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A Review Of Current Research In Precision Medicine And Gene Therapy

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Abstract

Personalized and effective therapies for a variety of genetic and chronic disorders are promised by the rapidly developing fields of precision medicine and gene therapy in the healthcare sector. With a rising number of academic institutions and biotech firms committed to promoting these cutting-edge technologies, India is one of the world's leaders in the fields of precision medicine and gene therapy.Since the government began promoting personalized medicine and genetic research, India has made major advancements in the field of precision medicine.In the same direction, gene therapy is also gaining popularity in India, where several clinical trials are being carried out for the treatment of genetic disorders such thalassemia, sickle cell anaemia, and congenital blindness. The Indian government has also started initiatives to promote the study and development of gene therapy. In India, the fields of precision medicine and gene therapy are expanding quickly, and substantial progress has been made in the development of individualised and efficient therapies for a variety of genetic and chronic disorders.

Keywords: Precision Medicine, Gene Therapy, Genetic Disorders, Clinical Trials, Personalized Therapies, Healthcare Sector

Introduction

The advancement of precision medicine and gene therapy has advanced significantly in India. This development has been significantly aided by the creation of the IGVC and government programmes to support genomic research and personalised medicine. Personalised precision medicine has advanced significantly with the introduction of gene therapy therapies for a variety of hereditary illnesses. To overcome the difficulties created by India's genetic variety and ensure the provision of individualised care through genetic counselling, more research is required.With individualised and successful therapies for inherited and chronic disorders, precision medicine and gene therapy are fast expanding sectors in healthcare. "Human genomics projects and precision medicine," according to Carrasco-Ramiro et al. 2017, highlighted the function of genomics projects in the development of personalised medicine.

India has made significant strides in the field of precision medicine, thanks in large part to the Indian Genome Variation Consortium (IGVC), which was instrumental in building a comprehensive genomic map of the Indian population that will help researchers find the genes responsible for specific diseases and create tailored treatments. Progress has also been aided significantly by the Indian government's measures to support genomic and personalized medicine.According to Dwivedi et al. 2017, diseases and

molecular diagnostics have gotten closer to precision medicine. It looked at how important molecular diagnostics is to identifying and treating diseases. The application of genomic research and personalized medicine enables the identification of individual genetic changes that may contribute to a given disease. Given that gene therapy offers cutting-edge therapeutic options and that genetic information is crucial to understanding how various diseases emerge, India's genetic variety offers a special potential for personalized medicine.

According to Klein et al. 2017, the clinical application of pharmacogenomics is a crucial step towards individualized precision medicine. This brought to light the problems and potential fixes for pharmacogenomics' clinical application. India's genetic variety poses problems for the development of precision medicine, and genetic counseling is crucial for providing individualized care. Despite these obstacles, India has made significant strides in creating gene therapy treatments for several genetic disorders, including inherited blindness, Sickle Cell Anemia, And Thalassemia. Figure 1 shows the genetic disorders briefly:

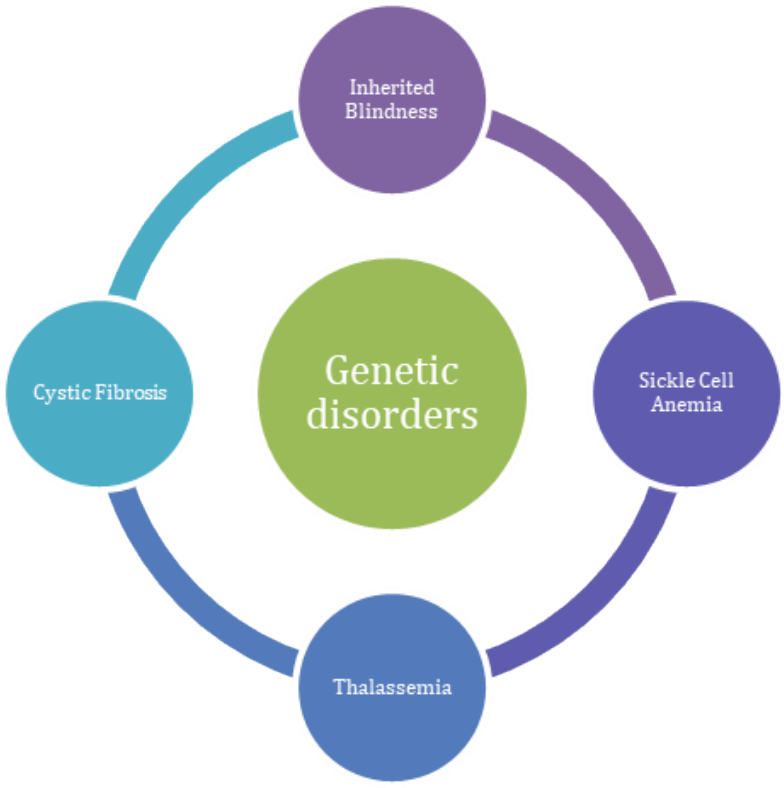

Figure 1 Genetic Disorders

Literature Review

In the field of healthcare research, "precision medicine and gene therapy" have grown in significance (Rosenberg & Rosenberg, 2012). The advancement of personalized medicine and genomics research has

attracted the attention of the Indian government. For example, the Indian Genome Variation Consortium (IGVC), founded in 2010, seeks to build a complete genomic map of the Indian population, which will help in the discovery of disease-causing genes and the creation of individualized treatments. Health care providers in India may be better able to provide patients with individualized treatment options based on their unique genetic make-up by utilizing this information.

