SHORT COMMUNICATION

Scientometrics Analysis of Iranian Orthopedics Academic Departments

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Abstract

Background: Scientometrics is one of the bibliometrics subsets aiming to study the status of scientific development of scientific and research institutes. This study aimed to investigate the scientific status of orthopedic departments in different universities of Iran using the national scientometrics system of the Ministry of Health in Iran.

Methods: This cross-sectional study investigated the researchers and orthopedic departments in different universities of Iran based on the data from the scientometrics system of the Ministry of Health in Iran until the beginning of 2021. All researchers and publications related to orthopedics, as well as the relationship of these researchers, have been studied part-time and full-time. The number of publications, indexing level, academic degree, and academic position has been also registered and examined through the scientometrics system.

Results: This study included 280 researchers from different universities in Iran. The mean number of the published articles was 20.6±19.8. The highest number of faculty members were from Iran (n=27; 9.64%), Shahid Beheshti (n=26; 9.28%), Tehran (n=25; 9.28%), as well as Mashhad and Shiraz Universities of Medical Sciences (n=18; 6.42%) in descending order. The overall mean values of the H- and G-index were determined at 5.85±2.7 and 9.3±4.2, respectively. Furthermore, the number of citations per published article was obtained at 6.7±1.3. It should be mentioned that Mashhad University of Medical Sciences obtained the highest H-index (9.6) and G-index (10.6), respectively.

Conclusion: The scientific productions and publications of the Iranian orthopedic academic institutions were similar to those of the international scientific institutes in terms of H-index and number of citations per published article. It is worth mentioning that Mashhad University of Medical Sciences was the leader in this regard.

Keywords: Evaluation, Medical research, Research performance, Scientometry

Introduction

Scientometrics is one of the bibliometrics subsets aiming to study the status of scientific development of scientific and research institutes (1). Bibliometrics is a practical mathematical and statistical technique used to study scientific publications and professional academic communication. In addition, accurate statistical analysis of the quality and quantity of scientific publications, including scientific books and articles, is possible using bibliometrics methods (2). The scientific productions and research publications of the countries reflect the state of their scientific growth and development. The budget spent on scientific production in developed countries is about 1.5% of gross domestic products, while in Iran, 0.5% is spent on science and technology. Scientific progress has been significant in Iran with the development of scientific and research institutes, especially in the field of medicine in recent decades (3, 4). Many researchers have participated in scientific growth with scientific papers from various institutions and universities in Iran; therefore, according to Butler et al., in 2006, Iran ranked second after Turkey among Islamic countries in terms of the

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number of scientific articles (5). Furthermore, based on a study conducted by Malekzadeh et al., the number of scientific articles indexed by the Iranian authors in the Web of Sciences showed a 26-time increase in Iran's scientific growth from 2000 to 2014 (6). Analysis of the scientific performance of institutions, universities, and researchers is an inevitable priority (6). The results of the scientometrics analysis can be used to increase the quality and quantity of scientific products and be effective in determining the necessary policies. Due to the importance of the issue in Iran, a comprehensive system for reviewing and analyzing scientific products has been created by the Ministry of Health and Medical Education, which has continuously provided scientific information and data to Iranian universities and researchers (6). This study investigated the scientific status of orthopedic departments in different universities of Iran using the scientometrics system.

Materials and Methods

This cross-sectional study investigated 280 researchers and orthopedic departments in different universities of Iran based on the information from the scientometrics system of the Ministry of Health in Iran until early 2021. All researchers, publications related to orthopedics, and the relationship of these researchers have been studied part-time and full-time. Furthermore, the number of publications, indexing level, academic degree, and academic position has been registered through the scientometrics system. The data of this study were based on publications and citations in Scopus. Descriptive statistical methods were used to analyze the data using SPSS software (version 16).

Results

This study included 280 researchers from different universities in Iran. The mean number of the published articles was determined at 20.6±19.8. The highest number of faculty members were from Iran (n=27; 9.64%), Shahid Beheshti (n=26; 9.28%), Tehran (n=25; 9.28%), as well as Mashhad and Shiraz Universities of Medical Sciences (n=18; 6.42%) in descending order. The overall mean values of the H- and G-index were determined at 5.85±2.7 and 9.3±4.2, respectively. Furthermore, the number of citations per published article was obtained at 6.7±1.3. Mashhad and Urmia Universities of Medical Sciences obtained the highest H-index (9.6, 6.8) and G-index (10.6, 12.5), respectively. In total, 33 (11.7%) academics did not have any research papers. Table 1 tabulates the bibliometric findings by the universities based on the H-index [Table 1].

