

## Google Scholar Citations Help on Calculation of H-Index of a Researcher in the Field of Pharmacology may be Misleading

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### Abstract

The importance of impact factor of journals and h-index of academics who aspire in their career to the rank of professor cannot be over emphasized. Google Scholar Citations Help (GSCH) is a software (A – W. Harzing’s publish – or – perish) that academics can use to determine the h-index of their publications. I used the software to calculate h-index of my publications, unfortunately what the software calculated was more of cumulative h-index of 100 publications belonging to 132 academics including myself, from various specialities and institutions. In 2008, Eighty-one (81) out of the 100 publications received 295 citations with cumulative h-index of 9 and i10-index of 7. By 2012, 65 out of 100 publications were cited 425 times with h-index of 11 and i10-index of 14 respectively. The h-index of a professor whose name appeared in 82 publications was not calculated. I recorded h-index of 4, disapproving the Google Scholar Citations Help. In 2012, my publications were separated from co-researchers. The publications (45) received 128 citations, h-index of 8 and i10-index of 6. The GSCH gives cumulative h-index of researchers who have worked together and whose names appeared in other papers. Therefore, the Google Scholar Citation Help software should be designed in such a way that it can calculate h-index of individual researcher, instead of calculating cumulative h-index of a group of researchers.

**Keywords:** Google Scholar; h-index; Cumulative h-index; Publications; Misleading

### Introduction

Google Scholar Citations Help® (GSCH®) provides a simple way for authors to keep track of citations to their articles. The GSCH® calculates both the h-index and i10-index of researchers. The Hirsch index (h-index) was introduced by Jorge E. Hirsch [1] as an indicator for lifetime achievement as measured by the number of received citations. A scientist has index h if h of his or her papers that have at least h citations each, and the other papers have fewer than h citations. But Glazel pointed out that the definition is not quite precise [2]. Although the h-index is a relatively simple indicator. It attracted a lot of attention [3-8]. Glazel, Jin and Rosseau discussed the advantages and disadvantages of this new indicator [2,8-11]. It became also clear that the h-index cannot only be used for lifetime achievements, but also in the context of many other source-item relationships [12,13]. More so not all source-items relationships fit into the calculation scheme of the h-index, by giving the example of bowling scores. A better example is the case of citations as sources and their population as produced items [14].

But the e-index is a necessary h-index complement especially for evaluating highly cited scientists or groups of scientists having an identical h-index, the h-index has been used by major citation database such as Web of Science Performance of Individual Scientists and Google Scholar Citations Help. Another disadvantage of h-index is the low resolution, resulting from its low potential [15]. Woeginger reported axiomatic characteristics of the g-index in terms of three natural axioms [16]. A recently suggested of the g-index is analysed in order to take multiple authorship approximately into account. By fractionalized counting of the papers once can obtain an appropriate measure which is called  $g_m$  - index which shows the correct behaviour when datasets are aggregated. For an intuitive comparison of the determination of the investigated variants of the h-index and the g-index, a visualized of the records is utilized [17]. Abass described some bounds and inequalities relating h-index, g-index and e-index and generalized impact relating these indexing parameters from their basic definitions [18]. US chemists who have ranked living chemists based on their h-indices have decided to stop compiling the rankings. The decision came after criticism that the list lent too much emphasis to a single metric for assessing academic [19]. The g-index is calculated based on; given a set of articles ranked in decreasing order of the number of citations that they received, the g-index is the unique largest number such that the top articles received (together) at least  $g^2$  citations [20]. In view of the need for every academic to know the level of his or her impact in the scientific findings on academic community, there is need to assess one's h-index using Google Scholar Citations Help® with a view to establishing its validity and reliability.

## Methodology

### Analytical software for h-index

H-index can be determined using “web of science”. Select “Science Citations Index Expanded”. Click “General Search” category and search for your name as an author (e.g. SAGANUWAN SA\*). Use “Refine Your Results” by Instruction to differentiate yourself from other scientists with the same initial(s). This is an important step, otherwise your publications will be intermingled with unrelated papers and your h-index will be inaccurate, click on “Citations Report” in the box on the right side. Your h-index will be calculated. An alternative method is to sort your citations by “Times Cite” using sort box on the right side. Scroll down the list until the number of the papers exceeds the number of citations to that paper. For example, your-index is 20 if your 21<sup>st</sup> paper has been cited 20 or fewer times, but your 20<sup>th</sup> paper has been cited 20 or more times. Google Scholar is another useful source of citations data. A.W. Harzing’s publish-or-perish software is a free application for Windows, Mac OS, and GNU/Linux that uses Google Scholar to compute citations counts h-index, Journal impact factors and many other citations metrics in collaboration with Joomla, a free software released under the GNU General Public License [21].

