

EDITORIAL

ENTERING THE ERA OF MOLECULAR MEDICINE: ARE WE PREPARED?

1. Since the advent of biotechnology in the recent century, rapid advancements have been seen in the field of several industrial sectors. These progressions have also outpoured into the field of clinical medicine in various shapes and dimensions. The science underneath medicine, as from the past, has taken a recent trajectory towards molecular medicine. While initially limited to the routine clinical lab in the shape of polymerase chain reaction (PCR) and techniques alike, a lot more is now available in developed economies to improve the health-care functioning. The last 2 to 3 decades have witnessed a plethora of molecular techniques, slowly but steadily, entering the clinical arena. Starting from PCR developed by Mullis, the clinical medical sciences have seen the ongoing evolution of nucleic acid sequencing technologies from Sanger sequencing to next generation sequencing technologies¹. Alongside, the field has also allowed the development of clonogenic assays, molecular cloning, microarrays, resistance gene testing in the field of pharmacogenomics, cancer genetics, disease prediction models, molecular epidemiology and recently the genome editing techniques².

2. The recent era has seen a pandemic situation with regards to appearance of multiple metabolic disorders like diabetes mellitus, hypertension, ischemic heart disease (IHD) and cancer. According to a study published in Cancer Research, Rahib *et al* have shown that not only the incidence of major cancers like lung, prostate, breast and colorectal cancers will be increasing but also the previously less common cancers like thyroid and skin cancers will also rise³. While not much data is available within Pakistan except Lahore and Karachi cancer registry, Idrees *et al* have shown a heterogeneous incidence of various cancers due to region and race but still highlight a very high occurrence of the disease in Pakistan⁴. Similarly the rapidly changing life style in the backdrop of genetics and epigenetics has resulted in an alarming

situation of other metabolic ailments like diabetes and ischemic heart disease within the region⁵. Acknowledging the higher prevalence of the cancer within our population, there is data available to suggest that minimal diagnostic and therapeutic resource is available for sufferers of the disease except the conventional treatments⁶. Another reason to incorporate the molecular sciences within our clinical framework is to understand the varying genotypes prevailing within our society which are quite different from the Caucasians and other races, highlighting again the pressing need to inculcate the requirements like pathogen genotype variation, drug resistance and disease prediction model along with developing curative genome engineering techniques to help develop population focused pathology trends⁷.

3. The pendulum of clinical medicine is definitely anticipating the needful shift and trend in conventional medicine and supportive diagnostics in allopathic science⁸. Recognizing these emerging issues with current practices and incoming gap with regards to newer molecular and Nano technology, we can definitely interpret our country lagging behind significantly in terms of optimal diagnostics to therapeutics, and prognosis monitoring^{8,6}. Not only the need has been well-established in developed countries where already molecular diagnostics and therapeutics are replacing or providing alternate to current day medical issues, authors have also suggested their potential in medical management in various resource poor countries⁹. Epidemiologically disease prediction models are also needed to curb the underlying genetic defects at the outset, along with genome editing techniques like CRISPR (Cas technology and RNA interference) carries promises in the shape of complete cure of both infectious and non-infectious diseases¹⁰⁻¹². Thus molecular medicine seems here to stay and is supposedly the most probable way forward for the future of medicine⁵.

4. Coming to developing countries like Pakistan we interpret a massive gap not only in terms of knowledge barriers for clinicians, laboratorians and biotechnologists but also the platform biotechnologies are still in the phase of infancy. Financial issues aside, the basic problems conceived are lack of molecular science knowledge, expertise in terms of human resource including consultants, technologists, biotechnologists, bioinformatics and molecular lab specific technical labor. While these new technologies are really taken to their potential in our neighborhood, we feel an obvious delay in the incorporation of such diagnostics and therapeutics here¹³. This non-progressive approach is not only causing us to lag behind in the field of molecular medicine and non-provision of quality care to our patients but also revenue being lost in the field of biotechnology and healthcare sector to neighboring countries¹⁴. So based upon the onslaught of molecular knowledge, emerging trends in diagnostics and therapeutics in molecular techniques and gaining benefits from this technology by timely incorporation in our healthcare market is thus the need of the day. Not only these molecular techniques will open new avenues to save lives for pandemic appearance of metabolic and non-metabolic diseases, but will also save time and may be cost-effective once incorporated timely and effectively.

5. Following is suggested to accelerate incorporation of molecular medicine in our set up at pace with the modern world:

- a) Kick start to this will remain the immediate training of consultant molecular pathologists, technologists, genetic specialists and bioinformaticians in line with multiple emerging domains within this era of specific specialty.
- b) Special oversight by "College of Physician and Surgeons" to help evolve molecular medicine within our country.
- c) Encouragement and focused help by the government to allow the evolution of the field of molecular diagnostics and

molecular lab development on priority basis to compete regionally and internationally.

- d) Regulatory bodies MUST be developed under the umbrella of HEC/PMDC/CPSP to help address the ethical issues related with clinical application of molecular medicine.

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