Impact of Expert System in Detecting Breast Carcinoma among Women Worldwide with Anxiety due to COVID -19

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ABSTRACT

Breast carcinoma is one of the most often detected cancer in female, every year there we can see more than two million new diagnoses throughout the world. The anxiety with Breast cancer is one of the deadliest and COVID-19 catastrophe has now annexed yet another level to this anxiety. Breast cancer detection is difficult when the woman is in her thirties' and has just began planning a future for herself. Women are generally treated at a later, more advanced stage with poor diagnosis. If it continues then by 2030, this dangerous disease will cause most deaths among women in world than any other disease. The Breast Cancer Detection and medicament Technologies industry has expertise astonishing advancements in 2020 with different crucial techniques and improvements boosting the digital health market. Machine learning and Artificial Intelligence predict disease risk from Breast Carcinoma. There are different methods used in detecting carcinoma at early stages with expert systems such as Computed tomography laser mammography, computer-aided detection, Magnetic Resonance Imaging, Microwave Imaging, Electrical Impedance Scanning, Digital Tomosynthesis Mammography, Sonography, Digital Infrared Imaging etc. An extensive advance in healthcare practice is the incorporation of Clinical Decision Support Systems (CDSSs) to help and assist medical workforce in clinical decision-making, hence developing the quality of decisions and complete patient care while reducing costs. The utilization and operation of CDSSs in Breast Carcinoma care in present situation is gradually increasing. Although there may be variation in how certain CDSSs are developed, the decisions they suggest, and how they are used in medical practice. The Expert System which helps decision-making in Breast Carcinoma treatment is provided along with certain advantages, risks and Challenges for development.

Keywords: *Breast Carcinoma, anxiety, Expert System, Artificial Intelligence, Digital Mammography, COVID-19.*

1.0 Introduction

Expert Systems can study how human brain envisage, grasp, choose and work, when it attempts to solve problems. Various tools and techniques are used in Expert Systems like artificial neural networks, psychology economics statistics, mathematics probability computer science, information engineering etc. Novel technologies are being developed and are more advanced in the detection and diagnosis of breast carcinoma. Medical expert-based systems are computer systems that have been instructed and trained with actual cases to perform sophisticated tasks. Some notable systems include Mycin for infectious diseases, and Internist-1, QMR and DXplain, Oncoin Quantx, e-morph koios medsol, IASST-IHC for general internal medicine.

Breast cancer testing programs are presently executed in most advanced countries and have been shown to rise earlier stage breast carcinoma recognition leading to developed diagnosis and reduction in death rates. Mammography is the most important screening tool for breast cancer for decades with more than billion women being scanned each year around the world.

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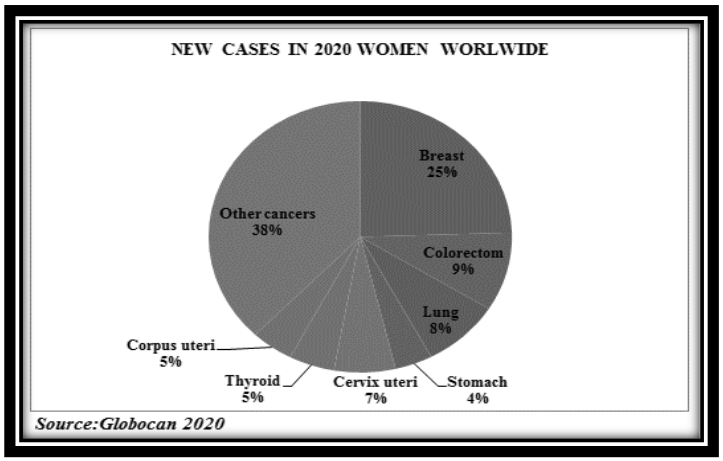
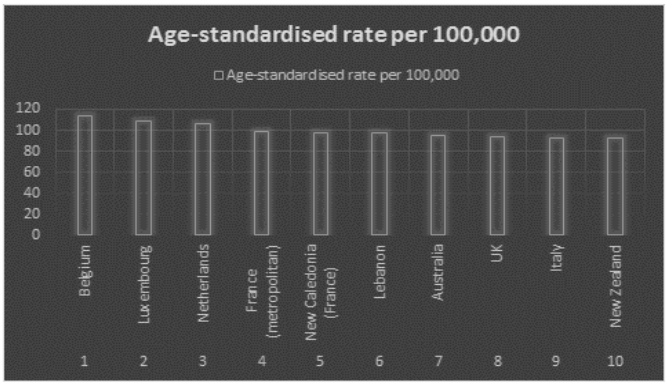
The use of artificial intelligence (AI) in medical imaging, various innovative algorithms based on deep learning have been established and applied to digital mammography. Initial investigations have proved that the use of expert systems or AI systems as contemporaneous readers for analysing mammograms can increase efficiency of the doctors in terms of sensitivity and time. Medical expert systems usually include a knowledge base and rule based inference to generate a differential diagnosis.