### The Applied Analytical Software for Calculation of My-h-index

I typed “Google Scholar” on the space for “Google Search” and clicked on the “Search”. It gave several websites including the Google “Scholar Citations Help”. I advanced my search by clicking on GSCH website (<http://scholar.google.com/intl/en-US/scholar/citations.html>) which provides a simple way for authors to keep track of citations to their articles [22]. One can check who is citing one’s publications and graph citations. Scholar Citations Help was clicked to give a page Google Scholar Citations. Thereafter a part “Get Started with Google Scholar Citations” was clicked to give a page were I signed in my name and password. The page had heading “Citations”. Written on the page are: Welcome to Google Scholar Citations; track citations to your publication; check who is citing your publications; graph your citations overtime; compute citation metrics; view publication by colleagues; keep up with their work; see their citation metric; appear in Google Scholar search results and create a public profile that can appear in Google Scholar when search for your name. Eventually, my profile was shown with citation indices. Provided on the profile was “Actions” with alternatives such as “Add”, “Export”, “Merge”, “Delete”, “View Trash” and “Profile update”. The study was done between 7<sup>th</sup> – 20<sup>th</sup>/02/2013 and 2016 in the cybercafé of Information Communication Technology, Directorate of University of Agriculture, Makurdi, Benue State, Nigeria.

**Results**

Google Scholar Citations Help showed 100 publications published between 1991 and 2012. The articles were co-authored by 132 academics from various institutions and specialities. Their institutions are University of Maiduguri, Usmanu Danfodiyo University Sokoto, University of Agriculture Makurdi, University of Nigeria Nsukka, University of Jos and Ahmadu Bello University Zaria all in Nigeria. The ten leading scientific researchers with a publication having highest number of citations are: P.A. Onyeyili (42), G.O. Egwu (24), U.K. Sandabe (21), Y. Karumi (20), Y.A. Geidam (13), A.S. Saganuwan (12), S.M. Anika (11), A.W. Mbaya (10), M.D. Salihu (9) and B.M. Aji (9). The publications mostly cited were Fitoterapia, Small Ruminant Research, Journal of Ethnopharmacology, Journal of Medical Science, Veterinarski Arhiv, Pakistan Journal of Biological Sciences, Animal Research International, Journal of Small Animal Practice and African Journal of Biotechnology.

There were 425 citations between 1989 and 2012 from 82 articles and 295 citations up to 2008 from 64 articles respectively. The h-index and i10 index of all the citations up to 2012 were 11 and 14 respectively. But the h-index and i10-index for citations up to 2008 were 9 and 7 respectively (Table 1). A professor and his co-researcher had a paper with highest number of citations published in 2001. The authors published in "Fitoterapia". The 2<sup>nd</sup> group of authors published their work in 1995 in "Small Ruminant". The article was cited 24 times. However the article for 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> group of authors were cited 21, 20, 13, 12, 11, 10, 9 and 9 times respec-

Scientometres	All the citations up to 2012	Citations since 2008
Citations	425	295
h-index	11	9
i10-index	14	7

