

Impact of Thermogram and Mammogram as an Early Diagnostic Tool for Breast Cancer.

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Abstract

Metastatic cancer has the same name and the same type of cancer cells as the original, or primary, cancer. In 2018, 1,62,468 new cases and 87,090 deaths were reported for breast cancer in India. 25 years back, out of every 100 breast cancer patients, 2% were in 20 to 30 years age group, 7% were in 30 to 40 and so on. 69% of the patients were above 50 years of age. Presently, 4% are in 20 to 30 yrs age group, 16% are in 30 to 40, 28% are in 40 to 50 age group. So, almost 48% patients are below 50. Breast self-examination (BSE) and clinical breast examination (CBE) are used to screen for breast cancer. CBE has a sensitivity of 57.14% and a specificity of 97.11%. Although it does not permit one to determine malignancy with assurance, it is useful for detecting suspicious breast lesions. Despite these results and those from similar studies, some believe that CBE and BSE should still be used, especially for women younger than 40 years as well as for those who do not undergo routine mammography. Thermal images are actually visual displays of the amount of infrared energy emitted, transmitted, and reflected by an object. Because there are multiple sources of the infrared energy, it is difficult to get an accurate temperature of an object using this method. The results from women of all ages that used hormone replacement therapy yielded a mammographic specificity of about 91.7%. Mammography is less sensitive in women with radiographically dense breasts. Sensitivity values range from 62.9% in extremely dense-breasted women to 87% in extremely fatty-breasted women, whereas specificity values ranged from 89.1% to 96.9%, respectively. Public health data indicate that the global burden of breast cancer in women, measured by incidence, mortality, and economic costs, is substantial and on the increase. Worldwide, it is estimated that more than one million women are diagnosed with breast cancer every year, and more than 410,000 will die from the disease. Although it is not certain which women have been affected, the imbalance suggests that there is substantial over diagnosis, accounting for nearly a third of all newly diagnosed breast cancers, and that screening is having, at best, only a small effect on the rate of death from breast cancer.

Keywords: Breast Cancer, Thermogram, Mammogram, Diagnostic tool, Breast self-examination (BSE) and clinical breast examination (CBE).

Introduction:

Cancer is a broad term. It describes the disease that results when cellular changes cause the uncontrolled growth and division of cells. Some types of cancer cause rapid cell growth, while others cause cells to grow and divide at a slower rate. Cancerous cells may appear in one area, and then spread via the lymph nodes. These are clusters of immune cells located throughout the body. There are many causes of cancer, and some are preventable. The process by which cancer cells spread to other parts of the body is called metastasis. A cell receives instructions to die so that the body can replace it with a newer cell that functions better. Cancerous cells lack the components that instruct them to stop dividing and to die. (Rachel Nall et al., 2018). Cancerous cells may appear in one area, and then spread via the lymph nodes. These are clusters of immune cells located throughout the body. There are many causes of cancer, and some are preventable. For example, over 480,000 people die in the U.S. each year from smoking

cigarettes, according to data reported in 2014. Currently, the most significant unpreventable risk factor is age. Genetic factors can contribute to the development of cancer. (YaminiRanchod et al., 2018).