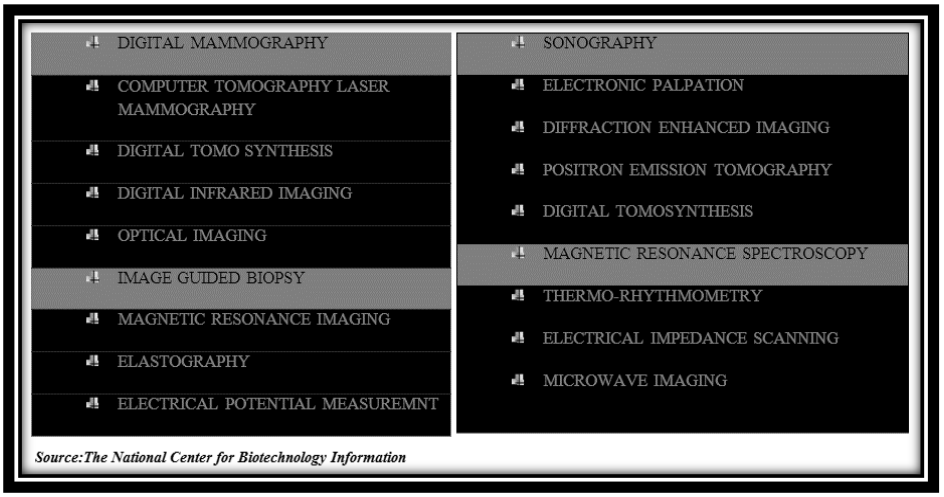




Source: Globacon 2020

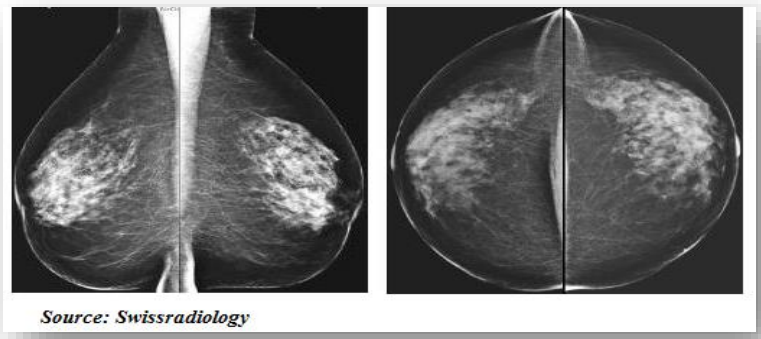
2.0 Types of Expert System in Breast Carcinoma Health care

Breast cancer Detection



2.1 Digital mammography

It is a method for storing x-ray images in digital format contradiction to x-ray film. The images are shown on a computer screen to identify the Carcinoma. The digital images may give better results when compare to regular mammography.



