Editorial

Do Scientometric Indices Require Revision?

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The scientific output of a researcher includes academic publications, creditability of these publications and number of citations. Universities and institutions evaluating the research activities have always taken into account the academic status and ranking of the researchers. Selection and application of an appropriate method to assess the academic activities have also been a concern for scientometrics centers. In the past, criteria such as number of publications, total number of citations and average number of citation were taken into consideration. In the past decade, a physicist named Hirsch (2005) introduced an index known as hirsch *(h* index*)* to evaluate scientific output (1).

The *h* index determines both the academic productions of the researchers and the scientific impact of the productions by a number; the larger is the number, the higher is the scientific impact. The *h* index is used to compare the researchers in the same subject area, aiming to differentiate highly cited researchers from least-cited scholars. Numerous advantages have been introduced for this index, including simple calculation, quantitative and qualitative evaluation of the scientific outputs, disregarding most-cited and least-cited papers, and differentiating prominent researchers from the others. However, the disadvantages of this index, some of which are being mentioned as advantages, include neglecting the total number of publications, neglecting the academic life of a researcher, dependence on the research area (inapplicability to compare the researchers in different subject areas), ignoring multi-authorship and dependence on the duration of scientific activity (2).

On the other hand, *h* index computation for young researchers is also not possible due to their short scientific activities. Moreover, despite the termination of the scientific life of a researcher and failure to present new publications, their previous publications may be cited. In addition, it is believed that in a scientific domain, more cited articles are in a higher scientific rank, while there are articles that are analyzed and reviewed by researchers due to presenting a contradictory subject, and are frequently cited in spite of their inappropriate scientific value, although these citations are not indicative of their higher quality.

The impact factor of journals can also make the comparison and ranking of researchers problematic. It is burdensome to compare two researchers with equal *h* index but different impact factor of journals in which they have published their papers. However, it should be noted that there are differences between two researchers with similar *h* index in terms of scientific life, number of publications, total number of citations and impact factor of journals in which their articles have been published. Further, the authors of an article do not have the same role and collaboration in publishing the paper. Imagine a researcher with 100 articles and *h*=15 has been the corresponding author only in 5 articles, but coauthor in the rest of articles. It seems that scientific index for the corresponding author of each article is more important than allocating similar credits to all authors.

Nowadays, *h* index is extensively used to measure the scientific status of researchers, journals, departments and universities. In some academic centers, however, it is incorrectly used to compare the researchers in different majors. Since the introduction of this index, various variants have been prompted upon it; thereby, presenting different variations such as *a*, *g*, *m* and *r* indices (3). Although, *h* index apparently differentiates the prominent researchers from those who have merely published many papers, it cannot reveal a perfect view of the scientific output of a researcher. Application of a scientometric criterion alone cannot determine the precise and valid scientific rank of the researchers. Thus, a proper combination of criteria seems necessary.

Furthermore, given the failure to register all scientific publications of a researcher in databases like Scopus and Web of Science, it is more logical to use other websites such as Google Scholar. Based on the abovementioned

discussion and to thoroughly compare the scientific output of researchers, it seems that features like number of publications, total number of citations, scientific life of the researcher (the gap between the first and last publication), *h* index, Hirsch core (part of the articles by a researcher that determine *h* index) and journal impact factor are essential to be taken into account as one index. It is also necessary to eliminate self-citation and to consider multi-authorship and amount of participation in scientific publications.

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