In India, we are now witnessing more and more numbers of patients being diagnosed with breast cancer to be in the younger age groups (in their thirties and forties). Among Indian women, breast cancer is the commonest cancer in Indian women overall. The information given here is for female breast cancers. Breast cancer is the most common cancer in women in India and accounts for 14% of all cancers in women. The incidence rates in India begin to rise in the early thirties and peak at ages 50-64 years. (Freddie Bray et al., 2019) Overall, 1 in 28 women is likely to develop breast cancer during her lifetime. In urban areas, 1 in 22 women is likely to develop breast cancer during her lifetime as compared to rural areas where 1 in 60 women develops breast cancer in her lifetime. In 2018, 1, 62,468 new cases and 87,090 deaths were reported for breast cancer in India. 25 years back, out of every 100 breast cancer patients, 2% were in 20 to 30 years age group, 7% were in 30 to 40 and so on. 69% of the patients were above 50 years of age. Presently, 4% are in 20 to 30 yrs age group, 16% are in 30 to 40, 28% are in 40 to 50 age group. (Jacques Ferlay ME et al., 2019) Breast cancer is a serious threat worldwide and is the number two killer of women in the United States. The key to successful management is screening and early detection (Isabella Soerjomataram et al., 2019). CBE and BSE should still be used, especially for women younger than 40 years as well as for those who do not undergo routine mammography. (J.P. Kosters and P.C. Gotzsche et al., 2003). A definite need exists to improve our ability to teach and validate BSE and CBE so that these methods can be used effectively for screening. (J.P. Kosters and P.C. Gotzsche et al., 2003). Generally referred to as the gold standard of breast imaging, mammography, or screen-film mammography (SFM), is the most common form of breast imaging. It is basically an X-ray examination of the breast under compression. It has a true-positive rate of 83% to 95% and a false-positive rate of 0.9% to 6.5%. Sensitivity and specificity (A.I. Mushlin, R.W. Kouides and D.E. Shapiro et al., 1998) of mammography are affected by breast density, which in turn is affected by “age, use of hormone replacement therapy (HRT), menstrual cycle phase, parity, body mass index, and familial or genetic tendency”. In one study, sensitivity was 68.6% in women aged 40 to 44 and 83.3% in women aged 80 to 89; whereas specificity values (in women who did not use hormone replacement therapy) were 91.4% and 94.4%, respectively. In that study, the results from women of all ages that used hormone replacement therapy yielded a mammographic specificity of about 91.7%. Mammography is less sensitive in women with radiographically dense breasts. Sensitivity values range from 62.9% in extremely dense-breasted women to 87% in extremely fatty-breasted women, whereas specificity values ranged from 89.1% to 96.9%, respectively. (A.I. Mushlin, R.W. Kouides and D.E. Shapiro et al., 1998). Mammograms have certain limitations. They require a dedicated machine, radiographic film and developing chemicals, a trained X-ray technologist, and a radiologist to read the films. They require breast compression, which causes the patient discomfort. Images seen on mammograms also lead to unnecessary biopsies. (Archie Bleyer, H Gilbert Welch et al., 2012). Full-field digital mammography (FFDM) is simply a digital mammogram. It has poorer spatial resolution than film mammography, and its files require large amounts of digital storage space. (Am. J. Roentgenol et al., 2006). The use of digital infrared imaging is based on the principle that metabolic activity and vascular circulation in both precancerous tissue and the area surrounding a developing breast cancer is almost always higher than in normal breast tissue. (Foster KR., et al 1998 and Rogalski., et al., 2003). This phenomenon may become clearer upon consideration of the formula:

Incident Radiant Power = Emitted Radiant Power + Transmitted Radiant Power + Reflected Radiant Power; Where incident radiant power is the radiant power profile when viewed through a thermal imaging camera. Emitted radiant power is generally what is intended to be measured; transmitted radiant power is the radiant power that passes through the subject from a remote thermal source, reflected radiant power is the amount of radiant power that reflects off the surface of the object from a remote thermal source.(Kaplan H., et al 2001) This phenomenon occurs everywhere, all the time. It is a process known as radiant heat exchange, since radiant power time equals radiant energy. However, in the case of infrared thermographs, the above equation is used to describe the radiant power within the spectral wavelength pass band of the thermal imaging camera in use. The radiant heat exchange requirements described in the equation apply equally at every wavelength in the electromagnetic spectrum.

Materials and Method

Thermogram:

All objects above zero Kelvin emits infrared radiation. The Stefan-Boltzmann law gives the relationship between the infrared energy and temperature. Emissivity of human skin is high (within 1 percent of that of blackbody) therefore measurements of infrared radiation emitted by skin can be directly converted to temperature (Springer J Med Syst et al., 2010).

There was taken for 67 patients between November 2018 to January 2019 at Harshamitra super specialty cancer center, Trichy.