Source: Swissradiology

2.2 Computer tomography laser mammography

It observes the blood circulation of tumours, and the most advantage of this Tomography laser mammography is there will be no breast compression and women feel comfortable while using this type of system. This expert system is designed especially for women who have heavy or dense breasts.

2.3 Digital tomosynthesis mammography

It involves rotating the x-ray machinery in a circle around the breast while taking several images .The method reduces the risk of imbricating structures from a particular angle will abstruse a carcinoma, likely generating abnormalities more noticeable. Presently, the most substantial obstacle to the acceptance of the tomographic technology is the amount of time that it takes to rebuild the image.

2.4 Digital infrared imaging

To do this imaging they increase circulation to the cells by transferring chemical signals to keep present blood vessels open, convert inactive vessels, and produce novel ones .The increased vascular movement repeatedly results in an rise in outward temperatures of the breast near the position of tumour, which can be seen through thermo graphic devices.

2.5 Optical imaging

It is a technology used to see the haemoglobin level, identifying possible malignancies. Imaging the absorption of near-infrared light in breast tissue can quantify the haemoglobin level and amount of blood providing variance between the solid vasculature usually connected with carcinoma and healthy tissue.

2.6 Image guided biopsy

It play a vital part in assisting physicians do breast biopsies, particularly of abnormal regions that cannot be handled but can be imaged on a regular mammogram and also with ultrasound. By use of a computer and perusing devices to get information about the exact place of the image in three magnitudes. A needle is then injected into the breast and a tissue sample is acquired for a complete analysis to test the sample.

2.7 Magnetic resonance imaging

Without use of radiation it involves a strong magnet associated to a computer generates complete images of the breast. Every MRI produces number of images of the breast from all angles. A radiologist then investigates the images to detect abnormal sections that may need further examination. While doing the test the patient lie down on her stomach on the perusing board. The breast hangs into a depression on scanning board which comprises coils that identify the magnetic signal. Clinical trials are being done to decide if MRI is appreciated for screening certain women at high threat for breast carcinoma.

2.8 Elastography

Plotting the mechanical properties such as rigidity or pliability of breast nerve can detect abnormalities that are frequently linked with cancer tumour. This type of cancer discovery is termed as Elastography. Elastography combines mechanical pulsations with imaging modalities like magnetic resonance. So imaging the actions of the breast tissue in reaction to mechanical pulsations can determine abnormalities in the pliability of the breast tumours that may not be spotted by mammography.

2.9 Electrical potential measurement

This method associated to electrodes applied to the skin to take dimensions of electrical potential at different places on the breast. The variance in electric charge is calculated in regions of doubtful conclusions in comparison with electrodes located in a different place on the chest. The irregular development of cancer cells may result in an ionic rise with potassium pushing out of the cells and sodium pushing into cells.

2.10 Sonography (Ultrasound)

Sonography is an imaging system in which high-frequency sound waves are echoed from internal tissues. Their resonances gives an image called a sonogram. Ultrasound is not now used for routine breast cancer screening as it does not constantly notice certain initial signs of cancer such as micro calcifications, a calcium deposits in the breast that cannot be fingered but can be seen on a regular mammogram, and are the most common gauge of ductal carcinoma.

2.11 Diffraction enhanced imaging

In this a silicon crystal is located between the object being studied and the digital indicator where the image is recorded and the crystal diffracts a specific wavelength of x-ray giving two images. The first one is related to x-ray absorption and the second one is related to refraction. Refraction is a procedure where light, including x-rays, diverges in direction slightly due to variances in the thickness of the material it passes through. Hence the combination of these two images give more detail in the nerve and tissue.

2.12 Positron emission tomography (PET)

It is a technique by which cellular and molecular measures can be evaluated. Radioactive tracers injected into the blood to plot the underlying biochemistry. It tests create live computerized pictures of chemical changes of a tissue. An injection is given to a patient that contains sugar and radioactive material. This can be absorbed by cells with higher metabolism, such as tumours. However, this test is limited in identifying metastatic cancer that has moved from the breast to another place in the body. This scans are more precise in noticing larger and more antagonistic tumours linked with metastatic cancers than they are in finding smaller tumours.

