

The power of precision

Examine the trends, research and innovations, and the future outlook of precision medicine in India

BY NAGESH JOSHI



Dr Arun R Warriar,
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The core approach of Sushruta, the ancient Indian physician, was to offer personalized treatment by understanding a patient's unique constitution first. Similarly, in modern healthcare, precision medicine is all about taking a personalized medication approach to treat a disease. Precision medicine factors in individual differences in genes, environments, and lifestyles to customize disease prevention and treatment to the specific needs of each patient, maximizing therapeutic effectiveness and minimizing side effects.

Dr Arun R Warriar, Senior Consultant - Medical Oncology, Aster Medcity, Kochi, says, "The goal of precision medicine is to target the right treatments for the right patients at the right time. In Oncology, targeted therapy drugs like TKIs, Immunotherapy are given by the medical oncologists. Radiation doctors have Cyberknife, Stereotactic Radiosurgery (SRS), Proton therapy to deliver focused radiation."

According to Dr Sewanti Limaye, Director of Medical & Precision Oncology, Sir HN Reliance Foundation Hospital, precision

medicine relies on genetic testing, including companion diagnostics and pharmacogenomics, to identify specific genetic variations to optimize treatment plans. It encompasses targeted and immunotherapies that focus on specific molecular characteristics of diseases like cancer and involves personalized prevention and screening strategies based on genetic risk profiling and lifestyle assessments, says Dr Limaye.

Dr Nikhil Mathur, Chief of Medical Services, CARE Hospitals Group, says that precision medicine includes companion diagnostics, targeted therapies, immunotherapy, and gene therapy. "Companion diagnostics help determine if a patient is likely to benefit from a particular treatment or not, while targeted therapies are drugs that target specific molecular pathways involved in cancer or other diseases." Similarly, immunotherapy uses body's immune system to fight diseases and gene therapy corrects genetic defects

The adoption trends

The adoption of precision medicine in India is gaining momentum, spurred by



Dr Sewanti Limaye, Director of Medical & Precision Oncology, Sir HN Reliance Foundation Hospital



Dr Preetam Jain, Medical Oncologist, Bhatia Hospital



Dr Nikhil Mathur, Chief of Medical Services, CARE Hospitals Group

increasing private sector investments in research and development and the rising incidence of chronic diseases. While India is still in the early stages of deploying precision medicine, experts predict significant growth in the market in the coming years.

Dr Niti Krishna Raizada, Senior Director - Medical, Oncology & Hemato-Oncology at Fortis Hospitals, Bengaluru, says that precision medicine adoption in India is still in its nascent stages. However, the market is predicted to grow rapidly, with the Indian precision medicine market expected to reach \$7.3 billion by 2028.

Abhimanyu Roy, Executive Director, Avalon Consulting, shares some statistics. "The global precision medicine market is expected to grow from \$80 billion in 2022 to \$168 billion by 2028, indicating 13.3 percent CAGR. In India, it is likely to be valued at around \$2 billion in 2022, exhibiting a CAGR of 14 percent until 2028, and reach \$4.4 billion, approximately."

In India, precision medicine's adoption has been driven by technological advancements, increased accessibility to genetic testing, and the growing demand

for personalized healthcare. Observing that precision medicine has gained substantial adoption, both globally and in India, Subodh Gupta, CEO, Lord's Mark Microbiotech, estimates the global market to be \$73.49 billion in 2022 and forecasted to reach \$175.64 billion by 2030, indicating 11.5 percent CAGR.

Citing report published by Strategic Market Research, Dr Vinay Bhatia, Head of Molecular Biology at Oncquest Laboratories, Gurugram, informs that North America dominates the precision medicine market with a 40 percent revenue share due to the rising prevalence of chronic diseases, massive expenditure on R&D, and growth in demand for precision medicine. "Examples include using targeted therapies to treat specific types of cancer cells, such as mutated epidermal growth factor receptor (EGFR) proteins in lung cancer or amplified human epidermal growth factor receptor (HER2) proteins in breast cancer. Precision medicine's day-to-day applications in cancer care continue to grow," Dr Bhatia says.