Emerging fields like gene therapy and precision medicine have a lot of potential to transform Indian healthcare. The future of healthcare in India is bright because to advances in gene therapy and precision medicine. The government is working very hard to boost research and development since they understand how important these disciplines are. To successfully integrate these new technology into clinical practise, a number of issues must be resolved. Precision medicine and gene therapy have the potential to greatly improve healthcare outcomes for patients in India with the correct investments in research and development, the creation of a qualified workforce, and the construction of regulatory frameworks.To effectively apply precision medicine and gene therapy in India, there are a number of issues that must be resolved. According to Debnath et al. (2010), a significant obstacle is the absence of infrastructure and funding for research and development. Another difficulty is the shortage of qualified healthcare workers who can use these new technology in an efficient manner. By putting money into R&D, building a qualified workforce, and putting in place regulatory frameworks to ensure the safe and efficient use of these technologies, the government and the business sector need to collaborate in order to meet these difficulties.

According to Lippi et al. (2016), the development of precision medicine has a significant impact on how laboratory medicine will develop in India. They discussed on how labs must change to reflect the evolving healthcare environment, which places a greater emphasis on personalised medicine. Laboratories might need to switch from conventional testing techniques to more advanced systems that can process huge amounts of genetic data. They said that this change would necessitate large expenditures for infrastructure and workforce training. The advantages of precision medicine, such as better patient outcomes and lower healthcare costs, were also mentioned, and they are expected to exceed the disadvantages of this change.

Fast-evolving fields like gene therapy and precision medicine hold considerable potential for enhancing the quality of medical care. A number of projects have been started to advance research in the field of precision medicine in India, where there has been an increasing interest in this concept. Khan (2014) asserts that the development of precision medicine, particularly in the area of genomics, has been greatly aided by biotechnology. The creation of focused medicines may result in lower medical expenses and improved health outcomes.An autoimmune disease that affects millions of individuals worldwide, rheumatoid arthritis (RA) is a chronic condition. Recently, there has been a lot of study done on the application of personalised medicine to the treatment of RA.

Burgos et al. (2009) claimed that better patient outcomes have resulted from the identification of RA biomarkers that have enabled the creation of more focused medications. These biomarkers can be used to find patients who are more prone to develop RA or who are more likely to respond favorably to

particular therapies. As a result, medical personnel are better able to treat RA patients with more individualized treatment, which ultimately enhances their quality of life. Especially in light of the enormous incidence of the disease in the community, the development of such biomarkers in India holds considerable promise for enhancing RA care.

By providing individualized treatments catered to a person's genetic composition, precision medicine and gene therapy have the potential to revolutionize healthcare. The forecasting of a compound's intestinal absorption by humans is a crucial component of medication research, and artificial intelligence systems have showed promise in this area (Kumar et al. 2017). By examining many characteristics like chemical structure, molecular weight, and solubility, artificial intelligence systems can help forecast the absorption rate of chemicals. Gene therapy has enormous potential for treating genetic illnesses despite its modest progress (Hanna et al. 2017). Gene therapy is used to treat or prevent diseases by replacing or repairing damaged genes with healthy ones. In India, gene therapy has demonstrated promise in the management of beta-thalassemia, a hereditary condition that impairs haemoglobin synthesis. Clinical trials have shown that gene therapy is beneficial in curing beta-thalassemia, offering encouragement for further gene therapy study in India. Additionally, genome engineering has the potential to advance ophthalmology, as evidenced by the promise of gene editing methods like CRISPR/Cas in the treatment of eye conditions (Hung et al. 2016).The use of biomarkers has also been examined in various healthcare fields outside of RA. By emphasizing their value in the early diagnosis of neurological illnesses,

Filiou and Turck (2011) give a description of biomarkers in neuroscience research. The creation of such biomarkers is especially important in India, where neurological illnesses place a heavy cost on the nation's healthcare system. With the help of biomarkers, medical practitioners may pinpoint patients who are more likely to contract neurological disorders and provide more individualized treatment options, eventually enhancing their quality of life. Furthermore, the use of biomarkers can help in the creation of novel therapies for neurological conditions, which can improve patient outcomes and lower medical expenses.

Conclusion

Gene therapy and precision medicine are two rapidly developing technologies that could completely transform Indian healthcare. In contrast to gene therapy, which alters a person's genes to treat or prevent disease, precision medicine includes customising medical care to a patient's genetic profile. Both areas have a lot of potential to advance Indian medical research and improve health outcomes while also lowering healthcare costs. One of precision medicine's most important advantages is that it allows medical professionals to pinpoint patients who are more likely to get specific diseases and modify their care accordingly. By taking this strategy, sickness can be stopped before it starts and existing problems can be treated more successfully. By minimising pointless procedures and minimising the need for hospitalisation, precision medicine can also aid in lowering healthcare expenditures. Gene therapy, on the other hand, has the promise of curing diseases that are now incurable, including some forms of cancer and genetic problems. It entails altering a person's genes to fix or swap out damaged ones to restore normal function. Researchers are actively investigating the possibility of this strategy for treating a variety of other disorders. It has already been used successfully to treat some forms of blindness. Given the size

of the population, the prevalence of chronic diseases, and the country's limited healthcare resources, precision medicine and gene therapy are particularly crucial in India.Doctors can improve treatment outcomes and cut healthcare costs by customising therapy to a patient's genetic profile. Similar to traditional medicine, gene therapy has the promise of curing a wide range of illnesses, easing the strain on the healthcare system and enhancing patient quality of life. In conclusion, gene therapy and precision medicine both have enormous promise to advance Indian healthcare. These methods can aid in lowering medical expenses, enhancing the effectiveness of care, and finding cures for diseases that are currently incurable. It is probable that patients and healthcare professionals in India and other countries will gain even more as these sectors continue to develop.

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