Scientific Productivity of Zahedan University of Medical Sciences

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Abstract

Background: Nowadays the scientific research outputs indexed in international databases are used in the bibliometric rankings of researchers, departments and universities. Measuring the impact and value of scientific publications is used by policy makers to distribute the research funds in way that support high quality research projects.
Materials and Methods: In this scientometric study, SCOPUS citation database was used to evaluate the scientific research productivity of Zahedan University of Medical Sciences (ZAUMS) over the period of 1976-2011. We retrieved the number of publications and citations of researchers, academic groups, and university and calculated their h-index scores. The affiliation varieties were used by researchers to address the university and different spellings of authors names were determind.
Results: The results showed that scientific productivity of ZAUMS has been improved so that it's h-index increased from 1 in 2000 to 19 over the period of the study.
Conclusion: Total number of 504 publications were indexed in SCOPUS in the forms of original article, review article, conference paper, letter, editorial, and note. Most of the publications were in the form of research article (91.2%). There was a significant coorelation between the number of publications, citation rates and h-index scores. Departments of biochemistry and infectious disease ranked first on the basis of producing the most scientific output of the university.

Introduction

Nowadays measuring the scientific productions, its development and impact on national and international ranking have attracted policy makers, because it helps them to allocate research budgets to support the most effective researches and projects. Scientometrics is the most common method of assessment the scientific activities [1]. International Association of Scientometrics was registered in Netherlands 1994 in order to encourage, communicate and exchange professional information of scientometrics [2].

Most scientific methods are based on indicators such as the number of publications, number of citations, average count of citations and other important indices [3]. For a long time, impact factor (IF) of journal was used to determine quality of an article. However, sometimes articles with highest quality were not published in journals with high IF [4]. In the last few years, different bibliometric indicies have been proposed for comparing scientific productivity of individuals and institutions. JE Hirsch, professor of physics university of California, introduced Hirsch index (h-index) in 2005 for quantitative and qualitative assessment of researchers. The simplicity and intuitiveness of the h-index have contributed to its popularity [5, 6].

A scientist has index h if h of his/her N papers have at least h citations each, and the other (N -h) papers have no more than h citations each. If a researcher's h-index equals 5, it means that 5 titles of his/her articles have received at least 5 citations. For first time, this index was registered in physics information database of SPIRES [7]. In fact h-index results from balance between number of

publications and number of citations per article [8]. Since 2005, several indicators are provided including w, r, h1, h2, m, g, etc [9]. Bornmann et al. has identified 37 h-index variants during last 6 years [10].

Number of articles and citations are known as the most important indicies around the world because scientific findings are reflected in these types of products and they are mostly used by researchers [11]. Web of Science (WoS) and SCOPUS are most valid indexing databases of scientific productions over the world. Hosseini and Jalil-Balleh compared research outputs and h-index of accademic staffs of the faculties of Pharmacology at three universities in Tehran Tehran University in mentioned databases [9].

Meho and Rogers compared number of citations and h-indexs of computer researchers in two mentioned databases [12]. SCImago Institute Rankings (SIR) reported the Middle East institution rankings scientific productions by using SCOPUS in 2011 [13]. Mostafavi and Bazrafshan determined the scientific position of Pasteur Institute of Iran by searching on these databases [8]. Vaziri investigated Iran's scientific productivity in WoS database [14]. This study was designed and performed to evaluate scientific productivity of Zahedan University of Medical Sciences (ZAUMS) in SCOPUS database from its establishment until the end of 2011.

Materials and Methods

This study was conducted by using the scientometric method. At first, we searched all documents published with the affiliation of Zahedan in SCOPUS during 1976-

2011. Then we reviewed the results and extracted all documents were indexed with different addresses of the university regardless of language and document type. Total number of documents, overall number of citations and university h-index score were determined once by including all the citations and once more by excluding self-citations. Top ten cited papers were also determined. After elimination of common scientific productions, we classified scientific output of eachacademic group and measured their h-index scores and ascertained authors with h-index more than 5. At next step, different university addresses used by authors to indicate their affiliations and the various spelling of authors' names have been assessed. Finally, research results were analyzed and compared using descriptive and analytical statistics.

