

ADVANCING BREAST CANCER THROUGH INNOVATION

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ABSTRACT

Breast cancer is a significant global health issue, with an incidence rate of 46.8 per 100,000 women worldwide, making it the second most common cancer overall and the leading cancer among women. Malaysia mirrors this global trend, facing both a high incidence and a concerning mortality rate. Despite the widespread prevalence, many individuals do not seek life-saving treatments due to negligence, fear, and lack of awareness. Guided by the Hadith, "Allah has sent down both the disease and the cure," this study aims to explore and promote innovative advancements in breast cancer treatment. Through a systematic literature review, the study evaluates cutting-edge technologies like wearable ultrasound scanners, cone-beam breast CT, iBreastExam, MARIA, PEM, magnetic targeting of tumors, and robotic mastectomy. These innovations hold the potential to significantly reduce the global burden of breast cancer and improve patient outcomes. To enhance public understanding, an accessible infographic was created using Canva to educate a broad audience, ensuring that these life-saving advancements are widely known and utilized.

Keywords: Breast cancer; innovation; infographics; advanced treatment; medical devices

1. INTRODUCTION

Breast cancer is one of the most prevalent types of cancer, primarily affecting women, though men can also develop the disease. It typically originates in the ducts or lobules of the breast and can either remain localized or spread to other parts of the body. Various forms of breast cancer, such as ductal carcinoma in situ (DCIS), invasive ductal carcinoma, and triple-negative breast cancer, present unique challenges in terms of detection, treatment, and prognosis (American Cancer Society, 2023). Globally, breast cancer is the most common cancer among women and the second most common overall, following lung cancer (World Health Organization, 2023). The incidence of this disease is rising, with over 2.3 million new cases reported in 2020 alone (GLOBOCAN, 2023). In Malaysia, breast cancer poses a significant health challenge, with an incidence rate estimated at 36 per 100,000 women (Malaysian Ministry of Health, 2022). While high-income countries have seen improvements in mortality rates due to advancements in early detection and treatment, many low- and middle-income countries, including Malaysia, continue to face difficulties with late diagnoses, which are often compounded by a lack of awareness about advanced technologies, contributing to higher mortality rates (American Cancer Society, 2023). Addressing these gaps in

access to timely and effective treatment and improving awareness of innovative technologies are critical for reducing the global burden of breast cancer.

2. MATERIALS AND METHODS

A systematic review of existing literature was conducted to gather information on the latest innovations in breast cancer detection and treatment. The review focused on journals, books, and research publications relevant to breast cancer treatment and detection technologies. Keywords such as "breast cancer," "advanced treatment," "innovation," "early detection," "breast cancer technology," and "medical devices" were used to identify studies directly related to these areas. The gathered data were then organized into a table to systematically compare and evaluate each innovative technology, its applications, benefits, and potential impact on patient outcomes. Additionally, to enhance public understanding and accessibility of the findings, an infographic was developed using Canva, chosen for its user-friendly interface and extensive library of templates. The infographic clearly communicates the key findings, summarizing the table's contents, including descriptions of each technology, its benefits, and its impact on breast cancer treatment outcomes, aiming to bridge the gap between technological advancements and public awareness.

3. RESULTS AND DISCUSSION

The systematic review highlighted several important innovations in breast cancer detection and treatment, each offering substantial potential to enhance patient outcomes. These advancements were meticulously summarized in a comprehensive table that provides a detailed overview of the purpose and application of each technology. To make these findings accessible to a wider audience, an informative infographic was also developed. This infographic was carefully designed to convey the key findings of the study, offering clear and easy-to-understand descriptions of each innovative technology, thus ensuring that the information is both engaging and educational for a diverse range of readers.

Table 1. Breast Cancer Innovation

Innovation	Type	Description	Impact on outcomes	Implementation Challenges
Cone-beam breast computed tomography (O’Connell et al., 2021)	Diagnostic	Provides 3D imaging with less radiation exposure than traditional CT	Enhances early detection, particularly in dense breast tissues.	Expensive equipment, not widely available in low-resource settings.
A Magnetism to Target Breast Tumors (Galehouse & Galehouse, 2020)	Treatment	Utilizes magnetic fields to direct therapeutic agents precisely to tumor sites	Enhances the effectiveness of chemotherapy with fewer systemic impacts.	Still in research phase; needs clinical trials.