2.13 Magnetic resonance spectroscopy (MRS)

This method can calculate the metabolism of pathological specimens and find biochemical variations, which closely connected with the existence of tumours. This method is costly and unverified, and therefore restricted to academic medical research centres.

3.0 Thermorhythmometry

It depends upon similar principles as infrared thermography to support find breast cancer, the method uses a different approach. Here the probes are located on the breast that tests the skin temperature frequently to find differences which may related to neoangiogenesis and carcinoma. To find abnormal levels that could be missed with tests that only observe the breast for a particular time, possibly missing cautionary signs that are only evident by examining the circadian temperature of patients.

3.1 Electrical Impedance Scanning

Various tissues have various levels of electrical resistance Electrical impedance is lower in cancerous breast tissue compared to healthy breast tissue. So electrical impedance scanning devices are used along with regular mammography to support notice breast carcinoma. This scanning device contains of a scanning probe and a computer screen that shows two-dimensional pictures of the breast. It will not emit radiation but very small amount of current, is transferred into the body. The current moves through the breast, where it is tested by the scanning probe and displays as bright white spots on a computer screen. The scanner sends the picture right to a computer, permitting the physician to move the probe around the breast to get the best interpretation of the place where it is being examined.

3.2 Microwave Imaging

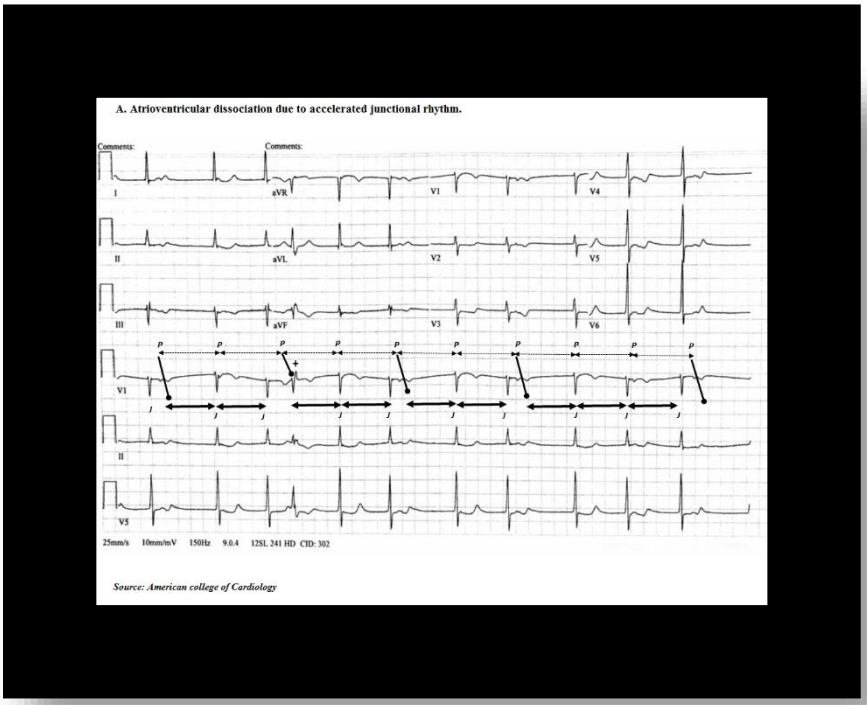
Recording the variances in the electrical properties can be proficient by using low-energy microwaves. Because there will be heavy water content in tumours when we observe with a healthy tissue, variances in breast tissue can be analysed by changes occurred in electrical properties. But micro calcifications, indicates of early breast cancer, can be found much smaller with mammography. Breast cancers have the possibility to show more contrast at microwave frequencies than at the x-ray frequencies which are used for mammograms.

