Scientific output of Shahrekord University of Medical Sciences in ISI database from 1993 to 2011 according to scientometric indices

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Abstract: Background and aim: The recognition and evaluation of research status in each country is a necessity for research planners, policymakers, and researchers of that country. Today, the quantitative examination of scientific output (particularly research articles) is one of the most important indices of research and knowledge generation. Science Citation Index Expanded (SCIE) database is offered by Institute for Science Information (ISI) and is considered as one of important databases in scientometric research. This study is aimed to examine the scientific output status of the researchers affiliated to Shahrekord University of Medical Sciences (SKUMS) from 1993 till the end of 2011 using the data of Web of Science (WOS). Methods: The present research is applied-descriptive. Data gathering was done in internet through WOS database. Having entered into *search* option of this database and selected science citation index of SCIE, we searched within 1993-2011 interval using different spelling of SKUMS as address. The data after being extracted from database entered into *Histcite* software. For data analysis descriptive statistics, including frequency and percent, and some scientometric rules were used. Results: The number of scientific documents authored by authors affiliated to SKUMS, published in 89 journals, was 142 in science citation database till the end of 2011. The total number of references to the university's articles was 352, with the mean reference of 2.48 to each article and h-index of 9 for SKUMS. There was an increase in the number of scientific records existing in this database and the references made to SKUMS' articles (from one in 2000 to 45 in 2011 and from one in 2004 to 93 in 2011, respectively). The highest knowledge generation was related to general internal medicine with 22 (15.5% of the) records. Conclusion: Knowledge generation in SKUMS has been on increase and the increase in number of citations is indicative of the articles' quality growth.

1. Introduction

Recognition and evaluation of research status in each country is necessary for planners, research policymakers, and researchers of that country. Recognition of the current status requires obtaining the information concerning the input (such as budget allocated to research and researchers), process (selection, approval, and conduction of research projects), output (reports and research articles), and finally the effect of the output on policy makings and plannings (Aminpour, 2008).

At present, the most important indices of knowledge generation across the world is the number of scientific articles indexed in reliable international databanks and the number of the references to these articles. The number of indexed articles represents quantitative growth of scientific productions and that of references to them indicates the impact of the published articles, that is, their qualitative level (Aminpour, 2008).

One of the most efficient methods of examining research output and by extension the general status of research is application of scientometric studies through examining the research articles published in scientific journals (Mostafavi, 2012). Quantitative evaluation of scientific findings obtained from research activities helps the officials and planners utilize financial and human resources optimally with less expenditure and benefit from it in optimization of the country's socioeconomic structure. Although quantitative evaluation cannot, and should not, be an alternative to research's qualitative evaluation, it could be an effective instrument to further understand the process of scientific research and analysis, distribution, and application of scientific information (Osareh, 2010).

Information Sciences Institute (ISI) has offered an opportunity to extensively use citation analysis through development of science citation index, social science citation index, and art and humanity citation index (Rasolabadi et al., 2010). In this website, more

than 16000 journals, books, abstracts of the articles presented in congresses, and other forms of science presentation have been indexed. Geographical distribution of the indexed articles, specific classification, easy accessibility and search, diversity of the sciences, observance of high standards in journals' selection, and an inclusive collection of scientific subjects have given a global authenticity to ISI (Saboury, 2011).

Willingness to do research on measuring scientific productions yielded by Iranian scientists dates back to two decades ago and is still expanding. Recently, much research has been done in this regard, indicating the growth of knowledge generation in Iran (Osareh et al., 2010).

According to the *Scopus'* database, Iran was ranked 21st in the world in 2009 according to the number of the indexed scientific records and 19th in 2010 with 28149 indexed scientific records. In 2011, Iran's science has increased by 14% compared to the year 2010 and has been ranked 18th in the world (Bayat et al., 2012).

Kelly and Jennions examined the quality of scientific output of 187 editorial board members (Ecology and Evolutionary Biology) in seven journals and calculated their h-index.Their research indicated that female scientists generally published fewer articles compared to male (Kelly and Jennions, 2006).

Comparison of h- index among different countries indicated that western countries had a higher index compared to Asian countries. The low number of scientific documents could be explained by the fact that the published articles of Asian scientists may have no opportunity to be internationally presented, not necessarily due to the low quality of the articles authored by Asian scientists (Guan et al., 2008).

