ORIGINAL ARTICLE

BIOMEDICAL RESEARCH IN THE MIDDLE EASTERN COUNTRIES: UPDATE AND INSIGHT USING SCIMAGO JOURNAL RANK INDICATOR

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Background: There is a dire need in the Arab world and Middle Eastern countries to reform the higher education, research policy and planning for improving the quality to meet the needs of modern society. The impact factor (IF) was developed in the 1960s by Eugene Garfield of the Institute for Scientific Information (ISI) in the USA. It has been extensively used for more than 40 years. The SCImago Journal Rank (SJR) indicator belongs to this new family of indicators based on eigenvector centrality was introduced since 2007. The SJR indicator is a size-independent metric aimed at measuring the current 'average prestige per paper' of journals for use in research evaluation processes. **Methods:** We present the status of the biomedical scientific research in the Middle Eastern countries through the newly developed SJR indicator showing some of the proposed ways that clearly can be applied for enhancing and development of that field in the Middle Eastern countries. **Results:** During the period from 1996 to 2008, Northern America, Western Europe and Asiatic region are the major contributors of the scientific research Worldwide. In the Middle East, the prominent two main Arab countries are Egypt and Saudi Arabia, nevertheless, they need more planned strategies for optimal contribution to their Middle East, Arab region and the World, despite the tangible achievements of the Arab states in the higher education and scientific research during the last decade. **Conclusion:** The SJR is seemingly satisfactory for ranking the countries for their scientific contribution and impact.

Keywords: Biomedical Research, Middle East, SJR

INTRODUCTION

One of the major functions of academic journals is to contribute to the evaluation of research activities and scientists. Invented more than 40 years ago, the ISI impact factor (IF) became the most important indicator of the quality of journals[1–3], in spite of well-known problems and critics such as the over-representation of English-language journals. Since 2007, the new SCImago Journal Rank Indicator (SJR) offers an alternative to the IF. SJR applies the Google algorithm (PageRank) to the journals of the SCOPUS bibliographic database that indexes more journals than ISI Web of Science. The results of a recent study of 368 French journals with IF and/or SJR are in favor of the usage of the new indicator, at least as a complement to the IF. SCOPUS covers much better the medical and pharmacological sciences. French titles become visible on an international level through SJR than through IF. The SJR is more interesting and representative of the French academic journal publishing market than the IF.[4]

The IF can be calculated by dividing the number of citations in a given year per the number of source articles in the previous two years. The source articles include all original research, case reports and reviews. Letters (except in some cases where original work is published in the form of letters), opinions, editorials and opinion pieces are not included in the denominator, but are included in the numerator. In the case of both the numerator and denominator, the only journals that are considered are those included in the ISI indices. The index was developed for a particular purpose, namely to inform decisions about what journals should be included in the Sciences Citation Index. However, its use has expanded enormously. It is now used to evaluate the quality of specific articles in a journal, and even the work of the authors of papers published in the journal. Decisions about promotion, appointment and research funding are informed by the IF of the journals in which the applicant has published.[5] Opposition to the use of the IF has been growing, there are a number of technical objections to the use of the IF to assess the quality of papers or their authors. The most obvious is that the ISI database includes only a very small percentage (less than 4%) of scientific journals published worldwide.[6–9] The IF refers to a mean, it does not follow that the impact of a particular paper in a journal correlates to the IF of that journal. Indeed, the overwhelming majority of citations to a particular journal are generated by a small proportion of papers in that journal. In the case of the journal Nature, for example, an analysis of citations in 2004 to papers published in the previous two years concluded that 89% of the citations were to just 25% of the papers.[10] Others,

while fully aware of the shortcomings of the IF, propose a more conservative response, in which the IF is modified to address some of these challenges, for example by extending the two year period for citations to five years. Some argue that such bibliometric measures are necessary to work towards a situation where there are fewer journals, containing fewer papers that are of higher quality.[11]

The main characteristics of the SJR indicator that it covers more than 18296 journal using SCOPUS database published in 50 language with 27 subject areas, 295 subject categories, the access is open, self citation is not included in the calculation and the update is daily.[12] We present the status of scientific research in the Middle Eastern countries through the newly developed SJR indicator showing some of the ways that clearly can be applied for enhancing and development of that field in the Middle Eastern countries.

