IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

PERSONALIZED MEDICINE FOR BREAST CANCER: A REVIEW

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Abstract: Personalized medicine, also known as precision medicine, is a type of medicine that uses information about a person's genes or proteins to prevent, diagnose or treat disease. What do most consumers know about personalized medicine? Only four out of 10 had heard of self-medication, and 11% said their doctor had discussed or recommended self-medication for them. The goal of personalized medicine is to improve treatment outcomes and reduce side effects that are important to both patient’s [1].The concept of personalized medicine can be used for new and changing treatments.Personalized medicine relies on the study of disease biology and uses predictive tools to assess health risks and create personalized health plans to help patients reduce risk, prevent disease, and treat disease exactly when it occurs.

***Key words* - Genetic study, Effective Treatment, Biomarkers, Breast cancer, Healthy Medicine.**

I. Introduction

Precision medicine provides a more scientific approach to the diagnosis and classification of diseases and leads to better treatment. The concept of personalized medicine can be used for new and changing treatments. Not only will it improve patient’s lives, but it will also increase the value of health by providing "the right treatment to the right patient at the right time with the right dose" Precision medicine for breast cancer is a diagnosis, treatment, and prevention approach that takes into account the genes you are born with (your genetic makeup) and the genes or other markers found in cancer cells. With this method, your blood or lymph nodes are collected for analysis, usually genetic analysis [2].

Personalized medicine is a treatment decision based on the characteristics of each patient. The approach is based on a scientific understanding of how an individual's molecular identity and genetic characteristics predispose to certain diseases. Precision medicine has many opportunities to improve the future of healthcare. While precision medicine is currently most heavily involved in oncology, it has a large and exciting list outside of oncology and advanced diseases, such as rare diseases and genetics, and holds some promise in the treatment of COVID-19.

Personalized Medicine (PM) or Precision Medicine in Oncology is a new approach to cancer treatment and prevention that uses genetics, the tumor (immune) environment, and the lifestyle and health of all people diagnosed with cancer. Biomarkers are important for the development of personalized or precision medicine. Biomarkers can be used in drug development (e.g., patient selection) or therapy, such as determining the best device or drug for a patient based on the presence or absence of certain biomarkers [2].

Personalized medicine offers pharmaceutical companies great opportunities to develop molecularly targeted drugs, as well as to optimize and reuse existing drugs and combination therapies. Personalized medicine will revolutionize diagnosis and treatment and increase patient engagement during and after treatment. For example, screening for prostate cancer allows patients to choose whether to seek immediate treatment but risk complications and discomfort or wait until symptoms appear.This aspect of personalized medicine includes the patient's condition, as the effect of treatment strategies is appropriate for them as a person, not just a patient.

II. Aim of Personalized Medicine:

The aim of personalized medicine is to detach from a "one-size fits all approach" and improve patient health by individualization to achieve the best outcomes in disease prevention, diagnosis and treatment.

Examples: Examples of personalized medicine include using targeted therapies to treat specific types of cancer cells, such as HER2-positive breast cancer cells, or using tumor marker testing to help diagnose cancer.