With cancer rates on the rise, precision medicine offers tailored treatment options



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based on specific genetic variations, leading to more effective disease management. The precision medicine market's robust growth is driven by the increasing number of treatment candidates in clinical trials and the rising prevalence of genetic diseases.

The Asia Pacific region, including India, is expected to experience lucrative growth due to low-cost clinical trials and a growing economy. In India, the government initiatives and investment in healthcare facilities and techniques may further fuel the demand for precision medicine.

"With more accurate individualization of diagnosis, prognosis, and therapy estimations for each patient utilizing sophisticated genetic diagnostics and imaging made feasible by recent technological advancements, precision medicine represents an extension of traditional personalized care," opines Dr Avinash Phadke, President and Mentor, Agilus Diagnostics Ltd (Formerly SRL Ltd).



The role of the regulator

A few initiatives by the Indian government have been directly or indirectly helping the field of precision medicine grow. One such initiative is the Indian Genome Variation database project started in 2003. This project has provided valuable genetic data on over a thousand genes from 15,000 individuals across different regions of India. The Genome India Project, launched in 2020, is another initiative that aims to collect 10,000 genetic samples to build a reference genome and further advance precision medicine.

The UMMID program, introduced in 2019, focuses on managing inherited genetic disorders through NIDAN Kendras, which provide training, screening, and comprehensive clinical care for pregnant women and newborns. This program aims

to address genetic disorders proactively and ensure early intervention. The National Digital Health mission, also launched in 2019, is another major step towards promoting a digital health system and the use of clinical decision support systems. This platform will facilitate the collection and storage of patient data, enabling better support for precision medicine initiatives.

The government's role in subsidizing tests and treatments based on their potential to improve population health outcomes has positively impacted various forms of cancer treatment. For instance, the treatment of chronic Myeloid Leukemia now costs approximately INR 3,000-4,000 per month, making it more accessible to patients.

The National Biopharma Mission, launched in 2017, is another



significant initiative that accelerates biopharmaceutical research and development in the country. It aims to strengthen the scientific and clinical research ecosystem, develop infrastructure for biopharma manufacturing, and promote entrepreneurship in the sector, including precision medicine.

However, the growth of precision medicine in India also faces certain challenges. The complex intellectual property rights regime makes it difficult for companies to protect their innovations and investments. To address this issue, the government is taking steps to streamline the regulatory environment for biopharmaceuticals, facilitating easier development and manufacturing of precision medicine products.

Advantages of precision medicine

Dr Preetam Jain, Medical Oncologist, Bhatia Hospital, says that precision medicine offers numerous benefits. It provides personalized therapy unique to each individual, better understanding of cancer behavior, simplified treatments, avoidance of unnecessary chemotherapy and related side effects, improved disease control, and enhanced overall survival.

One significant advantage of precision medicine is the improvement in the diagnosis and medical management of diseases. Abhimanyu Roy of Avalon Consulting says that with early improvements seen in well-studied diseases and potential advancements in treating a greater number of conditions. Genome sequencing, a key component of precision medicine, plays a vital role in identifying, tracking, and controlling infectious disease outbreaks. It enables doctors and public health officials to accurately diagnose and treat affected individuals. Newborn screening, another application, helps identify medical conditions early, reducing the risk of complications and improving infant health outcomes.

Biomarker testing and pharmacogenomics are instrumental in tailoring treatment plans to individual patients. Biomarker testing guides the selection of personalized treatments for cancer patients based on specific genetic or other alterations in tumors. This approach helps improve treatment efficacy and predict cancer recurrence, influencing treatment decisions like chemotherapy or radiation therapy. Pharmacogenomics, on the other hand, studies how an individual's DNA influences their response to drugs, enabling doctors to prescribe the most effective and safe medication and dosage for each patient.