Mammogram:

The 3D mammography procedure resembles that of traditional mammography. The procedure takes place in a private room and is conducted by a radiologic technologist. The woman undergoing 3D mammography is required to remove any clothing above the waist, as well as any jewellery or other objects that might interfere with the imaging process. During the procedure, the woman is positioned before a 3D mammography machine and her breasts are held in place by two compression plates. The pressure placed on the breasts by the compression plates can cause discomfort but only lasts for a few seconds.(Kolta, Gina et al., 2014). When ready, the radiologic technologist will start the 3D mammography machine and a robotic arm will move in an arc over the woman's breasts as multiple X-ray images are taken. The dose is similar to film mammography and is only slightly higher than in standard 2D digital mammography. The scan itself takes less than two to three seconds per view. The entire procedure takes approximately 10 to 20 minutes.(Biller- Andorono et al., 2014). Traditional mammography produces just two images of each breast, a side-to-side view and a top-to-bottom view. 3D mammography produces many X-ray images of the breasts from multiple angles to create a digital 3-dimensional rendering of internal breast tissue. This allows radiologists to view the breast in 1-millimeter 'slices' rather than just the full thickness from the top and from the side. 3D mammography can be used for routine screening mammography and may be particularly effective for women with dense breast tissue or those at high risk for developing breast cancer. Research suggests that radiologists are able to more accurately interpret results from 3D mammography in dense breast tissue, which can lead to fewer false-positive and false-negative readings.(Nikola et al., 2014).



Result and Discussion

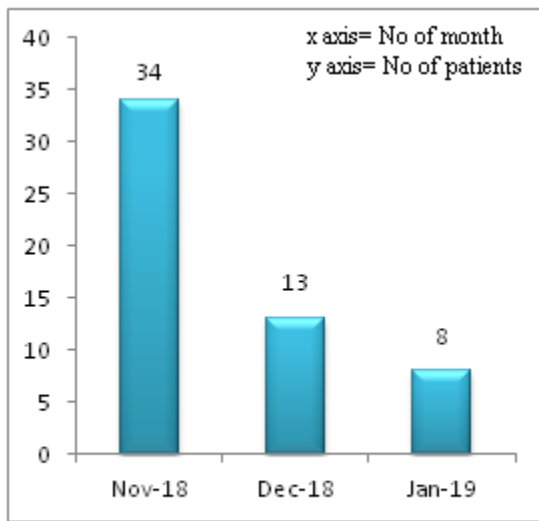
Breast cancer literacy with regard to risk factors among Indian women, irrespective of their socio-economic and educational backgrounds, with little correlation between awareness levels and strength of evidence of the risk factors. When plotting the studies in chronological order, we found no increase in the cancer literacy over time; low levels of awareness were consistently observed (Yadav P., Jaroli D.P. et al., 2010) for important risk factors such as age at menarche, age at menopause and age at birth of first child in the general population. This may not be true for nurses/nursing students, in whom improved literacy of risk factors was observed in more recent studies. In general, we found relatively low, and wide, variation in awareness of risk factors for breast cancer among women in India over the 8-year period of publications, even as breast cancer became the most common cancer in the country. (Marianne Carlsoon, Elisabeth Hamrin et al., 1994). Women more commonly believed that unhealthy habits related to alcohol and tobacco consumption were more important risk factors than reproductive history, which is a much stronger determinant of breast cancer. (Somdatta P. et al., 2013). Importance of getting screened for breast cancer. Encourage women ages 40 to 49 to talk with their doctors about when to start getting mammograms. Organize an event to talk with women ages 50 to 74 in your community about getting mammograms every 2 years. (Khokhar A. et al., 2009). A better understanding of risk factors such as age at birth of first child and alcohol consumption over the four-year period during which these studies were conducted was observed in nurses and/or nursing students, indicating a potential increase in literacy level among health professionals. However, a short time span and small sample size precluded a time trends evaluation, and populations may not be directly comparable on important characteristics influencing literacy. (Gabrial N Hortobagyi, et al., 1998)) Literacy deficit among health professionals is recognised as a potential barrier in breast cancer prevention and early detection, given their leading role and contribution in spreading awareness, particularly in primary care settings across the globe. There is an urgent need to explore the drivers of awareness deficits and stigma surrounding breast cancer, both in the general population and among health care professionals, as incidence and mortality rates continue to rise.

Understanding the drivers and barriers is important for strategic and effective awareness campaigns and/or interventions on prevention and early detection. (Scott H Burton, et al., 2013).