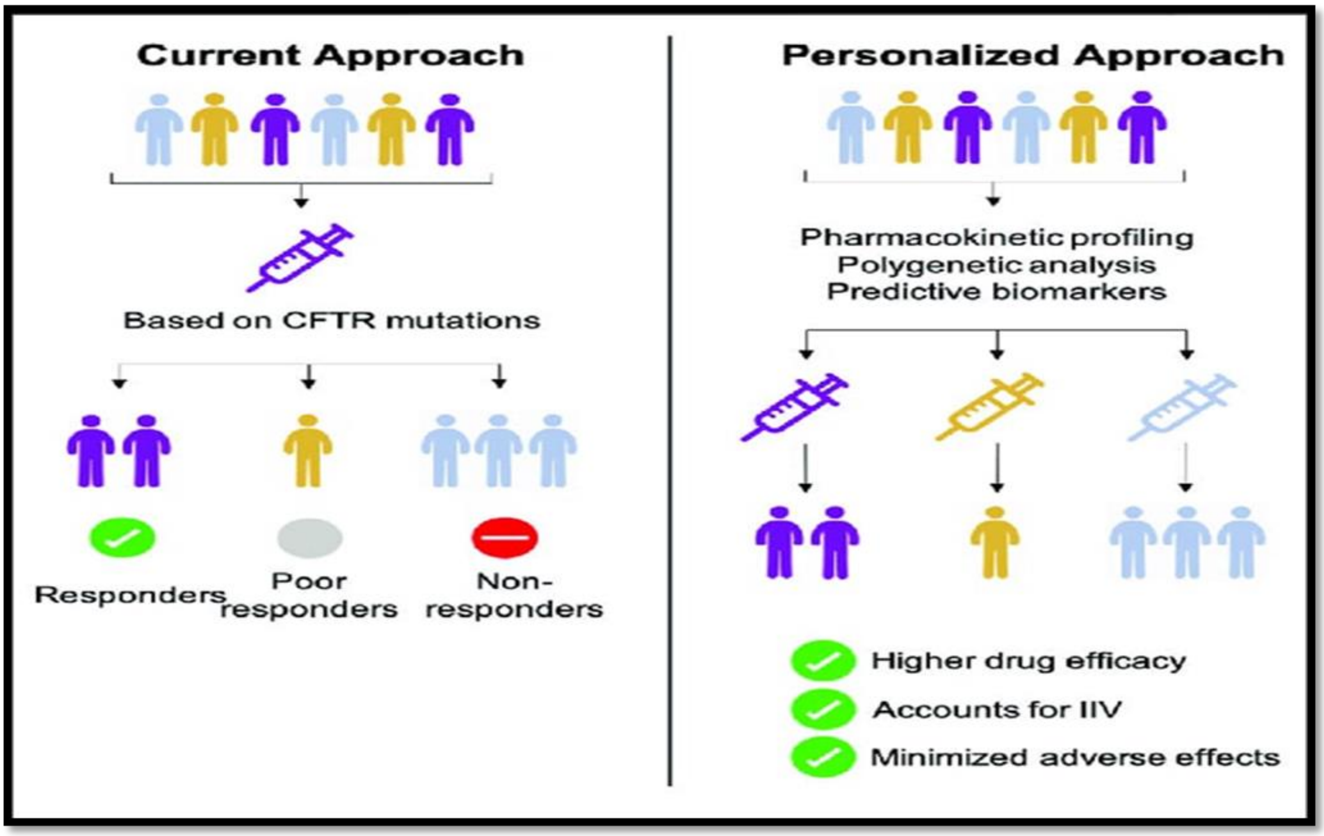

Fig. 1 Current Approach & Personalized Approach [8]

III. Application:

- More effective treatment.
- Improved side effect profiles.
- Reduced use of invasive testing procedures.
- Reduce health care cost
- Improve quality of life.
- Inform people about genetic risk.

Pharmacogenomics is an important aspect of personalized medicine. The underlying idea is that individual differences in drug response are due to many factors, including genomics, epigenetics, and environment and patient characteristics such as gender, age, and/or drug combinations. Precision medicine is a way in which doctors can provide and plan tailored care to patients based on the genes, proteins, and other substances in their bodies. This method is also sometimes called self-medication or self-care. Self-medication will lead to increasingly balanced health, access to routine health care, improved self-management of personal health information, and economic development in health [3].

P4 [Predictive, Preventive, Personalized, Participatory] Medicine is a new concept of medical models based on multivariate data and machine learning algorithms to implement public health services and protect the health of the population with a focus on health and well-being. Health Precision medicine is a growing field where doctors use diagnostic tests to determine which drugs are best for each patient or use treatments to alter the molecular processes that affect health.

Personalized Medicine is a medical model that combines prevention, personalization, participation and assessment. It is a way to improve treatment by identifying diseases that make up the face of one's genome. One type of prescription medicine may not work well for everyone who uses it. Precision Medicine can predict whether a treatment will work for you, and if it doesn't, your doctor won't prescribe it. This is why precision medicine will be better for your illness than medicine that treats everyone the same [4].