Results

504 indexed documents with name of ZAUMS and subordinate units (schools, hospitals, health centers, etc.) were extracted among 1502 retrieved documents with name of Zahedan city in SCOPUS database from its establishment in 1976 up to the end of 2011. 97% of doucuments were published in English and in 6 different forms: research articles (91.2%), review articles and letters to editor (each one 3.6%), conference papers (1.2%), editorials and notes (each one 0.2%). The overall citation count of all publications was 1657 and the university h-index was equal to 19. After excluding author self-citations it was lowered to 1274 and h-index was slightly decreasedto 17. Afterwards, number of productions and citations were in a growing trend. Maximum number of documetns published in 2010 and most received citations were in 2011(Table 1). University h-index score increased substantially over the last years and increased from 1 in 2000 to 19 in 2011 (Fig.1).

The first indexed document in SCOPUS database was published in the form of conference paper in 1995 and the first citations to the university publications were received in 2000. However, 46% of scientific productions received no citation at all and the rest of them (272 out of 504 publications) received 1-79 citations. A total of 227 documents out of 272 (45%) received the most rate? (rate or number) of citations between 1-9.

Total number of university authors with at least one article indexed in SCOPUS database was 283. 96.8% of scientific products were published by university faculty members (176 individuals) and 3.2% were produced by students and university staff (sometimes with the association of faculty members of other universities). Among 176 university faculty members, 58 authors published just one article, 26 authors published 2 articles, 15 authors published 3 articles and 77 authors published more than 3 articles. 226 individuals (80%) out of 283 authors wrote their names with one from of spelling, 32 individuals (11%) wrote with two different spellings and 25 authors (9%) wrote their names with various spellings. Eighteen different address varitions were used by authors

to illustrate their organization dependency but most of them (87%) were indexed by the correct name of Zahedan University of Medical Sciences (ZAUMS).

In ranking of different sectors and departments of 7 subordinate schools of ZAUMS according to their overall number of publications and citations and h-index scores, School of Medicine stands at the top (608 ducuments and 1871 citations) follwed respectively by School of Public Health (88 documents and 347 citations), School of Paramedical Sciences & Rehabilitation (26 documents and 66 citations), School of Dentistry (19 documents and 29 citations) and Schools of Nursing and Midiwifery in Zahedan and Iranshahr (11 doucuments and 7 citations) (tables 2 and 3). Some groups had no scientific production and had not been reported. Department of biochemistry with 96 articles and totally with 563 citations took the first place of the basic sciences group and department of infectious diseases and tropical medicine with 91 documents and 269 citations was at top of clinical medicine group.

Table 4 represents authors with h-index more than 5 according to their number of documents and citations. Top ten articles of the university based on total number of received citations up to the end of 2011 are listed in table 5. University authors are shown in bold font.
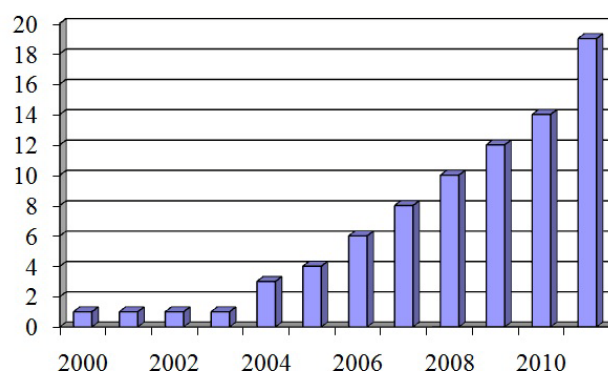

Figure 1. ZAUMS h-index scores in SCOPUS over the last 12 years

Table 1. ZAUMS scientific productions indexed in SCOPUS

Row	Year	Number of publications	Number of citations	Excluding self-citations
1	1990	1	0	0
2	1996	1	0	0
3	1999	1	0	0
4	2000	0	3	3
5	2001	0	3	2
6	2002	3	1	1
7	2003	10	3	3
8	2004	10	11	7
9	2005	28	29	13
10	2006	78	76	41
11	2007	57	105	60
12	2008	66	158	110
13	2009	63	290	204
14	2010	100	402	323
15	2011	86	576	507
	Total	504	1657	1274
h-index			19	17