4.0 COVID-19 Anxiety on Breast Carcinoma suffering Women

The COVID-19 disease has resulted severe impacts on people worldwide at different levels and especially on the Women Health. The medical care research and development is anticipated to show a sudden deterioration of women health in lockdown period. Severe stress, fear of death worsen the Breast carcinoma patient's metabolism rate and it can be assumed from the present circumstances brought about by the COVID-19 that the expert system techniques or methods applied on a women may provide how much anxiety and depression they are facing when they exposed to the information regarding this COVID-19 pandemic. The scientists are estimated to slowly improve post-COVID-19, which will current eye-catching chances for expert systems across regions of the world in the next few years to help the doctors in treating the patient's best possible way and reducing the risk of dying. There are various techniques that support people lessen anxiety and depression.

Scientists instructs a computer or expert system to calculate electrocardiograms to predict irregular heartbeat of people. Researchers developed a neural network to study electrocardiogram to find patients at high risk of dying. Expert System can observe electrocardiogram test results, to determine patients at increased threat of irregular heartbeat. This gives more indication that we are on

the margin of a change in medicine where expert systems will be functioning with doctors to advance patient care.



Anxiety and overthinking are frequently used words in present situation as many people are suffering from this kind of stress. But there is no successful application of expert system technology in developing people emotions.

5.0 Recent Developments of Expert System in Medical Care Sector

5.1 India-made MRI Machine by Arjun Arunachalam at Voxelgrids

This device can be transported to any place in India, as well as to remote areas, and possibly take medical imaging to the underserved parts. Peenya hub a healthcare modernization by a small firm promises to give high quality medical imaging, medical diagnosis and treatment accessible to places of India that are medically underserved. MRI machine created by Voxelgrids Innovations Private

Source:https://swarajyamag.com/technology/innovative-india-made-mri-machine-can-make-medical-imaging-affordable-and-accessible

Limited is totally made in India and reduces some of the primary risks linked with common use of MRI in terms of size time and cost.

5.2 OncoStem Development of CanAssist Breast

CanAssist Breast is a prognostic expert system introduced by OncoStem that categorises the patients as low or high-risk based on the patient's threat of breast cancer reappearance over five years. It gives information regarding the risk of reappearance of early-stage, breast carcinoma patient's receptor-positive of hormone. This test examines acute biomarkers in the tumour to measure the danger of reappearance, and assists doctors or oncologists to identify treatment procedure.

5.3 LungXpert by Sasikala Devi

Sasikala Devi,senior assistant professor at SASTRA Deemed University,developed LungXpert, which helps doctors to have early detection of common heart and pulmonary diseases.

5.4 SigTuple Technologies

SigTuple Technologies that has leveraged expert systems including robotics and data science to advance smart screening solutions, to make healthcare inexpensive as well as precise and accessible for all.

5.5 Artivatic.ai by Layak Singh

Artivatic.ai won the challenge in the medical care sector with their invention DARVIN, which is devoted to healthcare. This DARVIN, platform designed for hospitals, healthcare institutions, insurance companies, patients, clinics and more.

6.0 Conclusion

Expert systems that have been trained with live cases to perform complicated tasks. A number of medical expert systems techniques are there and can act as assistants to doctors, clinicians, assisting in laboratory analysis. This clinical examination proved that the concurrent use of this expert systems techniques improved the diagnostic performance of doctors in the recognition of breast carcinoma without delaying their workflow. Expert systems are helpful for decision making issues and very essential for healthcare prognosis. The expert systems is proficient in facing, challenging decisions and issues.

Even tremendous technology introduced in market the cases and deaths rates is gradually increasing from many decades because of lack of awareness about the technology or self-testing and not taking proper precautions. There can be conducted lots of programs especially in rural areas to get awareness of deadliest diseases and early detection by this expert systems may help many women in the world and may reduce the breast cancer risk.

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