Ophthalmic research in India – Revolution in evolution

"There are a couple of supposed absolute truths that science holds as self-evident. The first is that research is self-correcting: incomplete, irrelevant, and incorrect findings are shaved from the scientific record over time, to leave a reproducible and robust foundation for the future. The second is that science operates as a genuine meritocracy. Research and researchers advance on neutral data and objective analysis, so talent emerges alongside the truth." – Editorial in Nature, September 2016^[1]

The practice of medicine provides exciting opportunities for research and the emergence of new knowledge and talent. Developing countries typically have a high disease burden and a wide clinical spectrum, highly conducive to research. Yet, medical research is dominated by the developed world, possibly because the quality of life, prosperity, and societal well-being are the positive drivers for outward thinking and innovation.^[2] Some of the factors that fuel research are shown in Fig. 1.^[2]

Catalysts for Change

India is already on a trajectory of a steady ascent in medical research, specifically in ophthalmology. The future potential seems huge.^[3] Evolution of ophthalmology as an economically rewarding and professionally gratifying field of medicine, development of stand-alone ophthalmic subspecialties, each driving exclusive focus on niche areas, high-quality subspecialty fellowship training, availability of equipment on par with the developed world, local industries geared to innovate and bridge the technology gap, and relatively high patient volume to rapidly gain experience from have all seemingly contributed to the revolution in the evolution of ophthalmic clinical practice and research in India.

Establishment of exclusive ophthalmological institutes as centers of excellence in India, with the seed sown by Prof. L.P. Agarwal in founding the Dr. Rajendra Prasad Centre for Ophthalmic Sciences as part of the All India Institute of Medical Sciences, New Delhi in 1967, followed by several such institutes, all with the fundamental philosophy of excellence in patient care,



Figure 1: Factors influencing scientific research by nations and researchers. Modified from Coccia M. Socioeconomic driving forces of scientific research arXiv: General Finance, 2018

education, and research, have acted as serial catalysts in the rapid pace of development of ophthalmic subspecialties and research in India. Skillful and talented individual ophthalmologists and groups in private practice are actively contributing to research output. The All India Ophthalmological Society has lived up to its purported role of providing an optimal academic platform to support the rising aspirations of Indian ophthalmologists through its robust scientific programs and its official journal— Indian Journal of Ophthalmology (IJO).

The Impact of IJO on Indian Ophthalmic Research

High-impact international medical journals have traditionally been a monopoly of the West. Research in the developing world is often stereotyped for lack of focus and quality. However, even genuine work with impeccable scientific merit often fails to find a place in prestigious international journals. IJO has gradually evolved to rise to the challenge and meet the academic needs of Indian ophthalmologists.^[4] From being a quarterly journal initially, IJO is currently published every month and now has a companion journal for Case Reports.^[4] The number of publications in IJO has gone up from 268 in 2016 to almost a quadruple—1030 in 2020. The number of citations have improved from 819 (CiteScore 1.8) in 2011 to about five times - 4484 (CiteScore 2.7) in 2021 already. Coming of age of IJO seems to parallel the ascent of Indian ophthalmic research.

Has Indian Ophthalmic Research Made an Impact?

Countries, journals, institutions, and individuals are ranked in research, based quantitatively on the number of publications and qualitatively on the number of citations. The overall impact of Indian ophthalmic research was globally ranked 15 (113 citable publications) in 1996 (when the ranking system was initiated by SCIMAGO) in contrast to the leader USA (5343 citable publications). India steadily rose to rank 11 (183 citable publications) in 2000, eight (254 citable publications) in 2005, seven (397 citable publications) in 2010, and six (602 citable publications) in 2015.^[5] There has been a huge leap to rank three in 2020 with 1291 citable publications in contrast to the leader USA (4161 citable publications).^[5] The point to note is that the number of citable Indian publications has risen almost 11 times and the rank from 15 to three between 1996 and 2020, while the number of publications of the leader USA has seen a drop from 5343 to 4161 in the same time frame.^[5] Publications in IJO have helped in the addition of about 3000 papers by the Indian authors and 2000 unique authors to the pool of Indian researchers in the last 6 years.

