IMPROVING BREAST CANCER SCREENING WITH THE HELP OF AI TECHNOLOGY

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EXECUTIVE SUMMARY

Breast cancer is the most common type of cancer among Indian women, with mortality rates twice as high as in the USA due to limited screening and late-stage diagnoses. Key barriers include low awareness, inadequate state-led programs, cultural stigma, and insufficient access to healthcare, particularly in rural areas.

This policy brief proposes the integration of AI-based screening technologies like iBreastExam and Niramai Thermalytix. These portable, cost-effective tools are better suited for India's population and resource constraints, offering greater sensitivity for younger women with dense breast tissue.

Recommendations:
1. Adopt AI technologies in pilot programs to expand early detection.
2. Increase community engagement through trained frontline workers and public awareness campaigns.
3. Incentivize participation for healthcare workers and women.
4. Promote government and NGO collaborations to scale screening efforts.

Implementing these solutions can improve early detection, reduce breast cancer mortality, and ease the burden on India's healthcare system.

PROBLEM STATEMENT

Breast cancer is the most common type of cancer in women in India. It is estimated that at least 1 in 22 women from Indian metropolitan cities will have breast cancer during their lifetime (Dey et al., 2016). The statistics in India pose a different presentation compared to the Western counterparts.

For instance, in 2020, the number of newly diagnosed breast cancer cases in the USA was 1.6 times higher than in India (Sung et al., 2021). However, the breast cancer mortality rate in India was nearly twice that of the USA. One of the key reasons for this disparity is the lack of organized screening programs in India, which hinders early detection and timely treatment of the disease.

It was estimated that nearly 70% of the women who are diagnosed with breast cancer are those who are in their advanced or late stages, which presents only 25% of survival rates (Bhattacharya et al., 2022). With the resource scarcity in healthcare, the expense of treating advanced stage cancers which is 10 to 16 times higher than early stages is highly burdensome for a country like India (Sekar et al., 2022).

In India, the integrated National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke has incorporated the importance of awareness regarding breast cancer and its screening. It also provided set guidelines for mass screening programs. (Mishra et al., 2022). However, the National Family Health Survey (NFHS-5) reported that these guidelines have not been effectively implemented (Subba, 2021).

It has been reported that the percentage of women who have undergone breast cancer screening at least once in their lifetimes is only 0.9% in India. (Thulaseedharan, Gopika and Prabhu, 2022). The underperformance observed in screening efforts highlights significant shortcomings on the part of governments and public health professionals.

This situation underscores the urgent need for a more thorough investigation into the issue, as well as the development of improved alternative approaches to enhance screening accessibility and effectiveness.

CHALLENGES

- Lack of awareness in the general public
- Lack of organized screening by the state and local governments, which results in inaccessibility to rural and marginalized population
- Lack of human resources (there is only 1 radiologist for a population of 100,000 in India)
- India has a high incidence of breast cancer in young women, who have dense breast tissue. The current screening tests are not quite suitable to the Indian population as the sensitivity to thicker breast tissue is poor.
- Cultural, social and psychological barriers. Many women find it uncomfortable to let others touch their private parts (Bhattacharya et al., 2022) along with having a fear of rejection from the partner and the society.
- Mammography as a screening test is expensive especially with limited resource settings. (Bhattacharya et al., 2022).

USE OF AI TECHNOLOGY

Artificial intelligence is rapidly transforming healthcare, especially in preventive technologies. In India, startups have developed cost-effective and highly sensitive AI tools for early breast cancer detection.

Why AI?

India currently relies on conventional breast cancer screening methods such as Mammography, Clinical Breast Examination (CBE), and Self Breast Examination (SBE). While CBE is commonly used for mass screenings due to its low cost, these methods have notable limitations, making it essential for public health professionals to consider new technologies like AI.