MATERIALS AND METHODS

The SCImago Journal & Country Rank is a portal that includes the journals and country scientific indicators developed from the information contained in the SCOPUS® database (Elsevier BV). These indicators can be used to assess and analyze scientific domains. This platform takes its name from the SCImago Journal Rank (SJR) indicator, developed by SCImago from the widely known algorithm Google PageRank™. This indicator shows the visibility of the journals contained in the SCOPUS® database from 1996. SCImago is a research group from the Consejo Superior de Investigaciones Científicas (CSIC), University of Granada, Extremadura, Carlos III (Madrid) and Alcalá de Henares, dedicated to information analysis, representation and retrieval by means of visualisation techniques. Their web site is: http://www.scimagojr.com. The obtained data and ranking were generated using this site and the persons interested in the SJR calculations can easily be obtained as described earlier (SCImago Research Group).[13] The H index is a country's number of articles (h) that have received at least h citations. It quantifies both country scientific productivity and scientific impact and it is also applicable to scientists, and journals.

RESULTS

The obtained data showed that during the period from 1996 to 2008, Northern America, Western Europe and Asiatic region are the major contributors of the scientific research Worldwide (Figure-1). According to the total published documents in the same period, the ranking of some World countries are listed in Table-1. The USA is being the top country for research production, being also the first country in the World having the highest H index following by the United Kingdom (Table-2). H index causes some countries with high published documents to occupy a later order.

The outstanding two countries from the Arab world being occupy a main position in the Middle East are Egypt and the Saudi Kingdom. The relative total number of documents published in the period from 1996 to 2008 in the different areas of scientific research for Middle East countries (Table-3), medical scientific research (Table-4), biological and agricultural research (Table-5), and biochemistry, genetics and molecular biology (Table-6). The relative H index for some countries in the above mentioned research area is illustrated in Figure-2, in addition to the immunology and microbiology. It worth noting that H index makes Egypt and Saudi kingdom to occupy the second and third order interchangeably in most of research areas despite the presence of another country with higher research publications (Figure-2).

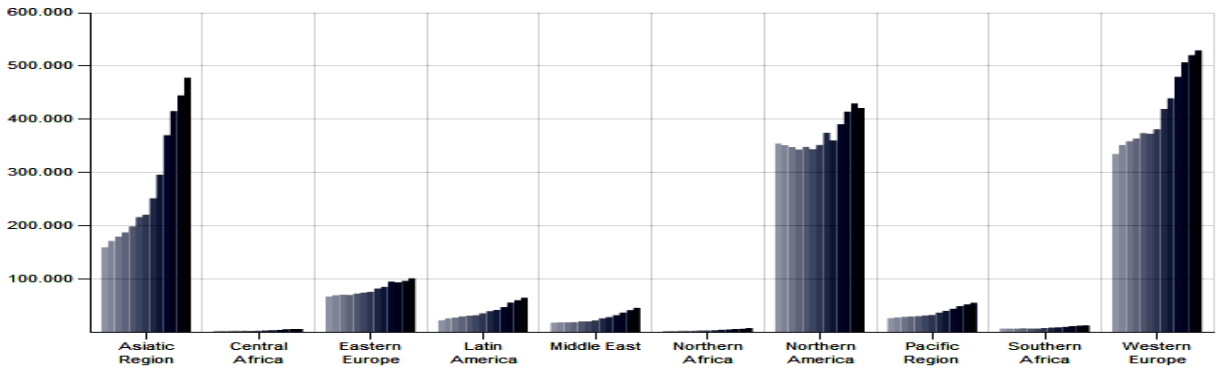

Figure-1: The scientific research in the different parts of the world. The columns represented the total documents per years from 1996 to 2008 beginning from left to right. The figure shows that the Northern America, Western Europe and Asiatic region are the major contributors. Eastern Europe, Latin America, Pacific Region, Middle East and Africa are the minor contributors.

Table-1: The order of some countries of the world arranged according to the total number of documents published from 1996 to 2008