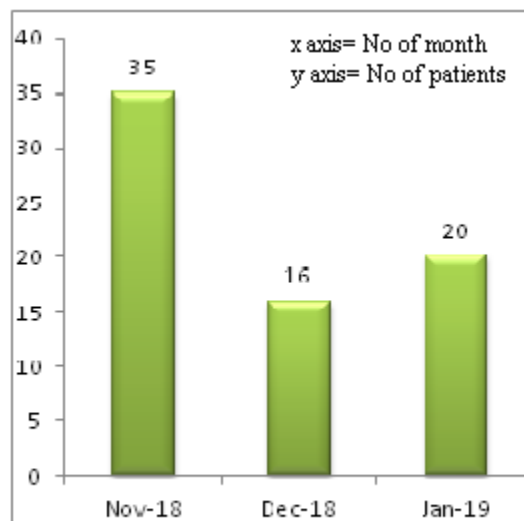
Our study also reveals that health professionals' awareness on the strength of risk factors for breast cancer was limited for guiding the patients towards important modifiable means of prevention.

Thermogram and Mammogram

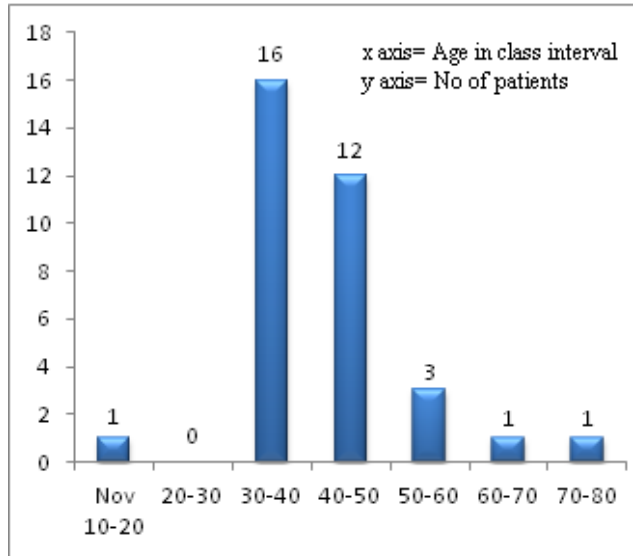
Result of thermogram, there was an no radiation. It was painless. Could detect breast cancer 10 years prior to onset. It has no age limit and it has been most predicted. In Mammogram, It has exposure to Low-Energy x-ray. It takes more pictures from different angles. Can eat and drink before a mammogram and its takes 10 to 15 minutes.