Positron emission mammography (PEM) (Ledger, 2012)	Diagnostic	Detects metabolic activity in breast tissues, aiding in the identification of cancerous cells.	Improves treatment planning by accurately staging cancer.	Expensive and limited by high operational costs.
MARIA (Blake, 2021)	Diagnostic	Uses microwave technology for safe, non-invasive imaging.	Increases patient comfort and compliance with screening recommendations.	Requires further validation and acceptance in clinical settings.
iBreastExam (Tyagi, 2017)	Diagnostic	A handheld device for early detection, especially useful in low-resource settings.	Could significantly reduce late-stage diagnoses in low-resource areas.	Limited by the scope of detection; needs broader implementation.
Robotic Mastectomy (Morrow, 2021)	Treatment	A minimally invasive surgical technique using robotic arms for greater precision.	May improve post-surgical outcomes and reduce hospital stays.	High cost of equipment and specialized training required.
A wearable ultrasound scanner (Massachusetts Institute of Technology, 2023)	Diagnostic	Portable devices that allow continuous monitoring of breast tissue	Potentially improves survival rates by catching cancer early.	Requires trained operators, integration into existing healthcare systems.

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CONE-BEAM BREAST COMPUTED TOMOGRAPHY



(Koning Corporation, 2015)

Provides 3D imaging with less radiation exposure than traditional CT

iBReaSTEXAM



(UE LifeSciences, 2017)

A handheld device for early detection, especially useful in low-resource settings.

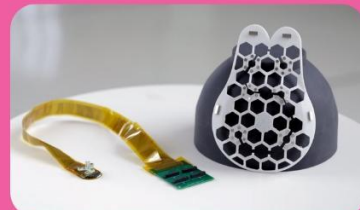
A MAGNETISM TO TARGET BREAST TUMORS



(Galehouse & Galehouse, 2020)

Utilizes magnetic fields to direct therapeutic agents precisely to tumor sites

A WEARABLE ULTRASOUND SCANNER



(Massachusetts Institute of Technology, 2023)

Portable devices that allow continuous monitoring of breast tissue

POSITRON EMISSION MAMMOGRAPHY (PEM)



(Tyagi, 2017)

Detects metabolic activity in breast tissues, aiding in the identification of cancerous cells.

ROBOTIC MASTECTOMY



(Northwell Health, 2018)

A minimally invasive surgical technique using robotic arms for greater precision.

MARIA



(Blake, 2021)

Uses microwave technology for safe, non-invasive imaging.

Figure 1. The infographic of latest innovations on breast cancer treatment

This study aimed to address the global challenge of breast cancer by improving the accessibility of information on the latest detection and treatment innovations. Guided by the Hadith, "Allah has sent down both the disease and the cure, and He has appointed a cure for every disease, so treat yourselves medically" (Sahih Bukhari, 5678), the research underscores the importance of medical treatment as a divinely endorsed practice. Despite significant technological advancements, late diagnoses and limited access to advanced treatments persist, particularly in countries like Malaysia, leading to higher mortality rates (American Cancer Society, 2023). The study's systematic literature review identified promising new technologies that could enhance early detection and patient outcomes. However, the success of these advancements depends on widespread awareness and accessibility. To address this, an infographic was created using Canva to simplify and clearly communicate these innovations to a broad audience. By presenting complex medical information in an accessible format, the infographic aims to combat the fear and lack of awareness that often delay treatment, particularly in low- and middle-income countries. The inclusion of the Hadith reinforces the importance of seeking medical care as part of divine guidance, highlighting the need for combining technological innovation with effective public health communication to reduce the global burden of breast cancer.

4. CONCLUSION

This study underscores the need for accessible breast cancer technologies, particularly in regions like Malaysia. Future work should focus on expanding the reach of the infographic to ensure life-saving information is widely available to the public, bridging the gap between innovation and understanding.

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