Country	Document	Citable document	Citations	Self-Citations	Citations Per documents	H Index
United States	4.307.536	4.093.725	72.315.171	33.964.623	17,29	1.023
United Kingdom	1.242.464	1.149.767	17.140.454	4.282.684	14,78	619
Japan	1.220.415	1.197.781	11.953.831	3.783.244	10,12	480
China	1.217.169	1.210.267	3.969.504	2.038.379	4,61	237
Germany	1.132.583	1.093.560	14.435.211	3.952.207	13,46	542
France	822.978	793.722	9.987.207	2.409.794	12,88	497
Canada	628.843	603.080	8.371.847	1.721.035	14,84	483
Italy	608.338	581.455	6.809.577	1.656.582	12,29	432
Spain	448.240	424.983	4.373.765	1.166.471	11,07	338
Russian Federation	405.278	402.933	1.778.817	558.282	4,42	239
Australia	400.860	379.694	4.709.170	1.046.069	13,40	368
India	391.687	375.928	1.974.974	685.821	5,77	202
Netherlands	346.852	332.278	5.348.158	957.715	16,88	418
Korea	318.480	314.108	2.076.627	500.633	8,14	224
Sweden	249.888	241.935	3.820.670	682.671	16,20	372
Switzerland	247.319	237.718	4.178.226	618.639	18,60	422
Brazil	235.216	229.522	1.509.255	479.730	7,93	212
Taiwan	233.198	228.847	1.514.306	394.815	7,88	187
Poland	209.076	206.022	1.250.544	359.402	6,61	208
Belgium	188.150	181.079	2.462.076	398.841	14,41	323
Turkey	170.616	162.296	821.820	243.162	6,03	139
Austria	130.299	124.708	1.590.326	245.409	13,56	281
Denmark	129.590	125.332	2.075.889	327.844	17,21	303
Finland	124.184	121.358	1.714.200	310.191	15,10	273
Greece	109.208	104.584	846.382	171.631	9,27	179
Hong Kong	103.227	99.733	929.992	172.769	10,31	196
Mexico	95.770	93.880	658.587	150.985	7,93	160
Norway	94.353	91.449	1.169.109	205.450	13,86	238
Czech Republic	93.138	91.810	612.547	157.122	7,33	164
Singapore	81.836	79.620	653.021	104.404	9,37	166
New Zealand	80.095	76.129	873.347	153.529	12,27	205
Ukraine	74.248	73.856	241.875	72.497	3,31	102
Argentina	73.427	71.725	587.707	137.155	8,68	153
Portugal	72.569	70.842	590.081	130.068	9,97	158
Hungary	72.080	70.330	633.534	118.928	9,37	183
South Africa	71.514	67.905	546.572	126.091	8,49	158
Ireland	58.350	55.342	624.904	79.134	13,14	192
Egypt	47.344	46.693	224.421	52.239	5,31	91
Romania	41.793	41.408	175.079	43.139	5,00	96
Thailand	41.637	40.776	257.805	48.023	8,27	115

Table-2: The order of some countries of the world countries arranged according to their H. Index according to published documents in the period from 1996 to 2008

Country	H Index	Country	H Index	Country	H Index	Country	H Index	Country	H Index
United States	1.023	**Australia**	368	**Brazil**	212	**Czech Republic**	164	**Ukraine**	102
United Kingdom	619	**Spain**	338	**Poland**	208	**Mexico**	160	**Slovenia**	101
Germany	542	**Belgium**	323	**New Zealand**	205	**Portugal**	158	**Bulgaria**	97
France	497	**Denmark**	303	**India**	202	**South Africa**	158	**Venezuela**	97
Canada	483	**Austria**	281	**Hong Kong**	196	**Argentina**	153	**Kenya**	96
Japan	480	**Finland**	273	**Ireland**	192	**Turkey**	139	**Romania**	96
Italy	432	**Russian Fed.**	239	**Taiwan**	187	**Chile**	138	**Croatia**	92
Switzerland	422	**Norway**	238	**Hungary**	183	**Thailand**	115	**Egypt**	91
Netherlands	418	**China**	237	**Greece**	179	**Slovakia**	110	**Puerto Rico**	90
Sweden	372	**South Korea**	224	**Singapore**	166	**Iceland**	109	**Estonia**	90

Table-3: The order of Arab Middle Eastern countries arranged according to the total number of documents published in the period from 1996 to 2008 in the different areas of scientific research

Country	Document	Citable document	Citations	Self- Citations	Citations Per documents	H Index
Egypt	47.344	46.693	224.421	52.239	5,31	91
Saudi Arabia	26.645	25.525	127.024	18.348	5,07	86
Jordan	10.685	10.546	43.138	7.683	4,91	51
Emirates	8.846	8.493	38.872	5.308	5,59	56
Kuwait	8.655	8.482	45.517	7.746	5,61	58
Lebanon	7.488	7.002	41.965	4.828	7,39	63
Oman	4.217	4.023	18.205	2.686	5,24	42
Syria	2.162	2.125	12.783	1.836	7,15	40
Qatar	2.140	2.044	5.931	617	3,64	26
Iraq	2.011	1.914	5.033	653	3,26	25
Bahrain	1.898	1.776	5.430	696	3,72	26
Palestine	1.267	1.241	4.998	893	5,82	27
Yemen	760	739	3.231	378	5,09	26

