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*RESEARCH ARTICLE*

# ARTIFICIAL INTELLIGENCE USING IN BREAST CANCER DIAGNOSIS: A SYSTEMATIC LITERATURE REVIEW

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## *Abstract*

In the worldwide cancer risk is increasingly common and presenting complex challenge in diagnosis and treatment, particularly caused by complex factorsfrom genetic, environmental, and socio economic factor s are more. For women, this shows the leading cause and diagnosis and treatment in worldwide, but AI has the capability of holding great promise for improving for clinical data interpretation, identifying ambiguous cases, predicting outcomes, and integrating diverse data into clinically meaningful decisions. Study covered 20 Articles for review on diagnosis of breast cancer with using of AI.AI is used in testing for genetics in find out particular high risk problemin breast cancer based o n patient genetic profiles, including individual is ed strategies for scree ning and prevention. For analyzing the study and tissue samples of brea st cancer the AI tool is support to pathologist.Study detection and predi cation is the potential revolutionize in the cancer and improve patient care shows with using of Integration of AI.



## Introduction:-

AI is applied for different diagnosis for clinical test of breast cancer patient in different medical fieldssuch as, diagnosis of pathological field;equipment in radiotherapy, screening of cancer and AI is using prediction and diagnosis cancer and also use drug development treatment has consistently used in research. AI is recently giving very significant result in testing and research.

It will be providing effective and efficient result in breast cancer result. AI will be used in machine learning and deep neural learningnetworks, images of medical and data related to genetic planning in breast cancer patient, integration of artificial equipments in clinicaltesting. AI has used from healthcare providers' of revolutionize approach to cancer care, helps to more definite diagnoses, individualise treatmentmodalities, and enhanced patient result.

## Literature Review:-

Alshehri and AlSaeed (2024) author carried out the systematic research on literature review study used on AI in the breast censer and diagnosis. Study identified the appropriate initial detection, and encountered improvable survival

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rates and actual treatment and effectiveness.Mammography as the standard used for imaging method. Study highlightsinfrared thermal imaging as another technique, because it peaceful, painless, and high cast in nature. But compared to both, the usage mammography, thermal imaging has shows good result, particularly when combined with deep learning networks, itincreases correctness in the earlyidentification. Author explores the deep learning techniques and necessary mechanism, identified their result to improved the identification performance across various imaging modalities.

Ansari, Tripathi, and Ahmed (2025) study explored breast cancer diagnosing with using of Machine learning and Deep Learning models. Find outs the significance prediction and diagnosing of the breast cancer, and the limitedinterpretability and transparency**is** the problem to real world clinical use.Study emphasis the crucial solution of XAI is need to fill the gaps in improving sincere and applied of AI system in healthier settings. Based on the data types the review categories XAI approaches provides a detailed analysis of popular XAI methods such as LIME, SHAP and Grad-CAM. It shows the XAI is widely has been implemented in clinical test, it shows improvement of clinical decision making and patient confidence. The author finally said, interdisciplinary collaboration among the medical staff, AI researchers and policy makers are to be with confidence in ethical and effective integration of AI technologies in breast cancer.

Mansour et al. (2024) this study has evaluating effectiveness of AI in the overall side of single radiologist with double reading of screening mammograms of large scalebreast cancer detection.Study applied 32,822 mammograms and analysed, and compared cancer detection outcomes between two models with traditional double reading by two radiologists between one radiologists assisted by AI. Providing of heat maps and abnormality increase by AI is too support the diagnosis.The detection of one radiologist and two radiologists are shown of 1324 and a293 cancers significant differences.

The AI- assisted model shows strong diagnostic achievements different specificity, productive value, negative value and accuracy.Itshows, AI and radiologist model significantly decrease false negatives. Outcome of the study is AI is very effective primary reader, application of continue mammography works, increasing cancer identification truth and effecting clinical judgement making in screening programs.

Chang et al. (2025) thestudy in South Korea shows the effectiveness of computer aided detection with using of AI, in increasing of mammography screening proper result in single read clinical setting. Here encountered 24,543 women in testing of breast cancer in national screening test detected 140 cases in among women within one year. The outcome of the study shows higher cancer detection is 5.70% and AI-CAD Achieved 13.8%, used of AI vs. 5.01% without AI is ($p<0.001$)it shows improvement of the diagnostic result not lead in rise recall rates and indicating, AI-CAD raised cancer detection without increasing false positives. Clinical value of the result stress, AI-CAD in real world breast cancer screening in programs improved early detection. Related to breast cancer screening result under score with using of clinical AI-CAD result, single –read workflows, and support, integration of national screening programs has improved early detection.