Discussion

The number of papers published in many scientific departments is related to the number of academics working in those places, and the more number of employees leads to the more scientific papers (6, 7). However, according to the findings of our study in the orthopedics department in Iran, this is not quite the case. Orthopedic surgeons working in scientific institutes are not very willing to participate in the research program. Only several Iranian orthopedic academic institutes have played a greater role in conducting research. However, in other academic disciplines, higher scientific growth has occurred; therefore, a study based on the H-index citation per paper on Iranian medical scientific products from 1978 to 2007 showed the highest and lowest growth

Table 1. Bibliometrics findings based on the Iranian medical scientometrics system and the H-index order

Iranian University of Medical Sciences	Publication	Citations	Self-Citations	H-index	G-index	Citations per publications	Full Professor	Associated Professor	Assistant Professor
Mashhad	29.5±2.1	1710.7±217.5	4%	9.6	10.6	4.9	3(16.7%)	8(44.4%)	7(39%)
Urmia	58.7±5.5	2090±136.8	5%	6.8	12.5	4.5	2(25%)	2(25%)	4(50%)
Tehran	21.2±3.9	1627.2±381	3.4%	5.2	8.7	4.9	4(16%)	8(32%)	13(52%)
Iran	24.5±4.5	2008.9±458.6	4.5%	5.1	8.1	13.5	6(22.2%)	8(29.6%)	13(48.1%)
Shiraz	26±3.4	1364.4±145.2	1.4%	5.1	9	5.8	2(11.1%)	5(27.7%)	11(61.1%)
Gilan	22.2±2.4	1030.8±123.9	4.2%	5	7.7	4.7	0	4(66.6%)	2(33.4%)
Babul	19.5±9.8	1380.5±77.7	1%	5	10.2	7.3	2(50%)	0	2(50%)
Shahid Beheshti	18.2±8.9	1070.5±887.8	1.6%	4.8	8.7	5.6	5(19.2%)	9(34.6%)	12(46.2%)
Tabriz	12.4±5.2	86.8±54.2	0.9%	4.8	8	7.08	4(26.6)	8(53.3%)	3(20%)
Kerman	19.2±7.3	75.6±64.3	4%	4.8	7.2	4.6	0	2(40%)	3(60%)
Isfahan	18.5±4.3	67.7±20.7	2.7%	4.7	8	7.5	0	7(50%)	7(50%)
Yazd	12.2±8.5	68.3±47.9	3%	4.5	6.7	5.8	2(20%)	4(40%)	4(40%)
Mazandaran	18±2.8	135±16.5	0.5%	4	9.5	5.8	0	1(50%)	1(50%)
Ahvaz	6.5±2	44.6±6.6	0%	3	5.3	7.9	0	0	3(10%)

in the fields of pharmacy and surgery, respectively (1). The H-index criterion is one of the common methods in reviewing the scientific achievements of researchers in academic centers. There is also a high correlation between the academic rank of scientific institutes and academic parameters with the H-index. The H-index was introduced in 2005 by Jorge E. Hirsch, also known as the Hirsch number or Hirsch index. The most important feature of this index is considering both factors, as well as the number of articles and citations (productivity and citations) simultaneously (6-8). In other words, using this index, influential researchers can be distinguished from others, and important journals in the medical world can be identified. Based on the findings of our study, despite having fewer academic staff, Mashhad and Urmia Universities of Medical Sciences have published the most influential orthopedic articles in Iran. The mean H-index values of these two universities were 9.6 and 6.8, respectively. One of the disadvantages of the H-index is the effect of self-citation on the false increase of this index. The overall mean of self-citation in our study was close to 5%. The number of articles is a limiting factor for the H-index and depends on the research life of researchers. Complementary indicators to solve this problem are M-index and G-index. The M-Index is obtained by dividing the researcher's H-index by the number of years of research life. The research life of the researcher is calculated from the time of publication of the first article. The G-index is the modified type of the H-index. Unlike H-index, this index gives more weight to the most cited articles (6-9). According to the G-index, Urmia and Mashhad Universities of Medical Sciences obtained the highest score in orthopedic departments. In a study conducted by Ence et al., the academic rank among orthopedic surgery faculty was conducted in the United States in 2016. In a review of 142 American academic institutions, the mean H-index of the orthopedic researchers was obtained at 5. Furthermore, the median values of the assistant, associate, and full professor's research life were 9, 17, and 27 years, respectively (9). Schoenfeld et al. performed a study to review the academic output of 282 spine surgery fellowships. The mean number of publications per article published from 2011 to 2014 was determined at 5.5 (10). In our study, the mean number of citations per orthopedic article published by orthopedic academic institutions was measured at 6.7, which was higher than that in the above-mentioned study. To increase the homogeneity, the criterion for measuring scientific products and publications based on the H-index is obtained from a single database (Scopus). The scientometrics system of the Ministry of Health in Iran uses this database, and the data obtained from the study is highly reliable since it has full MEDLIN coverage. However, this system has some limitations and does not take into account the research life of the individuals, and the calculation of the M-index is not possible, which has been one of the limitations of our study.

Scientific productions and publications of the Iranian orthopedic academic institutions are similar to those of the international scientific institutes in terms of H-index and the number of citations per published article. Moreover, Mashhad and Urmia Universities of Medical Sciences are the two leading universities in this regard.

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