Editorial

The Dawn of Genomics in Nephrology

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Sir Bruce Keogh, a former Medical Director of the National Health Service (NHS) England, once remarked, "As the microscope and x-rays revolutionised medicine in the 19th and 20th centuries, so knowledge of the human genome will dramatically change medicine in the 21st century".

The study of an organism's complete set of genetic instructions, known as genomics, has brought about significant advancements and revolutionized the field of clinical medicine. This revolution has been particularly evident since the completion of the human genome project, which has led to tremendous progress in genomics globally. Genomic testing is now being widely utilized to accurately diagnose, prevent, and treat various diseases, including complex and rare conditions, with a high degree of precision [1] predictive genomic testing is seen as the next major weapon in the arsenal of cutting-edge healthcare tech that can improve patient outcomes without relying on a curative approach.[2]

Next-generation sequencing (NGS) technology, a powerful tool, has had a groundbreaking impact on genomics research. It has made the quest for genomics easier, expanded research opportunities, and enabled studies on various areas such as rare genetic diseases, cancer genomics, microbiome analysis, infectious diseases, and population genetics. NGS provides detailed information about genome structure, genetic variations, gene activity, and changes in gene behavior, thereby facilitating the development of targeted therapies, precision medicine approaches, and improved diagnostic methods. Additionally, NGS has played a crucial role in advancing transcriptomics, epigenomics, metagenomics, and other omics studies.[3].

Advancements in gene and gene product analysis across the entire genome have paved the way for targeted molecular genetic testing in various medical disorders. This allows for precise diagnosis and tailored treatment and management of diseases, taking into account the likely benefits and side effects of specific treatments. This approach is often referred to as "precision and personalized medicine," where healthcare becomes more focused, precise, and individualized.

Taking advantage of genomics and precision medicine is necessary due to its transformative potential. It can significantly improve patient outcomes, revolutionize preventive medicine, and shift healthcare towards a more personalized and effective approach. By harnessing the power of genomics and precision medicine, we can create a healthier future for all.

Genomics and sequencing technologies are becoming increasingly crucial for global health. However, limited resources pose a significant challenge, particularly in low- and middle-income countries (LMICs). These countries often have a scarcity of genomics facilities and a shortage of adequately trained staff to effectively utilize these technologies. For example, in Nigeria, despite making progress in increasing capacity, there remains a shortage in infrastructure and training for genomics. Currently, the country has less than 0.1 percent of the global genetic database. This is concerning, It is crucial for Nigeria to prioritize treatments that consider an individual's genetic makeup to align with the global trend and avoid being left behind. To fully realize the potential of genomics and precision medicine, it is crucial to invest in research, infrastructure, and education. Integrating genomic information into routine clinical practice requires training healthcare professionals, developing robust data systems, and addressing ethical and privacy concerns. Collaboration

between researchers, clinicians, policymakers, and industry stakeholders is essential to ensure the responsible and equitable implementation of genomics and precision medicine.

Positioning nephrology for the new age of science involves embracing genomics, precision medicine, and technology to improve patient care and outcomes. By integrating genomic information, utilizing precision medicine approaches, and leveraging technological advancements, nephrology can advance towards personalized, proactive, and effective management of kidney diseases. In many patients with kidney diseases, obtaining a definitive diagnosis can be challenging, even with the available investigational modalities. Especially for inherited diseases that are monogenic, causes of chronic kidney disease (CKD) are more prevalent than previously believed and account for a significant percentage of kidney failure patients.[4] This knowledge has led to the development of diagnosis, prognostic value, disease-specific therapies. These advancements have the potential to improve patient outcomes by guiding lifestyle changes, enhancing knowledge about the disease within families, informing the selection of living donors, and facilitating disease management. Currently, the Human Heredity and Health Kidney Research Network is exploring genetic causes of kidney disease on the African continent. This network is taking the study of kidney disease to the stage of genomics and findings from this study are expected to influence the practice of nephrology.[5]

Investment in research are key to successfully navigate this new era of science in nephrology. Training and education for nephrologists to understand and utilize genomics, precision medicine, and technology is paramount. Collaboration between nephrologists, geneticists, technologists, and researchers is crucial. Building partnerships with industry can facilitate the development and implementation of innovative technologies and therapies.[5]. The impact of genomics has paved the way for elucidating a genetic cause of kidney disease; for example, APOL1-mediated kidney disease is now a recognised entity. Clinical trials are currently ongoing, and for the first time, chronic kidney disease may be cured, if not completely halted .

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