**Table 1:** Citation indices of some journals in which my name appeared.

Leading authors	Title of their papers	No. of citations	The journal that published the articles	Year of publication
P.A. Onyeyili, C.O. Nwosu, J.D., Amin, J.I. Jubike	Anthelmintic activity of crude aqueous extract of Nauclea latifolia	42	Fitoterapia	2009
G.O. Egwu, P.A. Onyeyili, G.A. Chibuzo, J.A. Ameh	Improved productivity of goats and utilization of goat milk in Nigeria	24	Small Ruminant Research	1995
UK. Sandabe, P.A. Onyeyili, G.A. Chibuzo	Phytochemical screening effect of aqueous extract of Ficus sycomoros	21	Journal of Ethnopharmacology	1995
Y. Karumi, P.A. Onyeyili, V.O. Ougubaja	Identification of active principles of M. balsamina (Balsam Apple) leaf extract	20	Journal of Medical Science	2004
Y.A. Geidam, A.G. Ambali, P.A. Onyeyili	Preliminary phytochemical and antibacterial evaluation of crude aqueous extract of psidium guajava leaf	13	Journal of Applied Sciences	2007
A.S. Saganuwan and M.L. Gulumbe	Evaluation of in vitro antimicrobial activities and phytochemical constituents of Cassia occidentalis	12	Animal Research International	2006
S.M. Anika, P.A. Onyeyili	Effects of trypanosomal infection on the pharmacokinetics of diminazene aceturate in dogs	11	Journal of Small Animal Practices	1989
A.W. Mbaya, C.O. Nwosu, P.A. Onyeyili	Toxicity and antitrypanosomal effects of ethanolic extract of Butyrospermum paradoxum (Sapotaceae) stem bark in rats infected with Trypanosoma brucei and Trypanosoma congolense	10	Journal of Ethnopharmacology	2007
M.D. Salihu, U. Junaidu, S.B. Manga, M.L. Gulumbe, A.A. Magaji, A. Ahmed, A.Y. Adamu	Occurrence of Listeria monocytogenes in Smoked fish in Sokoto, Nigeria	9	African Journal of Biotechnology	2010
B.M. Aji, P.A. Onyeyili, U.A. Osunkwo	The central nervous effects of Mitragyna africanus (Wild) stem bark extract in rats	9	Journal of Ethnopharmacology	2001

**Table 2:** The leading authors, their publications with highest number of citations and the names of the Journals that published the articles.

The track of some of my papers showed that the most cited paper was published in 2006. Others were published in 2008, 2009, 2010 and 2011. The number of citations of each paper were 12, 9, 9, 4, 3 and 1 respectively (Table 3).

S/No	Publications	Citations	Journal that published the article	Year of Publication
1.	Evaluation of in-vitro antimicrobial activities and phytochemical constituents of <i>Cassia occidentalis</i>	12	Animal Research International	2006
2.	Tropical plants with antihypertensive, anti-asthmatic and antidiabetic value	9	Journal of Herbs, Spices and Medicinal Plants	2009
3.	Some medicinal plants of Arabian Peninsula	9	Journal of Medicinal Plants Research	2010
4	Screening of <i>Sida acuta</i> subspecies <i>acuta</i> for phytochemical component and antimicrobial activity	4	African Journal of Clinical and Experimental Microbiology	2006
5	Acute toxicity of Potassium permanganate in mice	3	Nigeria Journal of physiological Sciences	2008
6.	Haematonic and Plasma expander effects of aqueous extract of <i>Abrus precatorius</i> leaf in mice	1	Comparative Clinical Pathology	2011

**Table 3:** Some citations of my publications reported by Google Scholar Citation Help.

The 4<sup>th</sup> which was latter tracked by GSCH® was cited 4 times and so added to h-index of my publications. Although at that time a total of 18 of my Publications are online and other authors have cited some of my other papers whose citations are were reflected in Google Scholar Citations Help. So, based on what GSCH showed of my publications, the h-index should be 4.

Total number of my citations rose to 178 and 160 in 2016 and 2011 respectively. But the h-index and i10-index was 8 and 6 in 2016 and 2011 respectively (table 4).

Scientometres	All the citations up to 2016	Citations since 2011
Citations	178	160
h-index	8	8
i10-index	6	6

**Table 4:** h-index of my publications in 2016.

## Discussion

Peer review is the process that decides whether your work gets published in an academic journal. The exhibition of my profile by GSCH indicated 100 publications published by 132 academics and cited 425 times up to 2012. This is untrue, because only 10 of my publications were shown initially by GSCH among the 100 publications. My findings disagree with the report of Eghe indicating that in the original context of publications and citations, the h-index is only weakly sensitive to the number of citations received [23]. When a scientist's h-index is equal to h, then this scientist's first h articles received at least h times which is equal to h<sup>2</sup> citations. This lower bound is the only relationship that logically exists between publications and citations, when the h-index is known. There is no upper bound for the number of citations received by their Hirsch Core. This is the set of articles occupying the first h ranks. For this reason, Eghe proposed another