Table-4: The order of Arab Middle Eastern countries arranged according to the total number of documents published in the period from 1996 to 2008 in the area of medical scientific research

Country	Document	Citable document	Citations	Self-Citations	Citations Per documents	H Index
Saudi Arabia	9.892	8.928	52.408	6.514	5,45	68
Egypt	6.948	6.538	43.025	4.627	7,49	63
Lebanon	3.244	2.798	18.517	1.736	7,25	48
Kuwait	2.441	2.315	13.651	1.663	6,02	38
Emirates	2.124	1.883	11.149	1.082	5,92	37
Jordan	2.104	2.007	9.214	850	5,10	35
Oman	1.225	1.064	4.631	433	4,47	24
Qatar	844	775	2.007	216	3,75	18
Bahrain	844	736	2.024	309	3,12	18
Iraq	686	610	1.850	230	3,51	20
Syria	305	281	2.016	256	8,61	22
Yemen	261	242	826	108	3,65	14
Palestine	212	198	831	179	7,54	14

Table-5: The order of Arab Middle Eastern countries arranged according to the total number of documents published in the period from 1996 to 2008 in the areas of biological and agricultural scientific research

Country	Document	Citable document	Citations	Self-Citations	Citations Per documents	H Index
Egypt	4.509	4.477	22.232	3.184	5,62	40
Saudi Arabia	1.442	1.435	5.030	749	3,74	24
Jordan	1.200	1.197	5.419	931	5,38	27
Syria	810	805	5.582	1.003	7,75	33
Emirates	634	631	3.159	545	5,48	18
Oman	523	517	2.670	520	5,67	20
Lebanon	462	454	2.359	358	5,99	20
Kuwait	443	442	2.477	436	5,85	21
Iraq	172	169	602	54	4,22	11
Bahrain	107	104	388	46	4,32	10
Qatar	92	91	329	32	4,99	10
Palestine	84	83	387	46	9,79	10
Yemen	72	71	491	27	7,78	13

Table-6: Order of Arab Middle Eastern countries arranged according to the total number of documents published in the period from 1996 to 2008 in the areas of biochemistry, genetics and molecular biology scientific research

Country	Document	Citable document	Citations	Self-Citations	Citations Per documents	H Index
Egypt	4.045	3.982	28.709	4.981	8,13	50
Saudi Arabia	1.983	1.920	19.421	1.929	10,19	55
Emirates	859	836	8.611	1.234	11,34	39
Kuwait	815	784	7.502	1.008	9,86	37
Jordan	798	787	4.920	745	7,48	30
Lebanon	631	588	7.932	576	15,81	42
Oman	233	225	1.699	228	8,92	20
Syria	184	181	1.928	182	12,70	23
Iraq	123	121	408	37	4,47	11
Qatar	105	97	532	39	6,33	13
Palestine	93	91	478	54	8,88	12
Bahrain	83	81	511	45	7,75	10
Yemen	40	40	267	18	9,33	9