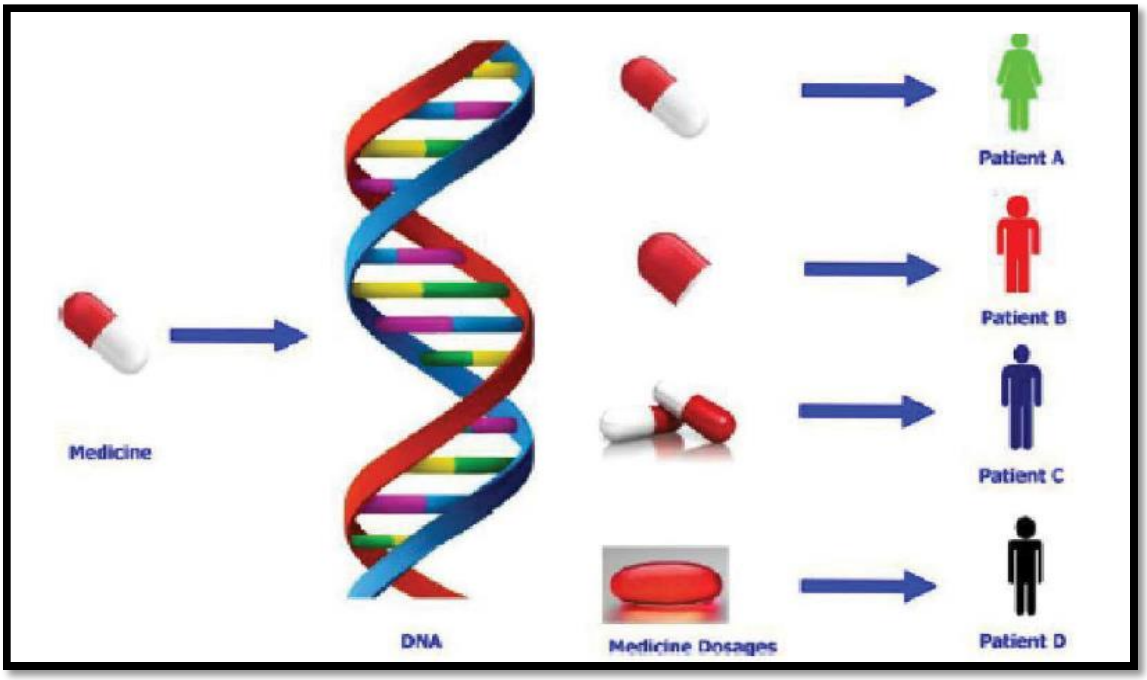

Fig. 2: Personalized Medicines [8]

Combining the CRISPR/Cas9 system with next-generation sequencing (NGS) has the potential to rapidly target cancer. Gene editing technology using CRISPR/Cas9 relies on the creation of double-strand breaks (DSBs) in specific genome segments that are then repaired by cellular mechanisms.

IV. Personalized Medicine used in Brest cancer:

Breast cancer is cancer that starts in breast cells. There are many different types of breast cancer, each with its own characteristics and treatment options. Personalized medicine is being used more and more in the treatment of breast cancer, especially when conventional treatments have failed. One of the most promising aspects of personalized medicine for breast cancer is the use of genetic testing to identify specific genetic changes that can cause the tumor to grow.

For example, some breast cancers are driven by mutations in the BRCA1 or BRCA2 genes involved in repairing DNA damage.

Other genetic mutations that may play a role in cancer include HER2, PTEN, and TP53. Once a genetic mutation has been identified, targeted therapies can be used to block the activity of the mutated gene or associated proteins.

For example, drugs such as trastuzumab (Herceptin) and pertuzumab (Perjeta) target the HER2 protein, which is overexpressed in some types of breast cancer [5].

In addition to genetic testing, other approaches to personalized medicine in breast cancer may include:

- **Imaging:** Advanced imaging techniques such as magnetic resonance imaging (MRI) can be used to determine the characteristics of the tumor, such as its size, location, and blood. This information can be used to inform medical decisions.

- **Hormone therapy:** Some types of breast cancer are hormone receptor positive, meaning they take hormones such as estragon or progesterone. Hormone therapy can be used to block the action of hormones, which can slow or stop tumors.