index, referred to as the g-index. The number of citations should be taken into account [9,10]. Her proposal is to use the average number of citations of articles in the Hirsch Core as a more sensitive indicator. As this proposal uses an average, Rosseau [14] referred to it as A index which is usually a positive real number (not necessarily an integer). Since the GSCH gave a profile of academics that published together or academics that were co-authors in other journals, it means the GSCH used to give an h-index of a group of researchers who may be related in the areas of research invariably giving what I may call cumulative h-index of a group of scientific researchers. Therefore, the up to date h-index of 11 and the h-index of 9 given in 2012 and 2008 are cumulative index. My findings disagree with the report of DTM-GL [21] that the h-index is a metric for estimating the importance, significance and broad impact of a scientist cumulative contributions. It takes into account both the number of individual's publications and their impacts on peers, as indicated by citation counts. Its creator Jorge Hirsch asserts that a successful scientist will have an h-index of 20 after 20 years; an outstanding scientist will have an index of 40 after 20 years; and a truly unique individual will have h-index of 60 after 20 years or 90 after 30. The given profile showed a most senior professor in the group to have a paper cited 42 times, although his h-index was not calculated. The fact that the 10 topmost cited papers are in the area of ethnopharmacology indicates that papers published in this area may likely be cited faster and so leading to higher h-index. Our findings agree with the report of Rosseau [14] indicating that "the h-index does not take articles receiving a small number of citations into account". This is well known advantage of this measure. It mainly reflects the number of highly cited articles, but the actual number of citations does not influence the value of h index. A scientist who writes many articles which are each well received, but not exceptionally well, will have a high h-index. His g-index will just be marginally larger than his h-index. Stated otherwise the ratio of g/h will be close to 1 (but never smaller than 1). A scientist who writes a few exceptional articles, while her other articles are hardly noticed by the scientific community will have a relatively low h-index and a high g-index. Therefore, taken together g and h present a concise picture of a scientist's achievements in terms of publications and citations. [13] However, only 3 out of 10 leading researchers in the profile are pharmacologists, the rest belong to other specialities such as public Health, Pathology, Physiology and Veterinary Medicine indicating collaboration among the specialists of various fields. Although, a professor whose paper is mostly cited is not the oldest in the group, the highest number of citations may be due to high level of interest of researchers in the medicinal plant research. This shows that the papers whose authors have h-index are always published in the flourishing areas of research interest such as pharmacology and other flourishing areas. My findings are corroborated by the report of Ball, Braun., *et al.* and Glanzel indicating that a set of papers are ranked in decreasing order of the number of citations they received [2,3,12]. The h-index is the (unique) highest number of papers that received h or more citations. It is a simple single number incorporating both publication (quantity) and citation (quality or visibility) scores and hence has an advantage over these simple separate measures and over measures such as number of significant papers (which again is not a single number). The h-index is also robust in the sense that it is insensitive to an accidental set of uncited (or lowly cited) papers and also to one or several outstandingly highly cited papers [1]. Because more challenging new infectious and non-infectious diseases that are emerging world-wide, the specialists in the areas of drug discovery and development have rededicated their effort towards realization of the new effective safe drugs that can be used to treat the new emerging diseases. The fact that number of my publications latter increased to 13 in the profile, and 5 out of them have citations and the 4<sup>th</sup> paper whose citation latter appeared in the website disagrees with the Google Scholar Citations Help. The calculated h-index of 4 for 13 of my reported papers needs to be reviewed, because further searches have shown several of my papers to have been cited by other researchers and such citations were not reflected in what was called by GSCH as Saganuwan's Profile.

The steady increase of my h-index to 8 in 2016 indicates that peer review is effective when the comments are positive [24]. This may be due to notion of publication bias [25], which demonstrates a clear willingness and a real appetite to use a "basket of metrics" to broaden the ways in which research merit can be detected and demonstrated [26]. Therefore, every scientist involved in this dispute could operate at the highest level of personal honesty and integrity [27]. The purpose of this instrument is to give correct citation [28]. However, for the case of deceased author, to correct this type of error is a matter of great concern. Applying these suggestions require a little more effort to institute intelligible principles, where modifications are slight and potential improvements worth it in terms of maximizing chances for article better visibility, increased download, and subsequent higher citation [29] as I have experienced.

## Conclusion

In conclusion, Google Scholar Citations Help gives more of cumulative h-index of researchers. But individual h-index of the published papers can be calculated by removing publications of other researchers. Therefore, GSCH is misleading and needs to be overhauled.

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