Sharifi et al. who examinedIran's research on mental health within a three-decade period (3031 articles) scientometrically indicated that the published articles in domestic and foreign journals increased remarkably during recent years, which could represent considerable efforts of the country's researchers in mental health subject area (Sharifi et al., 2004).

Alibeykand Rustaazadin a study of scientific output of associate professors and professors of School of Medicine of Iran University of Medical Sciences, Iran estimated the mean h- index as 2.76 for the whole population under study. The mean and standard deviation of h- index was higher for the professors compared to the associate professors. This index also was higher for the associate professors of the courses in basic sciences and men compared to those in clinical sciences and women respectively (Alibeyk and Rustaazad, 2008).

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according to scientometric indices till the end of 2010 indicated that the knowledge generation in this university underwent an ascending trend and the increase in citations represented article's quality growth (Rasolabadi et al., 2012). Bazrafshan and Mostafavi in a scientometric analysis of 36-year knowledge generation in Pasteur Institute Of Iran in ISI-SCIE database argued that the knowledge generation in this institute was increasing (Bazrafshan and Mostafavi, 2011).

Viewing the Iran's 20-Year Perspective Document expects to bescientifically ranked the first in the region. The prerequisite of achieving this purpose is continuous evaluation and monitoring of knowledge generation in the country and universities; therefore, the present study tries to evaluate the status of knowledge generation quantitatively and qualitatively in the researchers affiliated to Shahrekord University of Medical Sciences (SKUMS) till the end of 2011 using the data extracted from WOS citation information database.

2. Materials and method:

This applied-descriptive study conducted in October 2012 examined the scientific productions of SKUMS from the beginning of 1993 to the end of 2011 according to the report of WOS citation database.

Since the spelling of SKUMS for addressing purposes was not uniform, at first 846 records were retrieved through searching in WOS citation database, selecting SCIE and 1993-2011 interval, and using the *advanced search* section and *CI=Shahrekord* order. These records were relevant to all universities and institutes established in Shahrekord. Regarding the purpose of the study which was to examine knowledge generation only in SKUMS, we retrieved 122 records through *refine* panel of the database in *organizations* section and using the *refine* option, which are as follows:

SHAHREKORD UNIV MED SCI	96
SHAHRE KORD UNIV MED SCI	7
SHAHR E KORD UNIV MED SCI	5
HAJAR HOSP	3
HAGAR HOSP	1
CHAHARMAHAL BAKHTIARI UNIV MED SCI	1
MED PLANT RES CTR	1
MED PLANT RES CTR SHAHREKORD	1
MED SCI UNIV SHAHREKORD	1
MED UNIV SHAHREKORD	1
SHAHAREKORD UNIV MED SCI	1
SHAHREKORD MED UNIV	1
SHAHREKORD UNIV MED SCI HLTH SERV	1
SHAHREKORD UNIV MED SCI MICROBIOL IMMUNOL	1
SHAKREKORD MED UNIV	1

Again, having entered into *simple search* section, we combined different spellings of SKUMS which had been retrieved in the first search using *OR* function, selected the interval of 1993-2011 and SCI-EXPANDEDindex, whichretrieved 142 records. To further confirm the results, we refinedthe search through the above-mentioned names and again retrieved the same 142 records. The changes were as follows:

SHAHREKORD UNIV MED SCI   112
SHAHR E KORD UNIV MED SCI   12
SHAHRE KORD UNIV MED SCI   7
CHAHARMAHAL BAKHTIARI UNIV MED SCI 1
HAJAR HOSP   3
HAGAR HOSP   1
UNIV MED SCI SHAHREKORD   3
MED UNIV SHAHREKORD   2
MED PLANT RES CTR SHAHREKORD   2

All of the retrieved papers of the third row were seen to ensure that their authors are affiliated to SKUMS.A total number of 143 was obtained after counting the number of citations mentioned before each university's name while the number 142 was displayed in the *results* section in the *retrieval* system of WOS database. Having extracted the data from WOS database, we entered them into *Histcite* software for analysis.

3. Results:

The number of scientific documents authored by the authors affiliated to SKUMS in WOS database was 142 till the end of 2011 and all were in English. The highest proportion of knowledge generation was relevant to research articles with 74.65% (Table 1).