- **Chemotherapy:** Chemotherapy is a cancer treatment in which drugs that fight cancer are used.A personalized approach to chemotherapy may involve the use of genetic testing to determine which drugs are best for cancer.

- **Immunotherapy:** Immunotherapy is a cancer treatment that uses the immune system to kill cancer cells. A personalized approach to immunotherapy would involve the use of genetic testing to identify specific proteins on the tumor that can be targeted by immunotherapy [15].

Overall, personalized medicine is an exciting and rapidly developing field with great promise for the treatment of breast and other cancers. By tailoring treatment plans to each patient, we can improve outcomes and reduce the burden of cancer treatment-related side effects.

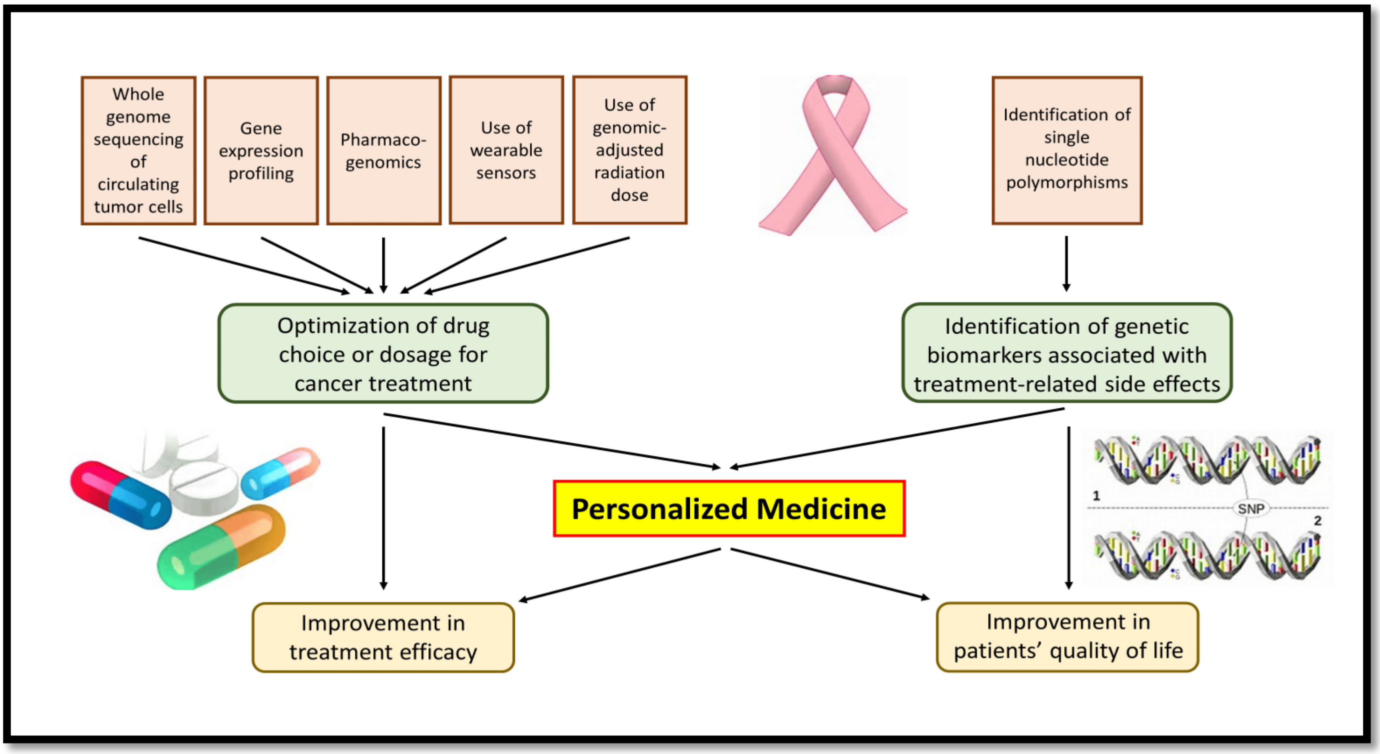

Fig. 3: Personalized Medicine used in Breast Cancer [8]

Here are some examples of how personalized medicine is being used in breast cancer treatment:

- **Genetic testing:** One of the most important tools in personalized medicine is genetic testing. Women who have a strong family history of breast cancer or who have certain genetic mutations (such as BRCA1 or BRCA2) may be more likely to develop the disease. Genetic testing can help identify these women, so they can take steps to reduce their risk or undergo more frequent screening. It can also be used to guide treatment decisions, as certain genetic mutations may affect a person's response to chemotherapy or other therapies.