The Survey has conducted Shen et al. (2022) on bibliometric analysis explore by the author, it shows the evolution, structure, and emerging trends of tumour pathologyresearch data related the year between 1999 to 2021 with Using of Artificial Intelligence. Web of science is the source for core collection for the study; VOSviewer and CiteSpace are the data tools used for map co-authorship, co-citation, and keyword co-occurrence analysed for 2,753 publications. Finding shows the growth rate of publications and United States leading and shows the citations and research impact. The most prolific institution is Harvard Medical School and prolific author is Madabhushi Anant, while Jemal Ahmedin was the most frequently co-cited author.

Analysis revealed the breast cancer histopathology," "convolutional neural network," and "histopathological image" are key research hotspots. The AI has increasingly important to improve diagnostic accuracy and efficiency.Study high lights, model interpretability and multi-modal fusion models and Study, felt to need of international and interdisciplinary collaboration advance work for future.

Astudy comprehensive bibliometric analysisand evolution ofAI in breast cancer diagnosis and prognosis using 2,678 peer reviewed articles in the year 2000 to 2024 conducted byAlok Singh, Akanksha Singh, and Sudip Bhattacharya (2024). Main sources are Scopus database.Bibliomrtrix R package has used and study assessed publications trends, key contributors, and global research collaborations. In the year 2018 to 2023 publications has in growing trend, the

USA is in leading contribution in both publications and citations, followed by India and prolific institutions such as Radbound University Medical Center and IEO European Institute of Oncology IRCCS.Study revealsFoundational AI research with using of key words, mammography and artificial intelligence indicating strong diagnostic imaging. In this study LeCun and Simonyan was frequently co-cited. The study also identified robust international collaborations, such as; USA, China, the UK, and Canada. With AI the study deep learning has find out significantly advanced breast cancer diagnostics. Finally, study shows some challenges, limitations of data, regulatory issues, and global disparities in research capacity. Study expects the strengthened interdisciplinary cooperation to ensure equitable and effective clinical integration of AI.

This review explores the expanding role ofAI in find out**,** check-up, and breast cancer therapy treatment**,** emphasizing its potential to revolutionize oncology and healthcare delivery. Deep learning algorithms are shown to accurately detect mammograms, ultrasound images**,** and hospital data, and predict interval risk and advanced-stage of Leukaemia**.**The integrated with breast density computation**,** AI systems improve the prediction of invasive cancers**,** particularly in late-stage diagnoses. Additionally, AI-driven genetic testingenables the identification of individuals at elevated risk, supporting personalized prevention and screening strategies**.** In pathology, AI aids in the analysis of tissue samples, enhancing diagnostic accuracy and efficiency for clinicians. The review consolidates prior academic studies and concludes that AI equipments are mould the further step of breast cancer care,invite next stage of previous detection**,** risk solved**,** and individualised treatment planning**.**

The study **S**cientometric analysis of global research trends on the application of AIstatus shows the diagnosis of cancer check-up, the data was using for this Web of Science Core Collection (WoSCC)in the year 2023. Publications 8,098 were analyzed with using the Babblemetrix package in R**,** from the USA, China, and Germany and identified leading contributors. Author used keywords those are “Classification,” “Cancer,” and “Diagnosis,”are the core themes in the literature. Study highlights the Pathology and Diagnostic applications dominate AI-related cancer research, while emerging areas of focus includesurvival prediction and computer-aided detection.The study concludes that AI holds tremendous potential to transform cancer care by enabling more accurate, timely, and personalized treatment strategies. These are valuable for researchers and policy-makers in identifying strategic priorities and need to future investment and innovation in the intersection of AI and oncology**.**

Author Ahn et al. (2023) conducted a study anapplication of the diagnostic and therapeutic continuumfor care of breast cancer cure**.**Study highlights, Breast cancer is the main cause of mortality of women is recognised, and hence, it is highlighted, Transformative potential enhancing and accurate result with AI through advanced image analysis and individualised treatment planning. It shows, screening, diagnosis, staging, biomarker evaluation, prognosis and therapeutic response prediction using of AI. It covers mammography, tom synthesis, MRI and Ultrasound, historical analysis of the pathology, biomarker assessment, and genetic profiling. It shows artificial intelligence holds immense potential to revolutionise breast cancer management, success with targeted research, collaboration in inters disciplinaryand strict clinical evaluation**.**

A scientometric study analysed by Miyawaki et al. (2025) conducted an examining the breast cancer detection using mammograms,focus on dataset diversity with using AI algorithms for researcher representation. Covered 264 studies between 2017 and 2023, then attention substantial increase in AI- related research with 311 publications were raised over this period. It shows the lack of racial, ethnic, and geographic diversity in patient R cohorts and more subjects were covered. Data come with high income countries, gender imbalance among lead researcher. These issues are varied regarding the generalizability, fairness and equity of AI models for mammogram interpretation. The authors highlights, limitations through diverse dataset inclusion and fostering inclusive international collaborations is vital to ensure AI advances in breast cancer care benefit all populations equitably.