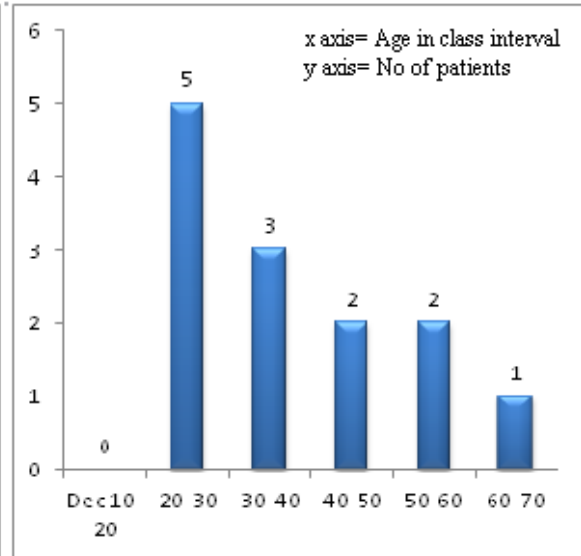
3.1. Thermogram



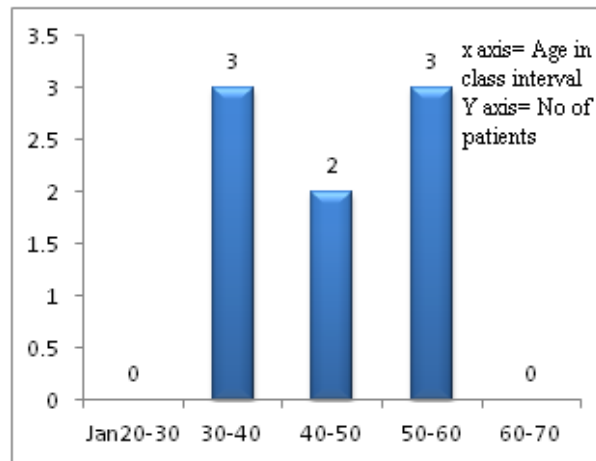
3.2. Mammogram



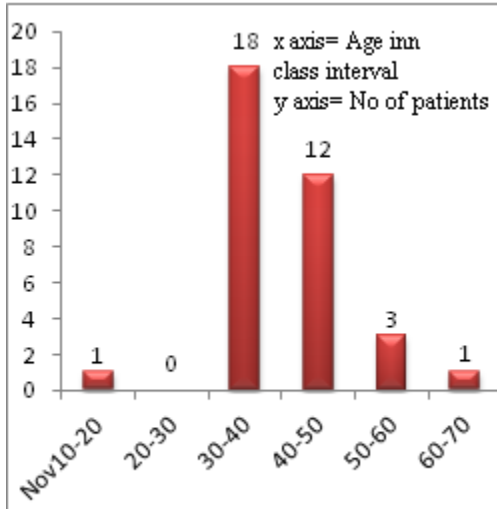
1.1. Thermogram-November 2018



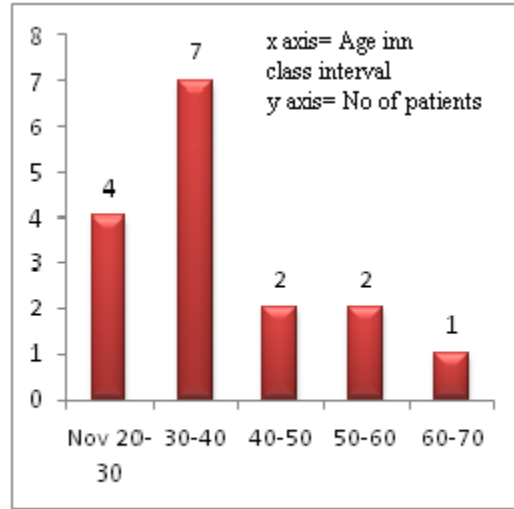
1.2. Thermogram December 2018



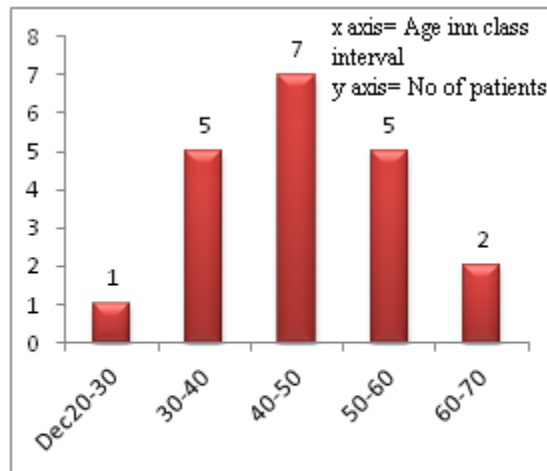
1.3. Thermogram January 2019



2.1. Mammogram- November 2018



2.2. Mammogram-December 2018



2.3. Mammogram-January 2019

Summary and Conclusion

Public health data indicate that the global burden of breast cancer in women, measured by incidence, mortality, and economic costs, is substantial and on the increase. Worldwide, it is estimated that more than one million women are diagnosed with breast cancer every year, and more than 410,000 will die from the disease. In low- and middle-income countries (LMCs), the infrastructure and resources for routine screening mammography are often unavailable.

Although it is not certain which women have been affected, the imbalance suggests that there is substantial over diagnosis, accounting for nearly a third of all newly diagnosed breast cancers, and that screening is having, at best, only a small effect on the rate of death from breast cancer.

Molecular subtype distribution of screen-detected breast cancer differs from that of cancers found outside of screening and accounts in part for the better outcome of screen-detected cancer. Self-

reported data may over-estimate the percentage of the population that has been screened and underestimate the interval since the last cancer detection procedures.

The reduction in mortality from breast cancer in the study cohort is consistent with an effect of the BSE containing Program, though selection bias, inherent in any observational study of screening, provided an alternative explanation for the findings. Triple-negative breast cancers have a more aggressive clinical course than other forms of breast cancer, but the adverse effect is transient. Triple-negative breast cancers have a more aggressive clinical course than other forms of breast cancer, but the adverse effect is transient.

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