- **Hormone receptor testing:** About two-thirds of all breast cancers are hormone receptor-positive, which means they have receptors for estrogen or progesterone. Hormone receptor testing can help determine whether a woman's cancer is likely to respond to hormone therapy, which works by blocking the effects of these hormones. If the cancer is hormone receptor-positive, the woman may be a good candidate for drugs like tamoxifen or aromatase inhibitors.

- **Targeted therapies:** In addition to hormone therapy, there are several other targeted therapies that are used in breast cancer treatment. These drugs work by targeting specific proteins that are involved in the growth and spread of cancer cells. For example, Herceptin (trastuzumab) targets HER2-positive breast cancer cells, which are more aggressive and less responsive to traditional chemotherapy. Other targeted therapies include PARP inhibitors, which are used in women with BRCA mutations, and CDK4/6 inhibitors, which can help slow the growth of hormone receptor-positive breast cancers.

- **Immunotherapy:** Immunotherapy is a newer type of cancer treatment that works by boosting the body's immune system to help fight the cancer. In breast cancer, immunotherapy is most commonly used in women with triple-negative breast cancer, which does not have receptors for estrogen, progesterone, or HER2. Drugs like Keytruda (pembrolizumab) and TelCentris (atezolizumab) have shown promising results in clinical trials, but they are not yet approved for routine use [14].

Personalized breast cancer treatments are superior to older treatments in several respects:

- **Enhanced diagnosis:** Personalized treatments that use genetic testing and other urine technologies to provide more accurate breast cancer diagnosis. This allows doctors to identify the type of cancer a patient has and tailor treatment to their individual needs.

- **More treatments:** Personalized medicine allows doctors to use treatments designed to attack the characteristics of a patient's cancer cells. This means treatments are better and have fewer side effects than older, more common treatments

- **Better outcomes:** By using personalized medicines to treat patients, doctors can achieve better outcomes in terms of survival and quality of care. Good results live. Patients are more likely to respond to treatment and are more likely to remain cancer-free for longer.

- **Fewer side effects:** Personalized medicine allows doctors to use treatments that have fewer side effects than older treatments. This means that patients are able to achieve a better quality of life during and after treatment.

- **Cut costs:** Although self-treatment can be expensive, it can still provide cost savings in the long run. By tailoring treatment plans to patients, doctors can avoid expensive drugs that may not work. This reduces the overall cost of treatment and helps make treatment more affordable [6].

V. Challenges:

Personal medicine has many challenges, notably getting approval for routine use by various regulatory agencies. There are also many problems with the widespread acceptance of personalized medicine by different healthcare providers such as doctors, healthcare administrators, insurance companies and eventually patients [9].

- No response to treatment.
- Patients delay treatment that is better for them.
- Destroy the drug itself.
- Avoidable adverse drug reactions.

Many of the perceived risks, lack of evidence for accurate measurement and effective treatment; less information about patients leading to more approval; the poor and minorities may not have access to precision medicine; misuse of information by insurance companies [12].

Ethical issues in precision medicine are, Patient understanding of outcomes, potential for patients to make health decisions based on incomplete information, distrust of adverse outcomes and impact on health preservation, lack of data from prospective studies showing better clinical outcomes, Insufficient technology, less knowledge and research gap, integration of precision medicine into routine medicine is a big problem for creation of collective assets providing education and training. Inequalities in care and lack of names

Some of the major issues include the high costs associated with authentic medicine, fear of genetic discrimination, poor health and interpretation of genetic data, access and availability of genetic testing, and relative shortages of medical staff.

