital Tomosynthesis: Technique. Radiologic Clinics of North America, 52(3), 489–497. https://doi.org/10.1016/j.rcl.2014.01.003

Zhou, J., Zhao, B., & Zhao, W. (2007). A computer simulation platform for the optimization of a breast tomosynthesis system. Medical Physics, 34(3), 1098–1109. https://doi.org/10.1118/1.2558160

Cite this article: Kumar K, Pitla RSK. Tendencies in Tomosynthesis Research Output 2000-2020: Bibliometric Analysis. Journal of Data Science, Informetrics, and Citation Studies. 2023;2(3):223-32.