Considering that the total number of the country's scientific productions indexed in SCI-EXPANDED was 113991 articles till the end of 2011, SKUMS' contribution was 0.124% with 142 documents. Totally, 393 authors participated in authoring these 142 articles with a mean of 2.77 authors per each article.

Knowledge generation trend in SKUMS till the end of 2011shows that the most proportion is related to the year 2011 with more than 45 records. The speed of scientific productions was high in the interval of 2006-2007 and the number of documents underwent a four-fold increase in 2007compared to 2006 (from four records to 17 records).

Considering the number of the published articles and the citations, h-index of SKUMS was calculated as 9. It means that the authors affiliated to SKUMShad already published at least nine papers and that each paperhad been already referred at least nine times (Table 2).

Table 1. Frequency distribution of scientific productions in ShahrekordUniversity of Medical Sciences based on the type of the scientific documents till the end of 2011.

Row	Type of the document	Frequency	Percent
1	Research article	106	74.65
2	Meeting Abstract	28	19.72
3	Letter to the editor	6	4.22
4	Review articles	2	1.41
5	Proceedings Paper	1	0.70
6	Total	173	100

Table 2. Frequency distribution of the references to the articles authored by the authors affiliated to Shahrekord University of Medical Sciences in science citation database till the end of 2011

Row	Number of citations	Number of papers	Percentage
1	67	1	19.03
2	23	1	6.53
3	16	1	4.55
4	14	1	2.98
5	12	1	3.41
6	11	1	3.12
7	10	2	5.68
8	9	2	5.11
9	8	3	6.82
10	7	5	9.94
11	6	2	3.41
12	5	3	4.26
13	4	4	4.54
14	3	9	7.67
15	2	11	7.25
16	1	20	5.68
17	0	75	0
Total	352	142	100

In the rows having more than one article, the number of citations was multiplied by the number of articles to yield the percentage.
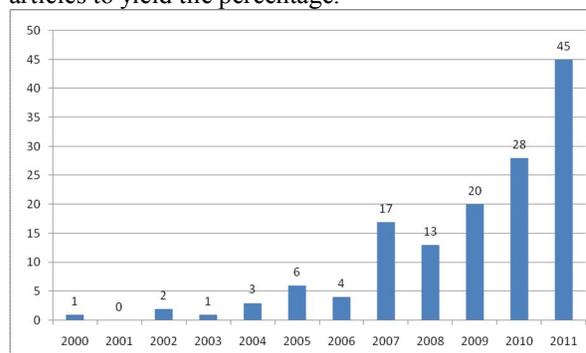

Figure 1. Frequency distribution of scientific productions of Shahrekord University of Medical Sciences in science citation database till the end of 2011.

The total number of references toSKUMS' papers was 352. Accordingly, each paper hada mean reference of 2.48. The highestproportion of citations occurred in the years 2011 and 2012 with 96 and 93 citations respectively (figure 2).
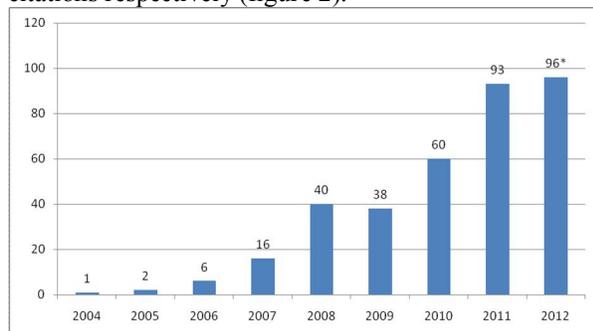

Figure 2. The trend of references to the papers published by the authors affiliated to Shahrekord University of Medical Sciences in the science citation database till the end of 2011
*the number of references to the published papers till the end of 2011 is at the time of conducting the study in 2012.

The highest proportion of scientific productions was relevant to the subject area of generalinternal medicine with 22 (15.5% of the)records, followed bypublic, environmental, and public environmental occupational health with 16 (11.3% of the) records, pharmacology and pharmaceutics with 14 (9.9% of the) records, oncology and radiology, nuclearmedicine and medicalimagingeach with 9 (6.3% of the) records, and genetics and pediatrics each with 8 (5.6% of the) records. Researchers of SKUMS had the most international communication with England (with 14 records) and Holland (with 12 records) and the least with Canada, Germany, India, and Switzerland (each with 1 record) (Table 3). At the national level, the most collaboration was done with Isfahan University of Medical Sciences (with 25 records) and Islamic Azad University (with 13 records).

