**Editorial**

# Getting 'hi' on research

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Science is based on evidence, which is mainly derived from research. Scientific research is the process of systematic collection, analysis and interpretation of data in order to answer a question on scientific theory or hypothesis. In medicine, such evidence is applied to improve the quality of health care and services, and thereby address health and social needs of individuals and populations. An integral part, if not the most important, in this process is the dissemination of evidence derived from research to the scientific community. In the modern world, dissemination of evidence is predominantly by publishing the work in science related journals. Journal publication coupled with its availability online has revolutionised the application of evidence-based practices across the globe, as well as the behaviour of researchers. High impact journals have caught the attention of researchers on the presumption that their work is well received in the form of citations, and also better publicized so that their excellence in the field of research is duly recognised by the scientific community. Concurrently, several different bibliometric indicators based on the number of papers published (publications), citations received (impact) and journals' impact factor have been introduced to quantify the scientific output of a researcher. Lately, there has been an overemphasis on indicators that could quantify this output in a single summary measure. Among such metrics, *Hirsch* index (*h*-index) takes the centre stage.

According to Jorge E Hirsch (2005), a researcher has index *h*, if *h* of his/her papers have at least h citations each, and the other papers have no more than *h* citations each. It is auto-calculated in *Web of Science* and *Google Scholar*. It is robust in capturing both the quantity and impact of publications in a single measure, while favouring the performers who are consistent in publishing papers of lasting impact. This makes the index insensitive to both lowly cited papers and to one or few outstandingly highly cited papers. The latter however may underestimate the overall quality or achievements of a high impact researcher with a relatively small number of papers, for example, despite the ground breaking work on genetic inheritance, Gregor Mendel's *h*-index runs the risk of being low! *H*-index also gives less consideration to scientific innovation and creativity (for example, Albert Einstein's work), strongly depends on the research discipline, and is affected by the duration of the research career (cumulative expansion with time). As alternatives, variants of the *h*-index, such as the *A*-index incorporating the number of cites of the h most cited papers of the author (thus, highly sensitive to one extremely highly cited article), *AR*-index incorporating the age of papers, and *g*-index incorporating the total number of citations of the top papers have been introduced. The latest is *hg*-index, which incorporates benefits of both measures, and is supposed to give a more balanced and concise view of lifetime achievements of a researcher. Although exceedingly better than subjective metrics in evaluating individual research productivity, *h*-index or its variants may not accurately convey the true research excellence of an individual. Lifetime performance of a researcher, after all, is a complex endeavour that is difficult to be summed into a single number.

In more recent times, *h*-index has been in vogue as a vital decision making factor in job recruitment, university ranking, promotion and funding. When the use of quantitative metrics becomes reward or ego-centric, its well-intended objective of achieving socially relevant and impactful research outcomes is likely to be lost. Instead, it would lead to the creation of unhealthy competition between researchers and research groups. The implications are serious in terms of ethical conduct and social responsibility of researchers. Overemphasis on single quantitative metrics could easily breed fertile grounds for poor scientific progress, inequity and unethical behaviour among researchers. In search of a 'high' *h*-index, researchers may be compelled to boost the quantity of their work at the expense of quality and to move away from research that takes a longer time to

complete (e.g. follow-up studies), requires more resources (e.g. reviews being preferred to original research), difficult to procure funds or less attractive for incentives, which are ultimately counter-productive for scientific progress of the researcher. Recent incidents reported on manipulating impact factors, bogus data collections, distorting *p* values intended to produce publishable results, abusing the peer-review process and self-citation are some of the consequences of over emphasis of these metrics.

Although *h*-index provides a universal yardstick, it is misleading to compare researchers from developed and developing countries on the same level given the enormous disparities in terms of funding available for research, access to literature published in high impact journals, language skills and publication bias. It is not uncommon for research from low- and middle-income countries to fail to obtain publication in high impact international journals, if not co-authored by prominent researchers from developed countries, due to inappropriate selection of reviewers with limited experience in local health systems and due to high publication fees.

The good, the bad and the ugly of *h*-index in evaluating research output must be recognised. Emphasis needs to shift back from the dizzy *h*-i of metrics to quality of research.

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