VI. Role of the pharmacist in personalized medicine:

An important part of the pharmacist's job is to prescribe personalized medicine according to the patient's age, height, physical activity, joint treatment, diet, allergies and disease status. Doctors also provide personalized medicine through drug screening. The pharmacist's role in medicine is to take all the information available about the patient and use it to recommend the best and most effective treatment plan. Now pharmacists can use the patient's previous medical history; various key controls; physical characteristics of the patient such as height, weight, gender; and patient preferences to recommend the correct drug and dose. In the future, pharmacists will be able to access each patient's medical records and add information that can be used in treatment recommendations. The genome tells the pharmacist a lot. He can tell them that patients are more likely to have cancer or heart disease not particularly helpful in deciding which medication to use for an infection or migraine.

The genome will tell the pharmacist that the patient does not have a particular enzyme used to metabolize the drug, or that the patient may have an additional enzyme that metabolizes the drug. This information will be most helpful. The current model for determining the dosage of the drug is essentially a trial and error process that works well in most situations, but the obvious downside is that it's not "accurate". Every once in a while, someone takes a drug that should be safe but is somehow unsafe. In these cases (except for certain allergies), the basis of the unexpected drug reaction is often genetic.

These dangerous situations can be avoided by providing good access to the patient's genetic information. This should result in fewer doctor visits, fewer emergency room visits and fewer deaths while promoting better medical outcomes [40].

VII. Future:

Consider taking a pill to solve multiple problems at once. Personalized medicine will lay the groundwork for this by generating a wealth of knowledge about what works and what doesn't. The availability of modern biomedical tools such as DNA sequencing, proteomics, and wireless monitoring devices has made it possible to detect these changes, essentially demonstrating the need for some personalized treatment of these drugs.

Personalized medicine aims to use the knowledge gained in the genetic and biological processes of diseases, with special consideration to the needs of the patient, to make treatment safer and more effective [25]

Precision medicine has many opportunities to improve the future of healthcare.

It currently has the most widespread and exciting use of oncology and advanced diseases such as precision medicine, rare diseases and genetics in oncology, and also shows promise in the treatment of COVID-19.

Outlook The world's private pharmaceutical industry is valuable. It reached US$300 billion in 2021 and is expected to reach US$869.5 billion in 2031, with a CAGR of 11.2% from 2022 to 2031. Precision medicine already has many opportunities to improve healthcare in the future. Although precision medicine is currently at its best in oncology, it has wide, exciting applications outside of oncology and advanced diseases such as rare and genetic diseases, and there is also some promise in the treatment of COVID-19 [7].

The future prospects of precision medicine depend on it. How we incorporate these technologies and the knowledge and skills needed to use them in healthcare. This means research is done to understand relevant information and whether changes in patient management are effective.

Physicians are increasingly using patients' genetic and other molecular data as part of routine medical care. Develop the ability to predict which treatment is best for an individual patient. To better understand the mechanisms underlying the development of various diseases [8].

VII. Conclusion:

In the future, using a personalized approach, each person will receive complete genomic information at birth and include it in their medical record. This information will enable doctors and therapists to use treatment more effectively depending on the patient's exposure to different diseases. Precision medicine must be involved in the international process of strategies to treat and improve patients' health. Precision medicine must be involved in the international process of strategies to treat and improve patients' health. If identity is a continuous process in which a person retransforms various objective data, assigns meanings to them, and thus creates his own way of being human, then the medicine, rather than the identity of the individual, may be the identity of the information he provides. .

The revolution in healthcare can only be achieved by patients and consumers participating in clinical trials, entrepreneurs and innovators creating smart devices and analyzing data genetics, and regulators by educating consumers and providers and promoting change in healthcare. Policy and management, physicians understand disease at the molecular level, academic researchers discover new insights into the molecular basis of disease through new research and support, execute drug development plans, IT departments collect and protect patients by developing special electronic equipment, new diagnostic equipment, stakeholders, payers and Types of treatment and other treatments to inform policy makers of personal suffering. The availability of modern biomedical technologies such as DNA sequencing, proteomics, and wireless monitoring devices has made it possible to detect these changes, essentially demonstrating the need for some personalized treatments for these drugs

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