Raghavendra Goud Vaggu, Global CEO, Empe Diagnostics, says, "With precision medicine, doctors can select therapies that have a higher chance of success based on a patient's genetic profile or biomarker



Raghavendra Goud Vaggu, Global CEO, Empe Diagnostics



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status. This targeted approach improves treatment efficacy and reduces the risk of adverse effects." Early detection and intervention, facilitated by precision medicine, lead to better outcomes and potential disease prevention."

Says Dr Vinay Bhatia of Oncquest Laboratories, "Precision medicine enables clinicians to tailor medical treatments to a patient's genetic profile and specific biomarkers targeting the specific genes and proteins involved in the growth and proliferation of cancerous cells, thus, optimizing patient outcomes and safety. In oncology, precision medicine offers targeted therapies that focus on molecular targets in tumors, reducing damage to healthy cells. Personalized treatment plans based on genetic makeup and tumor features ensure patients receive the most effective treatments for their specific cancer subtype."

"By reducing treatment toxicity as therapies are tailored to address the underlying genetic abnormalities driving the cancer, precision medicine minimizes the adverse effects and harm to healthy cells, enhancing patient well-being during treatment," says Dr Bhavin Visariya, Senior Radiation Oncologist, HCG Cancer Centre, Mumbai. Precision medicine also aids in the early detection and diagnosis of diseases, particularly through genetic testing and screening techniques. By identifying genetic abnormalities or mutations linked to specific tumors, clinicians can initiate early interventions. Precision medicine, he observes, also improves clinical trials by focusing on certain molecular abnormalities and selecting patient subgroups that are likely to benefit from novel therapies. Prognostic and predictive biomarkers enable medical decisions, helping clinicians select the most suitable treatment for each patient.

Key trends in India

According to Dr Nikhil Mathur of CARE

Hospitals Group, the growing investment is essential for advancing the field, enabling the development of innovative technologies and treatments tailored to individual patients.

The adoption of precision medicine products is another prominent trend in India. With an expanding range of precision medicine products available and growing awareness of their benefits, healthcare providers and patients are increasingly embracing these personalized solutions. "There has been a growing awareness among patients and healthcare providers of precision medicine in India. This is being driven by the increasing availability of information about precision medicine and the growing number of clinical trials being conducted in India," says Dr Niti Krishna Raizada of Fortis.

Precision medicine is gaining significant traction in the field of oncology in India. Raghavendra Goud Vaggu of Empe Diagnostics observes that genetic testing, including prenatal testing, carrier screening, and diagnostic testing, are becoming accessible and widely used. This enables the identification of genetic predispositions, aiding in personalized treatment decisions.

Development of indigenous genomic databases and research are happening to address its unique genetic diversity, informs Dr Sewanti Limaye of Sir HN Reliance Foundation Hospital. While AI and ML help analyze genomic data, telemedicine, and other digital technologies help improve the access to precision medicine. The Indian government has launched initiatives such as the National Genomic Grid to establish a national network for genomic data sharing and analysis, she informs.

However, for precision medicine to gain rapid adoption, a wider section of healthcare providers must learn about molecular genetics and biochemistry, opines Dr Sandeep Goyle, Head, Medical Oncology, Kokilaben Dhirubhai Ambani Hospital, Mumbai. "If precision medicine

approaches are to become a part of routine healthcare doctors and other healthcare providers will need to know more about molecular genetics and biochemistry. They will increasingly need to interpret the results of genetic tests and understand how this information is relevant to treatment approaches and convey this knowledge to patients," he warns.

A few shortcomings

Highlighting the shortcomings of precision medicine, Dr Muzammil Shaikh, Director - Medical Oncology, Nanavati Max Super Speciality Hospital, says, "Accessibility of advanced diagnostic tests in tier-2 cities is often limited. Moreover, the high costs associated with several of these tests put them out of reach for many patients."