Table 2. Distribution of scientific production of ZAUMS- School of Medicine according to citations

School	Academic group	Department	Number of publications	Number of citations	Period	h-index
School of Medicine	Clinical Medicine	*Infectious Diseases	91	269	2003-2011	9
		*Internal Medicine	57	164	2005-2011	7
		Neurology	27	137	2003-2011	7
		Neurosurgery	21	61	2003-2010	5
		*Ophthalmology	8	58	1996-2011	5
		*Pediatrics	32	51	2004-2011	4
		*Obstetrics & Gynecology	24	37	2006-2011	4
		*Anesthesiology	20	20	2002-2011	3
		Orthopedics	3	15	2005	3
		Cardiology	2	10	2009-2011	1
		Psychiatry	10	9	2006-2011	2
		Dermatology	2	7	2009-2010	2
		*Radiology	7	3	2002-2011	1
		*Surgery	2	2	2005-2011	1
		Otolaryngology	2	0	2003	0
		Urology	1	0	2009	0
	Basic Sciences	Biochemistry	96	563	2004-2011	11
		Histology	31	91	1999-2011	5
		Hematology & Immunology	17	87	2002-2011	3
		Parasitology	16	69	2005-2011	5
		Pathology	16	48	2003-2011	3
		Microbiology	28	34	1990-2011	3
		Nutrition	22	32	2006-2011	3
		Genetics	13	27	2008-2011	3
		Physiology	11	17	2006-2011	2
		Clinical Psychology	8	12	2007-2010	2
		Laboratory Sciences	17	6	2007-2011	1
		Medical Physics	4	4	2007-2008	1
		Pharmacology	4	0	2010-2011	0
Others			16	38	-	
Total			608	1871	1990-2011	

*Academic groups with residents

Table 3. Distribution of scientific production in schools of ZAUMS except School of Medicine according to citations

School	Department	Number of publications	Number of citations	Period	h-index
Public Health	Biostatistics & Epidemiology	46	256	2003-2011	8
	Public Health	25	63	2003-2011	5
	Environmental Health	10	25	2006-2011	3
	Occupational Health	7	3	2008-2011	1
Paramedical Sciences & Rehabilitation	Physical Therapy	17	54	2006-2010	3
	Speech Therapy	8	12	2007-2011	2
	Optometry	1	0	2010	0
Dentistry	Pediatric Dentistry	4	11	2008-2011	1
	Periodontics	4	10	2006-2011	2
	Prothesis	4	5	2007-2011	1
	Oral & Maxillofacial Surgery	1	2	2002	1
	Endodontics	1	1	2011	1
	Diagnostic Dentistry	5	0	2009-2011	0
Nursing & Midwifery (Zahedan & Iranshahr)	Nursing	6	4	2007-2011	2
	Midwifery	5	5	2009-2011	1

Table 4. Scientific outputs of authors with h-index>5

Author's name	Degree	Department	Number of publications	Number of citations	h-index
Hashemi, Mohammad	Professor	Biochemistry	76	487	11
Moghtaderi, Ali	Associate Professor	Neurology	24	135	7
Sharifi-Mood, Batool	Professor	Infectious Diseases	54	104	6
Alavi-Naini, Roya	Associate Professor	Infectious Diseases	26	72	6
Salehi, Masoud	Associate Professor	Infectious Diseases	25	79	6
Izadi, Shahrokh	Associate Professor	Epidemiology	15	119	6

Table 5. Top ten articles of ZAUMS indexed in SCOPUS based on number of citations up to the end of 2011