Table 3. Frequency distribution of national and international collaboration of Shahrekord University of Medical Sciences with different countries according to the sciences citation database.

Row	Country	Frequency	Percentage
1	Iran	137	97.9
2	England	14	10
3	Holland	172	8.6
4	Belgium	3	2.1
5	America	3	2.1
6	Australia	2	1.4
7	Nigeria	2	1.4
8	Canada	1	0.7
9	Germany	1	0.7
10	India	1	0.7
11	Switzerland	1	0.7

142 scientific papers of SKUMSwere published in 89 different journals. *International Journal of Hyperthermia* and *European Psychiatry* each with six papersfollowed by*Clinical Biochemistry*, *Iranian Journal of Pediatrics*, *Iranian Journal of Public Health*, *Journal of Medical Plants Research*, and *Journal of Research in Medical Science* each with five papers published the highest number of thearticles authored by the authors affiliated to SKUMS.

4. Discussion

This research presented a general picture of the scientific productions in SKUMS. The results showed that the publications of this university underwenta remarkably increasing growth in the sciencecitation index and are still on increase. These results confirm the results of the research conducted by Osarehand Wilson investigating Iranians' scientific contribution during three five-year intervals in the sciencecitation index.Their study's results showed that Iran's scientific publications were doubled in the second interval compared to the first and underwent a 2.8-fold increase in the third interval compared to the second (Osareh and Wilson 2002). In another research, Wilson and Osarehscientometrically examined Iran's publications on science and technology within four seven-year periods (1975-1981, 1982-1988,1989-1995, and 1996-2002) in the science citation index database. Based on their results, Iran's publications growth trend has been on the rise since 1990s, increasing by 0.23% (from 0.02% in 1985 to 0.23% in 2002) (Wilson and Osareh, 2003). The results obtained in the research by NorooziChakli et al., in which Iran's scientific productions was examined during the two-year period of 2005-2006, showed a 21% increase in 2006compared to the previous year in the sciences citation indexdatabase (Noruzi-Chakoli et al., 2007).In addition, study of the trend of scientific productions in Pasteur Institute of Irantill the end of 2009 showedan approximately two-fold increase during 2005-2009 (Bazrafshan and Mostafavi, 2011).

According to the data obtained from *Scopus* index, Iran was ranked 21stin the world in 2009 in view of the number of the indexed scientific documents and ranked19th in 2010 with 28149 indexed scientific documents. Iran had a 14% scientific growth in 2011 compared to 2010 and was ranked 18thin the world (Bayat et al., 2012).

The trend of knowledge generation in SKUMS showed a decrease from 17 records in 2007to 13 ones in 2008. This decrease in knowledge generation was similar to that in the country's knowledge generation. In 2008, the contribution of Iranians' articles showed a 1.5% decrease compared to 2007.

The total number of references to SKUMS' articles was 352. Therefore, each paper has received a

mean citation of 2.48. As scientific productions by the authors affiliated to SKUMS, the amount of references to the articles sped up and increased by 33citations (from 60 citations) in 2010 (to 93 till the end of 2011).

On the whole, 393 people authored these 142 papers with a mean of 2.77per each article. This index for Iranian authors was reported as 3.4 in Medline (Mostafavi, 2012), 2.7 in Kurdistan University of Medical Sciences (Rasolabadi et al., 2012), and 5.4 in Pasteur Institute of Iran (Bazrafshan and Mostafavi, 2011). By comparison, collaboration index of the authors affiliated to SKUMS is relatively low. It is recommended that the national and international collaborations of the researchers affiliated to SKUMS be promoted through providing helpful conditions.

The number of scientific board members in SKUMS was 139 till the end of 2011 with a mean of 1.02 members per each article of the 142 scientific productions in WOS database. It means that one articleper each scientific board member was indexed in the science citation index. It is about 3.3 for the universities and higher education institutions across the country (Mostafavi, 2012).

5. Conclusion

Generally, scientific productions of SKUMS is increasing proportionally to the country's scientific production, which shows that the research policy of this university has been to some extent successful in20-Year Perspective Document terms. The continuation of this trend is dependent on several factors such as increase in the national and international scientific collaborations, increase in the research infrastructures (such as the number of expert researchers), increase in the budget allocated to research, and holding coursesonscientific writing, etc.

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12/12/2013

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