Challenges With Conventional Methods

·Mammography: While effective, mammograms do not detect all cancers and have reduced sensitivity in dense breast tissue, which is common among young Indian women (American Cancer Society, 2022). The procedure can be painful, requiring 10 to 12 pounds of pressure on the breasts (Centers for Disease Control and Prevention, 2024). Additionally, mammography is resource-intensive, with high equipment costs and the need for specialized infrastructure, making it less suitable for widespread use in India (Mishra et al., 2022b).

·Clinical Breast Examination (CBE): Though cost-effective, CBE's success heavily depends on the skill of the health worker, and its efficacy in large-scale screenings is not well-established (Ngan et al., 2020).

·Self Breast Examination (SBE): Although the most affordable option, SBE is unreliable as a sole screening method and requires further confirmatory tests (Mishra et al., 2022).

The Role of AI

Emerging AI-based technologies, such as iBreastExam and Niramai Thermalytix, offer a promising alternative to traditional screening methods. These innovations have been clinically proven to be as effective, if not more so, than mammography and CBE. Notably, Niramai's method has greater sensitivity to dense breast tissue compared to mammograms.

Advantages of AI Technologies:

Portability: AI tools like Niramai are highly portable and easy to set up, taking only 15 minutes.

Cost-Effectiveness: A thermal camera for Niramai costs about $10,000, significantly less than a mammogram machine, which costs at least $350,000.

Safety: These methods are radiation-free, minimizing risk.

Ease of Use: Health workers can be trained to use these AI tools in less than two hours, and the tests require minimal technical expertise.

Patient Comfort: The AI methods use a no-touch approach, preserving patient privacy and comfort, which may increase screening participation (Bansal et al., 2023)

INTEGRATING AI

MOBILE CLINICS

Mobile clinics have proven to be an efficient way of increasing the reach to any public health program. This has been reported in several studies and a mobile breast cancer screening program conducted in Delhi has been able to identify that when there is a screening camp established closer to their livelihood areas, women tend to participate easily and also bring in more of their peers (Sekar et al., 2022). Project Nidan program in Maharashtra has been a testimony of innovation combined with ground level implementation strategy when it comes to breast cancer screening. It has been able to efficiently combine the AI integration along with mobile clinic methodology. This model can be a case study for other regions in the country and can be adopted to their populations and geographies. More details on Project Nidan is given in page - 5.

TRAINING AND CAPACITY BUILDING

Comprehensive training sessions have to be conducted for health workers to ensure they are proficient in using AI tools. Training should cover both the technical aspects of the tools and the interpretation of results. This can be done in collaboration with the community based medical camps where the frontline workers can be trained under the supervision of duty doctors.

Frontline health workers like ASHAs (Accredited Social Health Activists) have to be trained to provide awareness programs and they have to be appropriately incentivised with an increase in pay or recognition. They have to be equipped with easy-to-understand education materials like leaflets, brochures in local language that can be shared during community visits.

HOLISTIC APPROACH

A comprehensive approach has to be used where there is facilitation from the government not just in screening but also in further treatment and care. One stop radiology centers have to be set up taking inspiration from the breast Health Initiative.

Breast Health Initiative from the states Uttar Pradesh And Jharkhand have shown excellent results through this method. Further details in page - 5.

AWARENESS CAMPAIGN

Targeted awareness campaigns and workshops have to be launched in collaboration with local NGOs. Attention of local media and social media platforms can be a major boost to the success of these programs

School children can play a major role in educating the population. Children from different schools can be encouraged by the local government to create attractive posters and educational materials. Competitions can be held between the schools to emphasize interest and awareness not only in children but also among parents.

Project Nidan: Solapur, Maharashtra

Faced with low participation due to cultural barriers and a lack of access, the district's Zilla Parishad partnered with Niramai Health Analytics to deploy AI-powered Thermalytix technology through mobile screening vans.

With a modest budget of INR 20 lakh, the project trained Accredited Social Health Activists (ASHAs) to conduct preliminary screenings. In just two months, 5,000 women were screened, leading to the early detection of three positive cases.