Tan et al. (2022) conducted a study on an umbrella review that synthesizes present review literatureusing AI the breast imaging, recognising breast cancer is the lead risk for women worldwide, and study emphasis machine learning and deep learning are important in improving the screening invention, detection andproblem monitoring and also management of data within breast imaging.Covered 71 systematic reviews and Meta analyses under the PRISMA guidelines analysing, this scientometric umbrella review expected a comprehensive overview, that how AI technologies are reshaping clinical workflows. This study portrays, pattern, quality and evidence of research as a one stop resource for researchers and healthcare professionals. AI find outs ambiguous cases, predicting patient outcomes, different clinical data is for high informed decisionsdata. Study finally focus position is AI is promising

as a transformative force in breast imaging with impacts on improving diagnostic accuracy and healthcare delivery worldwide.

Uwimana, Gnecco, and Riccaboni (2025) explore the application and evaluation of AI, particularly Machine Learning (ML), with using of 1,652 articles identified, 104 met inclusion criteria in breast cancer clinical care. Study highlightsthe demonstrated advantages of diagnostic accuracy, reducing false positives, and enabling personalized treatments, although widespread clinical integration remains limited. The PRISMA guidelines and analyzed literature from 2015 to 2023, using the MI-CLAIM checklist to evaluate AI model quality and the Health Technology Assessment (HTA) Core Model to assess clinical and economic outcomes.

Study find outs clinical effectiveness (78.84%), patient benefits (13.46%), or organizational and legal implications is only 25% addressing legal approval). Finally, it shows Cost-effectiveness was rarely evaluated,study design Quality assessment showed high scores, data, and model performance is (>80%), but low scores in reproducibility (14.7%). Only 20.59% of studies used large-scale, representative real-world screening data and just 10.78% demonstrated robustness and generalizability.Author felt to need for more comprehensive evaluations of AI's in organizational, economic, and ethical dimensions and to facilitate its responsible, effective integration into breast cancer clinical practice.

Performance of an abbreviated breast MRI based transfer learning, algorithm versus a traditional radiomics signature (RS) in predicting**l**ymph vasculardetection (LVI)to thepatients for the clinically node-negative infiltrating breast cancer (IBC) evaluated byBao Feng et al. (2022) This is retrospective study included 233 patients from two centers, 130 patient is from training cohort and another 103 patients are from validation cohort (103 patients).Study highlights the least shrinkage and operator selection (LASSO) multi- layered neural networks, both a TL signature and an RS have developed on AB-MRI data. It explores the decision curve analysis on TLS has provided greater clinical net benefit compared to RS.The study concluded, AB-MRI-based TL algorithm is superior to traditional radiomics for preoperative LVI prediction of IBC patients in clinically node-negative, potentially aiding clinical decision-making.

The present study covered the peer- reviewed documents from 2000 and 2021 documents collected from the databases of Scopus and Web of Science and analyzed and using visualized throughBibliometrix R package. The analysis revealed a significant growth in AI research focused on detection of breast cancer and prediction of survival with publications increasing from 12 in 2000 to 546 in 2021. The most productive countries are: United States, China, and India are come under the study shows the publication volume, the highest publication is from USA has leading in total citations. However, Hungary and the Netherlands topped the list in citations per year. Wang J was the most productive author was identified,followed by while Zhan J was the relevant contributor. Among the institution the leading was Stanford University has stood on the bases of journal articles publications.**Computers in** Biology and Medicine as the highest publications stood on Top 10. Author highlights the current research topics are transfer learning and deep learning.

The study, covered on Artificial Intelligence Application in Cancer, related analysis study with Scientometric on Health Management & Information Science explored by Meisam Dastan, Mostafa Kashan, MahnazMohseni (2023). Study highlights, the advances in healthcare, cancer remain a highest reason for the death in worldwide. The prominent equipment is AI and it will be address to critical challenges in cancer research and treatment. Author aimed to analyze the scientific landscape of AI applications in cancer using of scientometric methods such as; conducted Web of Science for Core Collection which as indexed database in the year 2023 with using of Bibliometrix R package for data analysis.

Results of this article find outs from relevant articles of 8,098 from most prolific contributors the USA, China, and Germany with using of AI and cancer research. Classification," "Cancer," and "Diagnosis," is more frequently used key words, reflecting the primary focus areas and Pathology and diagnosis emerged as the dominant research topics and attention given for cancer survival and computer-aided detection. Author said, AI is too used in cancer research and treatment;this was identified the most effective personalized therapies. These will be assist policymakers and researchers in setting priorities and guiding future research directions in this rapidly evolving field.