One of the direct measures of the impact of Indian ophthalmic research is the international ranking of Indian authors. Baas *et al.*⁽⁶⁾ have created a public database of scientists that provides standardized information on citations, h-index, co-authorship adjusted hm-index, citations to papers in different authorship sequence and a composite indicator, and ranking based on the impact of non-self-cited publications. Separate data are provided for career-long and single-year impact. Version 3 of the dataset has been released on October 19 this year. It is based on the data from Scopus as of August 1, 2021, updated to the citation year 2020.⁽⁶⁾ The list has 1353 ophthalmic researchers in the top 2% of the world pool of researchers based on their career-long impact, of whom 14 are from India [Table 1].⁽⁶⁾ Of 1371 ophthalmic researchers based on their single-year impact (2020), 37 are from India [Table 2].⁽⁶⁾ It

Table 1: Science-wide author databases of standardizedcitation indicators - Career-long Impact of IndianOphthalmic Researchers based on non-self-citedpublications and composite score

- 1. Rao, Gullapalli N.
- 2. Thomas, Philip Aloysius
- 3. Sangwan, Virender Singh
- 4. Srinivasan, Muthiah
- 5. Sharma, Savitri
- 6. Gupta, Amod
- 7. Honavar, Santosh G.
- 8. Murthy, Gudlavalleti V.S.
- 9. Keeffe, Jill
- 10. Biswas, Jyotirmay
- 11. Garg, Prashant
- 12. Sihota, Ramanjit
- 13 Chhablani, Jay
- 14. Nangia, Vinay

Table 2: Science-wide author databases of standardizedcitation indicators - Single-year (2020) Impact of IndianOphthalmic Researchers based on non-self-citedpublications and composite score

1. Honavar, Santosh G.

- 2. Chhablani, Jay
- 3. Murthy, Gudlavalleti V.S.
- 4. Sangwan, Virender Singh
- 5. Ali, Mohammad Javed
- 6. Thomas, Philip Aloysius
- 7. Srinivasan, Muthiah
- 8. Sharma, Savitri
- 9. Gupta, Amod
- 10. Rao, Gullapalli N.
- 11. Garg, Prashant
- 12. Gupta, Vishali
- 13. Shetty, Rohit
- 14. Nangia, Vinay
- 15. Keeffe, Jill
- 16. Kaliki, Swathi
- 17. Kumar, Vinod
- 18. Sharma, Namrata
- 19. Biswas, Jyotirmay
- 20. Raman, Rajiv
- 21. Sihota, Ramanjit
- 22. Agarwal, Aniruddha
- 23. Dada, Tanuj
- 24. Lalitha, Prajna
- 25. Saxena, Rohit
- 26. Sridhar, Mittanamalli S.
- 27. Jacob, Soosan
- 28. Das, Taraprasad
- 29. Khanna, Rohit C.
- 30. Bathinam, S. B.
- 31. Vasavada, Abhay R.
- 32. Titiyal, Jeewan Singh
- 33. Naik, Milind N.
- 34. Sharma, Ajay
- 35. Basu, Sayan
- 36. Vinekar, Anand

appears that while the pool of ophthalmic researchers is large in India, only a small minority have made it to the top 2%; this number will hopefully rise over the next decade with the robust growth in the volume of ophthalmic publications that India is currently witnessing, and IJO is ably supporting the growth. Looking at the list, and by hindsight, my ten takeaways for a young ophthalmologist passionate about research are 1. Start early, 2. Have a clear focus area, 3. Perform clinically relevant or translational research, 4. Form a team, 5. Publish consistently, 6. Publish a good mix of original research and review articles on unique topics, 7. Publish work with citation potential, 8. Minimize self-citations, 9. Collaborate nationally and internationally to broaden the spectrum, and most importantly 10. Have a clear and unwavering personal goal beyond your institutional agenda and non-academic compulsions and continue to consistently pursue it.

Publish and Flourish

"Research is something that everyone can do, and everyone ought to do. It is simply collecting information and thinking systematically about it." - Raewyn Connell

Research is as simple as that - asking a question, forming a hypothesis, collecting relevant information, and systematically analyzing the data to arrive at a logical conclusion. Each one of us should nurture the spirit of exploration for new knowledge routinely in our clinical practice and make the thus found knowledge immortal by providing it with the sanctity of a peer-reviewed scientific publication. I would strongly encourage Indian ophthalmic researchers to make IJO their preferred choice to publish the best of their works. This will not only help the authors to have a relatively faster publication and thus a better citation lead time, but also raise the impact of the national journal.

"What we find changes who we become." - Peter Morville

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| Quick Response Code: | Website: |
| | www.ijo.in |
| | DOI: 10.4103/ijo.IJO_2914_21 |
| | |

Cite this article as: Honavar SG. Ophthalmic Research in India – Revolution in evolution. Indian J Ophthalmol 2021;69:3385-6.