Title	Journal	Authors	Total citations	Excluding self-citations	Number of authors
Mechanism of apoptosis induced by S100A8/A9 in colon cancer cell lines: The role of ROS and the effect of metal ions	(2004) Journal of Leukocyte Biology, 76(1), pp.169-175.	Ghavami, S., Kerkhoff, C., Los, M., Hashemi, M.,Sorg, C., Karami-Tehrani, F.,….	73	45	6
S100A8/A9 at low concentration promotes tumor cell growth via RAGE ligation and MAP kinase-dependent pathway	(2008) Journal of Leukocyte Biology,83(6),pp.1484-1492.	Ghavami, S., Rashedi, 1, Dattilo, BM, Eshraghi, Ml, Chazin, W.J., Hashemi, M.,…	62	53	9
The impact of dietary and lifestyle risk factors on risk of colorectal cancer : quantitative overview of the epidemiological evidence	(2009) International Journal of Cancer, 125(1),PP.171-180.	Huxley, RR, Ansary-Moghaddam, A., Clitron, P., Czernichow, S.,…	53	52	6
Primary immunodeficiency in Iran:First report of the national registry of PID in children and adults	(2002) Journal of Clinical Immunology, 22(6),pp.375-380.	Aghamohammadi, A., Mahmoudi, M., Mansourri, D, …., Khazaei, H	52	11	23
Apoptosis and cancer: Mutations within caspase genes	(2009) Journal of Medical Genetics, 46(8),pp.497-510.	Ghavami, S., Halako, AJ, Los, M, Hashemi, M, Ande, SR,Yeganeh, B, …	51	47	11
Apoptosis in liver diseases-Detection and therapeutic applications	(2005) Medical Science Monitor,11(11),pp.RA 337-RA345.	Ghavami, S, Hashemi, M, Kadkhoda K, Alavian, SM, Bay, GH, Los, M.	48	37	6
Validation of Michigan neuropathy screening instrument for diabetic periferal neuropathy.	(2006) Clinical Neurology and Neurosurgery, 108(5),pp.477-481	Moghtaderi, A, Bakhshipour, A, Rashidi, H.	30	30	3
S100A8/9 induces cell death via a novel, RAGE-independent pathway that involves selective release of Smac/DIABLO and Omi/HtrA2	(2008) Biochimica et Biophysica Acta-Molecular Cell Research, 1783(2),pp.297-311	Ghavami, S, Klonisch, T, Los, M, Kerkhoff, C, Chazin,WJ, …., Hashemi, M	29	18	11
Epidemiologic aspects of Bam earthquake in Iran: the nephrologic perspective	(2006)American Journal of Kidney Diseaes, 47(3), pp.428-438	Hatamizadeh P, Najafi I, Vanholder R, Rashid-Farokhi F, Sanadgol H, …	26	18	13
Cytotoxic effects of intra and extracellular zinc chelation on human breast cancer cells	(2007) European Journal of Pharmacology,557 (1),pp.9-19.	Hashemi, M, Ghavami, S, Eshraghi, M, Booy, EP, Los, M.	25	13	5

Discussion

The university h-index increase from 1 in 2000 to 19 in 2011 represents the growth of university scientific productivity from its establishment up to the end of 2011. The same trend of growth in Iranian scientific products during recent years was reported by several authors. In Kharabaf and Abdullahi study it was revealed that over the last 35 years Iran with a rank of 31 in the world has the second place after Turkey among its neighbors and the eight in whole Asia [15].

The present study showed that growth in rate of scientific publications led to growth in number of citations and h-index of researchers and university as in Gun and Gao [16] and also Kelly and Jennions studies [17]. Providing well-equipped research laboratories, allocating enough budget, facilitating procedures for conducting research projects, providing quick and easy access to informational resources and considering higher score in annual ranking of researchers are among factors of improving research productions. Most indexed scientific documents of ZAUMS in SCOPUS were in English (97%) and published in the form of original article. Those findings are consistent with the results of Vaziri studies on scientific productions of four Iranian

leading organizations (Tehran University, Tehran University of Medical Sciences, Tarbiat Modarres University and Islamic Azad University) [14] and studies of Norouzi-Chakly and colleagues [18] and Niakan [19]. International valid databases are in English language and concequently native english countries have naturally more opportunities to emerge themselves in international indexes. So, universities are responsible to increase the number of registered English-language journals in international databeses, held up English language classes and workshops to improve the researchers knowlege of writing English articles.

Up to the end of 2011, h-index of ZAUMS was 19 (1657 citations) while by excluding all author self-citations it was lowered to 17 (1274 citations). The authors h-indexes also changed 1 to 2 numbers. Although self-citation can obviously increase authors and universities h-index but it's effect on h-index is much smaller than on total citation count. Jalili-Baleh and Mirhosseini reported that excluding author self-citations of pharmacology academic staffs did not show a prominent effect on their h-indexes [9]. Cronin and Meho in their study on the h-index of American Information Scientists showed that excluding

self-citations had little effect on researchers h-indexes [20]. Kulkarni studied the author self-citation in the literature of general medicine of three general medical journals with high impact factors. They concluded that self-citation peaks within two years of publication and is more evident in articles with more authors [21].

