

Editorial

BENCH TO BEDSIDE: CHALLENGES AND OPPORTUNITIES IN LOW- AND MIDDLE-INCOME COUNTRIES

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ABSTRACT:

Translational research is a modern era of medical and clinical research where basic research discoveries are brought in the clinical practice to the patient care. The medical science has been revolutionized by these discoveries and clinical outcome of diseases has improved with longer survival and better quality of life. However, low-middle income countries (LMICs) are not enjoying the magic of translational research in its true sense as they are still dependent on discoveries from high income countries. There is no lacking of talent or ideas in LMICs but there are challenges like inappropriate infrastructure, shortage of trained human resource and also there are issues of funding for translational research projects. The medical research is expensive in fact but LMICs must see it as an investment. While working on local problems and finding their solutions locally, will certainly establish local research based business and the products can reach to the patient at low cost. Thus this may be taken as opportunity.

Keywords: Translational research, low-middle income countries, medical discoveries

INTRODUCTION

Translating laboratory research into clinical practice is defined as *Translational research*, which is basically a journey of a scientific theory from basic sciences laboratory i.e. Bench to the use in clinical practice to cure patients i.e. Bedside. It is a major milestone in modern medicine and recent research paradigm shift. The ability to convert molecular insights, genetic discoveries, and novel therapeutics into meaningful improvements in patient outcomes has revolutionized healthcare around the globe. However, major discoveries have come from high-income countries. While in low- and middle-income countries (LMICs), this journey remains fraught with obstacles, raising critical questions about equity, feasibility, and sustainability in medical innovation.

The Paradox of Discovery and Delivery

The LMICs have talent, ideas and capability of innovation. The science in these regions is still facing challenges like infectious diseases even at advance level, in addition, the burden of non-infectious diseases is also there same as high-income countries. Researchers in these regions do involve in innovative research in their laboratories but these discoveries seldom reach to the patient care or pharmaceutical market, not even within their own country. It is an important aspect to realize that there are certain local issues, including health issues such as predominance of particular diseases, thus local research is always there, but the issues related to the access of the infrastructure to test these discoveries, and integrate these innovations into health systems remain limited.

Barriers to Translation of basic research into bedside clinical practice

There are several barriers involved:

1. **Infrastructure Gaps:** Clinical trial facilities, advanced diagnostic platforms, and biobanks are scarce, limiting the capacity to conduct translational studies.
2. **Funding Limitations:** Research budgets are often minimal and heavily reliant on international donors. This dependence means priorities are frequently externally set and may not align with national health needs.
3. **Regulatory Bottlenecks:** Lengthy, under-resourced, or fragmented ethical and regulatory processes delay trials and discourage collaboration with industry. The registration and approval of the sites are also expensive in terms of infrastructure and human resource, thus further limit the testing of the discoveries.
4. **Human Resource Constraints:** While there is no shortage of motivated clinicians and scientists, few are trained in translational research, and even fewer receive mentorship in cross-disciplinary collaboration.

5. **Weak Academia-Industry Linkages:** In many LMICs, partnerships between universities, research institutes, and local pharmaceutical or biotech industries are either underdeveloped or non-existent.

Patient as partner in translational research

The involvement of patients is equally important as testing in a clinical scenario make the route of the discovery to the market. Patient involvement starts from Phase I to Phase IV. From patients point of view, they often present late in the disease course, face financial barriers to care, and are excluded from advanced therapies developed elsewhere, and understandably cannot be included in initial stage of the disease. Literacy rate of LMICs is also low thus compliance of the trial/ research protocol is often a question is be taken care at the time of study designs.

Opportunities amid Challenges

Despite all these barriers there are possibilities of creating opportunities, there are a few mentioned here:

1. **South-South Collaborations:** Increasing partnerships between LMICs allow resource-sharing, pooled expertise, and regional clinical trial networks. In addition, researchers from limited-resource countries may understand each other in making situational decisions.
2. **Digital Health Solutions:** Mobile health, telemedicine, and AI-based decision support tools can accelerate translation by bypassing some infrastructure gaps.
3. **Policy Reforms:** Some countries with low resources have demonstrated that how supportive policies, investment in local biotech, and regulatory streamlining can foster translational ecosystems.
4. **Capacity Building:** Training clinician-scientists in translational medicine and embedding research within clinical practice can bridge the current divide.

For LMICs, the challenge is not only scientific but systemic. Governments, academia, industry, and civil society must recognize translational research as a national priority and view it as a business opportunity for local economic growth. Local health problems demand local solutions, and these solutions must reach patients without delay and also at an affordable cost. International collaborations should shift from extractive models to equitable partnerships, ensuring that LMIC populations benefit from discoveries to which they contribute.

CONCLUSION

The journey from bench to bedside in LMICs is long and uneven, but it is not insurmountable. By strengthening infrastructure, investing in human capital, and fostering collaborations rooted in equity, LMICs can carve pathways for research that is not only innovative but also transformative for the patients who need it the most. Translational research, when contextualized to the realities of resource-limited settings, has the potential to redefine healthcare delivery and bring science closer to those it seeks to serve.

Conflict of Interest

Author declare no conflict of interest.