Project Nidan not only demonstrated the potential of AI to make breast cancer screening more accessible and affordable but also highlighted the importance of integrating modern technology into public health initiatives to improve outcomes in low-resource settings

- Non-invasive and radiation-free: This feature encouraged more women to participate without fear of discomfort or exposure to harmful radiation
- Cost-effective: The portable infrared cameras used costed one-tenth of traditional mammography equipment, making widespread deployment feasible
- Minimal training required: Technicians needed only two days of training to operate the system, allowing for rapid scale-up.
- The contactless screening method aligned with cultural norms, helping women feel more at ease and encouraging greater participation.

Case Study: Breast Health Initiative in Uttar Pradesh and Jharkhand

Training and Capacity Building:

A total of 1,159 Accredited Social Health Activists (ASHAs) were trained to deliver targeted breast cancer education to women aged 30–65. Additionally, 498 staff nurses and 140 medical officers underwent competency-based training in Clinical Breast Examination (CBE), ensuring consistent screening quality and referral practices.

Community Engagement and Awareness:

Culturally appropriate, behavior-focused materials—such as pictorial guides—were developed to support awareness efforts. Frontline workers were trained to integrate breast health messaging into ongoing community health programs, increasing outreach at the grassroots level.

System Integration:

Breast health services were embedded into all tiers of the public health system, with screenings offered at 225 facilities. Specialized one-stop clinics were established, allowing women to consult surgeons, radiologists, and other specialists in a single visit.

Outcomes and Impact

ASHAs reached out to 108,112 women, with nearly half (52,248) attending follow-up CBE screenings. The initiative notably improved follow-up care, with adherence rates doubling over time. Before the program, over half of patients delayed care by 4–5 months, leading to late-stage diagnoses. The initiative successfully reduced these delays, promoting earlier detection and better outcomes.

ACTION RECOMMENDATIONS

1.Adopt Cost - Effective and Accessible Screening Methods

Screening technologies must be affordable, require minimal training, and be easily portable to reach remote and underserved areas. Innovations like AI-based tools such as Niramai's Thermalytix should be prioritized due to their low cost, ease of use, and suitability for dense breast tissues common among younger Indian women. Implementing such technologies can increase coverage, reduce the burden on existing healthcare infrastructure, and ensure early detection across diverse populations. Leveraging public-private partnerships can accelerate the deployment of these advanced screening technologies and expand the reach of breast cancer programs.

2.Enhance Community Awareness and Engagement

Community awareness is crucial for the success of any screening program. Local governments should collaborate with frontline healthcare workers to deliver targeted awareness campaigns using social media, community radio, and local gatherings. Training ASHA workers and other frontline health personnel to deliver culturally sensitive information on breast cancer can encourage more women to participate in screening programs. Tailored behavioral communication materials, like those used in the Breast Health Initiative in Uttar Pradesh and Jharkhand, should be developed to resonate with diverse communities.

3.Promote Proactive Engagement by Local Governments and Health Professionals

Local governments, municipalities, and public health professionals must take an active and enthusiastic role in promoting breast cancer screening. This includes integrating screening campaigns into existing health programs and ensuring consistent monitoring and support for these initiatives. By embedding breast health services into primary healthcare systems, local governments can create sustainable and scalable models that encourage regular screenings.

4. Incentivize Health Workers and Beneficiaries

To boost participation, incentives should be provided to both healthcare workers and beneficiaries. Health workers, including ASHAs, nurses, and medical officers, could receive financial incentives or recognition for successfully engaging communities and increasing screening rates. Similarly, women who participate in screening campaigns could be offered free or subsidized health checkups for other conditions, such as diabetes and cardiovascular diseases, making the campaigns more attractive and holistic.

5.Engage NGOs and Local Civic Societies

Non-governmental organizations (NGOs) and local civic societies play a vital role in reaching marginalized communities and providing on-the-ground support. Their involvement can ensure that screening programs are inclusive and cater to the unique needs of different population segments. Collaborating with NGOs can also help in mobilizing resources, training volunteers, and implementing innovative outreach strategies that resonate with local communities.

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