Lin and Huang indicated that there were significant relationship between the number of co-authors and number of citations of an author and his/her other colleagues [22]. This subject is shown in table 5 indicating top ten articles of the university in terms of total citations, excluding self-citations and number of co-authors. It is notable that in recent years association between co-authorship network of organizations was developed and collaboration network analysis is becoming as one of the scientometric indicators. We recommend the same study on ZAUMS research productions to determine the collaboration features.

In comparing two main academic groups, clinical and basic medical sciences, in the school of medicine, the first one had more publications (309 versus 283) while the second one received more citations (990versus 843). Higher number of scientific production or citation dosen't show priority of one academic group to the other one because not only the number of faculty members in various intervals was not equal but also the scientific nature of various fields is very different. In an investigation of fifteen years research production of Iran in WoS database by Norouzi-Chakly and colleagues, some areas of basic sciences had higher scientific production but they concluded that more products did not indicate more successful or higher scientific productivity of scientists in that subject area [18].

Interdisciplinary relationship is the cause of increasing the production of some departments such as biostatistics and epidemiology which had more cooperation with others because of their natures. Some disciplines had little productions just because of participating in production of others. Moreover, departments with PhD degree students had more opportunity due to writing and finalizing more dissertations than the other groups and the ability of publishing more papers.

Since the number of university faculty groups and faculty members of each group was not identical in different years and some schools and departments were older than others, it was impossible to compare them with each other. This kind of comparison would be helpful just in a limited period by using identical weighing indicators. In Aminpoor and colleagues study, more than half of scientific productions of Isfahan University of medical sciences was devoted to its faculty of medicine in 2008 and it stood at the first place among 7 faculties. However, according to number of faculty members, this school was ranked in third place [23].

Although most addresses used by the authors (87%) were correct affiliation of ZAUMS, but if we eliminate documents were published just by the correct format, the whole documents would fall to 437 and university h-index score would drop to 16. Zolfigol and colleagues confirmed lack of familiarity of some authors with correct name of the university caused them not to be indexed properly and the position of university in national and international ranking would drop [24].

Mostafavi and Bazrafshan also pointed out about 45% incorrect addresses of Pastour Institute of Iran in WoS [8]. Therefore, applying address variations is a serious threat to the scientific products and should be considered by university policy makers. Ministry of Health and Medical Education policy makers or High Council of Medical Universities Development can determine one or two places for suggesting English affiliation in the application forms of establishing a new university, colleges and/or research centers and approve both the Persian & English names simoltaniously.

University policy makers or responsible departments announce correct affiliations in different ways such as putting on university web site, sending text messages and e-mails to researchers and writing as footnotes in correspondences. Besides, authors who have not used correct form of address in their publications should be informed of missing their products and loosing real h-index scores.

Among 283 authors who had indexed articles in SCOPUS database, 80% wrote their names with one type of spelling. It is notable that 40% of them had just one publication and so it will be possible to use other spellings in their next publications. After identification of authors who identify themselves with different spellings in the articles, the scientometric department should inform them about failure of finding their real h-indexes. It is suggested that researchers use their English name as a single ID in all automations, electronic programs and email address.

In this case, ID performs as a reminder both to the author and his/her co-authors. Sending one message to a group of colleagues and asking them to save the correct spelling of a researcher's name under his/her cell phone number would simply avoid repetition or unwanted occurrence of numerous spelling errors. Due to the importance of assessing scientific outputs and their impact on various sciences, hundreds of delegates participate in conferences held in different countries and investigate the new evaluative metrics have been emerged on bibiometric analysis of citation counts, article usage, collaborative scientific network.

In early scientometrics symposium held on 2011 in New Mexico, it was emphasized on the necessity of using more than one method to capture the impact of research publications and authors [25].The university policy makers should establish or activate scientometric departments in order to be familiarize with new bibliometric techniques and survey and analyze the university products for them.

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Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of Interest

The authors declare no conflict of interest.

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