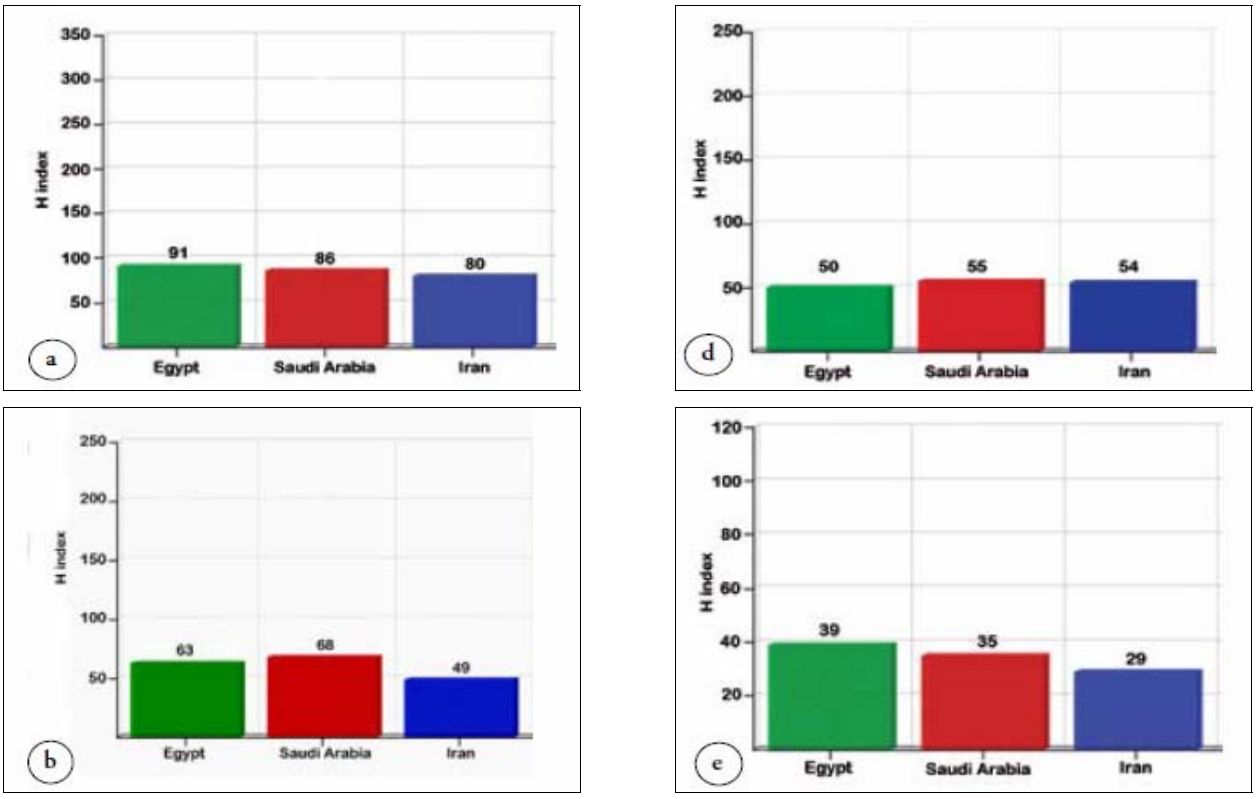

Figure-2: Comparison between some Middle Eastern countries in the H index for the total period from 1996 to 2008 in different areas of scientific research (a), medicine (b), biological and agricultural sciences (c), biochemistry, genetics and molecular biology (d) and immunology and microbiology (e).

DISCUSSION

This is the first report worldwide to use SJR indicator in deduction the status of scientific research in Middle Eastern countries. The SJR is having many advantages; the best criterion is the simplicity of the web site use and the open access. The obtained data showed that there is a

significant problem in the scientific research in the Middle Eastern countries despite the major achievement of the Arab World in the last 10 years.

Higher education constitutes the best and most accurate model of the system which is highly appreciated by the citizen in the world. It is one of the components of the educational apparatus. More importantly, its primary function is to produce and provide advanced scientific knowledge, as well as ensure methodological training for specialised medium and high-ranking executives. Further, higher education strongly represents the scientific research aspiration towards progress and building a better future. The scientific research is an essential component for any country to achieve sustainable and global development. Many studies indicated that the decline in higher educational scientific research of Middle Eastern countries and Arab world because of the lack of resources along with the abuse of those available, the lack of a motivation for research, the lack of a strategic plan for research, the poor economic condition of university staff, and the decrease of its funding.[14]

The above mentioned problems can be solved firstly by running of a national policy that comprises introducing a strategic plan defining priorities according to social needs. Secondly, restructuring the scientific research pattern by launching unique autonomous research centers committed to academia, development of standards of excellence for research centers which undergo regular internal and external inspection, and accreditation of eminent research centers. Thirdly, search for untraditional funding including the cooperation between the public and private sectors, development of scientific research management and training personnel so as to be able to follow up and respond to funding organizations, and training researchers to compose competitive scientific projects submitted to different funding organizations. Fourthly, enhancing research innovation through coming up with original ideas that solve real problems endangering society, developing creativity-enhancing curricula, developing academic research ethics code, and encouraging researchers to pursue international publishing and patent inventions. And lastly, developing accredited performance indicators for both researchers and research institutions.[15]

In conclusion, the SCImago journal rank indicator is a novel tool for the ranking of scientific journals and countries that may challenge the established premiership of the journal IF in ranking scientific journals. It provides unrestricted access, is based on a larger source journal database, and focuses on the quality of citations that a journal receives by other journals, rather than the absolute number. However, the extension of its applications should be handled with care after concise examination and validation, the case with all the bibliometric measures. Moreover, in the Middle East, the prominent two main Arab countries in the scientific research are Egypt and Saudi Arabia, nevertheless, they need more planned strategies for optimal contribution to their Middle East, Arab region and the World, despite the tangible achievements of the Arab states in the higher education and scientific research fields during the last decade (UNSECO report).[16]

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