Another study by Guoet al (2025) onexploring the Relationship Between Assisted Reproductive Technology (ART) and Breast Cancer Risk: A Comprehensive Review. This showsthe complex relationship of the assisted reproductive technology (ART) and the potential problemin breast cancer and explained of both theoretical frameworks and empirical studies concerning this association. Study highlights, ART increases reproductive hormone levels over a short timeframe, which could potentially raise breast cancer susceptibility. Study shows the reasons of applied clinical confirmation are not much support linkbetween Art and Breast cancer development.A direct link between ART and breast cancer development.

The review synthesizes existing theoretical and clinical research, laying the foundation for informed discussions and further investigation. Author feel to need of guidance for healthcare specialists and patients making decisions about ART treatments, specifically emphasizing the need to balance potential risks with benefits.The studyconclude it, in breast cancer risk ART theoretically may elevate, because, due to hormonal imbalance robust clinical evidence confirming relationship lacking. Study emphasis in the potential breast cancer the ART association and supporting informed decision-making in women reproductive health is the crucial to better understand and manage the case.

Authors, Xiao et al (2022) conducted a study on Artificial Intelligence in Breast Imaging: study shows the significant gaining of machine learning and rapidly advanced deep learning, in health care Application of AI related **to** detection, diagnosis, disease monitoring, and comprehensive data management.Study has reviewed 71 articles systematically, on AI in breast imaging, following PRISMA guidelines. Study set-up the goal and the landscape of the research, highlighting trends, quality, and types of AI applications in breast imaging.The review serves as a comprehensive resource offering a panoramic view of how AI is shaping breast imaging practices, useful for newcomers, researchers, and stakeholders aiming to understand current progress and future directions in the field. Study covered, scientific databases including PubMed, Scopus, Web of Science, and Google Scholar using keywords are “artificial intelligence” and “breast cancer.”

Bibliometric analysis tools, such as Scopus analytics and VOSviewer, were employed to visualize research trends. Findings of the result USA, India, China, and Great Britain and literature spans 11 major disciplines, predominantly medicine, computer science, biochemistry, engineering, and mathematics.Publications were covered 4,751 divided in to three thematic clusters: artificial intelligence, imaging methods, and pathomorphology of breast cancer. Three chronological research phases were identified: early studies focused on radiological and pathomorphological methods; followed by AI automating imaging analysis; and most recently, AI involvement in pathohistological image analysis.

Bibliometric Analysis of Artificial Intelligence in Breast Cancer Diagnosis and Prognosis (2000–2024). Artificial Intelligence (AI) has substantially improved and accurate treatment in breast cancer screening. This has extensive bibliometric review of AI is the advance in breast cancer diagnosis and prognosis; used Scopus database covered 2000 to 2024.Publications 2,678 were analysed, from this the leading contributors include Zheng B, and leading country is Radbound University Medical Centre and the Ieo European Institute of Oncology IRCCS and also USA and followed by India. Analysis highlights “mammography” (3,171 occurrences) and “artificial intelligence” (1,691 occurrences) as dominant themes.Contributed authors are Lecun Y.

and Simonyan K. Works on foundational applications of AI in breast cancer and shows collaboration of countries such as China, the UK, and Canada. Author conclude that AI particularly deep learning and treatment of cancer over the past two decades. Author pointed early detection, advanced study, challenges and limitations, regulatory barriers global collaboration persists, underscoring the need for continued interdisciplinary efforts to effectively integrated AI into clinical practice. Study conclude, with leading contributors, countries, Institutions, challenges, limitations, regulatory barriers, global collaboration and interdisciplinary efforts effectively integrates by the AI in to clinical practice.

Authors Sun et al (2017) were presented the report on Breast Cancer is the second highest health problem in deaths of women. Because the development of breast cancer is related to multiple-steps and involved in development of multiple cell types and its prevention is challenging. Author opinion ondeveloped countries; the 5-year relative survival rate of breast cancer patients is above 80% shows by early prevention. But the progress made by the development of the preventive methods has highest. The genetic problems, drug resistant cancer stem cells have been explained. Author opinion on chemoprevention of breast cancer, and biological prevention has been recently

developed to improve patients' quality of life. Author highlights the genes, risk factors and preventative methods on breast cancer over the past years and these findings represent a small step in the long fight against breast cancer.

## Conclusion:-

The study reveals the relevant identifications of conducted studies characters, feature and valuable inputs. Hence, this study covered some valuable issues such as; application of AI in breast cancer research in clinical study it shows, different types of diagnostic performance, find outs ambiguous cases, predicting patient outcomes, different clinical data is for high informed decisions, screening, diagnosis, staging, biomarker evaluation, prognosis and therapeutic response prediction, itneed to valuable for researchers and policy-makers in identifying strategic priorities and need to future investment and innovation in the intersection. The AI has increasingly important to improve diagnostic accuracy and efficiency in the breast cancer testings. It shows encouraging factors, future collaboration works, directing research effects, advancing artificial applications for breast cancer patients. All above issues are very helpful to future studies.

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