Dr Prasant Chandra, Assistant Professor - Surgical Oncology, DPU Private Super Specialty Hospital, Pimpri, Pune, agrees and sheds light on how expensive these treatment plans can be for patients. "The total cost of these treatment plans range from Rs 12 lakh to Rs 24 lakh per patient every year. Moreover, lack of government support and limited insurance coverage make it further unaffordable for many patients."

Another significant challenge lies in the limited number of actionable mutations found in cancers. Dr Arun R Warriar of Aster Medcity points out that only five to ten percent of cancers have actionable mutations, making targeted drugs available for a small percentage of patients today. Moreover, the resistance to drugs may develop over time, rendering them ineffective.

Illustrating this point further, Dr Bhavin Visariya of HCG Cancer Centre, says that finding precise molecular targets in all cancers is challenging, and tumor heterogeneity and resistance to targeted drugs are other significant concerns. "Limited access to molecular testing, cost and reimbursement challenges,

interpretation of genetic data, and privacy and ethics issues pose barriers to widespread adoption."

Collaboration and data integration are critical for effective precision medicine implementation. Dr Avinash Phadke of Agilus Diagnostics believes that there needs to be greater collaboration amongst companies to avoid data duplication and to accelerate research. Inadequate funding and IT infrastructure also hinder the assimilation of precision medicine technologies into healthcare practice globally.

Research and innovations

Precision medicine is witnessing continuous research and innovation, with new findings published almost daily. Efforts in cancer research, for instance, focus on identifying specific molecule-changes causing cancers and targeting particular mutations, observes Dr Prasant Chandra of DPU Private Super Specialty Hospital. At DPU Private Super Specialty Hospital, he informs, researchers are striving to pinpoint mutations or molecular targets responsible for head and neck cancer and breast cancers.



Dr Avinash Phadke, President and Mentor, Agilus Diagnostics Ltd



Dr Muzammil Shaikh, Director - Medical Oncology, Nanavati Max Super Speciality Hospital





Dr Bhavin Visariya,
Senior Radiation
Oncologist, HCG
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Other research areas include the development of new diagnostic tests utilizing gene sequencing and proteomics technologies. Researchers are also exploring novel treatment options targeting specific molecular pathways, such as the use of immunotherapy.

An upcoming innovation is liquid biopsy, which involves testing mutations in a patient's blood sample. This non-invasive approach reduces the need for potentially unsafe invasive biopsy tests. Researchers are studying circulating tumor cells in the blood as a means of tracking cancer relapse during follow-up. Early detection of cancer recurrence before visible masses appear on scans allows for better disease control.

Future outlook

"With advancements in technology and increasing awareness, precision medicine is set to revolutionize healthcare in the country," says Subodh Gupta of Lord's Mark Microbiotech. "Going forward, big data analytics and AI will enhance the ability to analyze complex patient information and provide personalized treatment recommendations. The development of cost-effective genomic sequencing methods will enable better understanding of genetic variations and their impact on disease susceptibility and treatment response. The expansion of digital health platforms

and telemedicine services will improve access to precision medicine across diverse populations, including rural areas," he says.

According to Dr Arun R Warriar of Aster Medcity, the availability of affordable tests and generic medicines are expected to create a big impact in the management of advanced cancers. "With ongoing research and the development of innovative medications, precision medicine is gaining momentum in the country. Research institutions are now investing in this field, fostering collaborations leading to targeted therapies for genetic mutations and biomarkers," says Dr Sandeep Goyle of Kokilaben Dhirubhai Ambani Hospital.

With increasing awareness and advancements in genomics, there will be a greater emphasis on personalized diagnostics, targeted therapies, and preventive strategies, says Dr Sewanti Limaye of Sir HN Reliance Foundation Hospital. "Indigenous genomic databases will help uncover population-specific genetic variations and disease risk factors. Efforts to enhance affordability and accessibility, along with patient empowerment and education, will further drive the adoption of precision medicine. Collaborations among stakeholders and partnerships will foster innovation and accelerate progress in this field," she concludes. 