Brief report

State of clinical neuroscience research in Saudi Arabia: where do we rank in the world?

Abdulhakim B. Jamjoom, *FRCS, FRCS (SN).*

Journal impact factor (IF) is a measure that reflects the average citation numbers of a recent publication in a journal. The h-index is a measure that indicates output and citation impact of articles published by a scientist. The wide acceptance of these 2 metrics signifies the importance of quantifying the scientific creditability of research and researchers. The IF and h-index can also be used to compare the scientific contribution of various countries to a particular specialty. The world ranking of universities had attracted substantial interest and it is also expected that the world ranking of medical specialty research will generate considerable appeal. Over the last 3 decades clinical neuroscience researchers from the Kingdom of Saudi Arabia (KSA) have contributed to the national and international literature. However, to date there has been no reports that compared the input of KSA researchers to the rest of the world. The objective of this study was to evaluate the state of clinical neuroscience research in KSA by determining its world ranking based on the quantity and citation impact of its research on the subject. In addition the study aimed to examine some of the features that may influence a country's position among the top 50 in the world in clinical neuroscience research. SCImago Journal & Country Rank (SCR)[1] is a portal that incorporates journal and country scientific indicators developed from Scopus database. The web site provides lists of country rankings based on 6 individual features: total documents, total citations, h-index, citable documents, citations per document, and self-citations. The findings vary according to the searched subject area, category, region and year. The SCR site was searched on twentieth August 2015 using the parameters "medicine" for subject area, "clinical neurology" for subject category, "1996-2014" for year and "all" for region. The site was also searched for "clinical neurology journals" and found to include 335 international journals that cover the range of clinical neuroscience specialties. The listed journals included Neuroscience (Riyadh) journal as well as 31 Neurosurgery journals including Pan Arab Journal of Neurosurgery. As a result it was considered appropriate to refer to "clinical neurology" in the SCR site as "clinical neuroscience" thereafter in this article. Using the site 3 separate top 50 world rankings based on total publications, total citations, and h-index in clinical neuroscience were obtained. These 3 parameters were chosen as they were considered appropriate indicators of the quantity and quality of research from any country. A correlation coefficient (R) was calculated between the 3 rankings. An adjusted top 50 ranking list was structured using mean values of the 3 rankings. When means were equal the country with higher total publications was ranked ahead. In addition to the 3 parameters the following country-related data were collected: population size from the worldometer web site,[2] gross domestic[2] product at purchasing power parity per capita (GDP/capita) from the International Monetary Fund database[3] and the number of universities in the world top 500 from the Shanghai ranking web site.[4] Furthermore, the number of clinical neuroscience journals listed in the SCR site for each country was determined. Using the median as a cut-off point, countries ranked 1-25 were compared to those ranked 26-50 utilizing the following parameters: population in million (≤23.5 versus >23.5), GDP/capita (≤ $31,500 versus >$31,500), number of universities in the world top 500 (≤ 3 versus >3) and the number of clinical neuroscience journals listed in the SCR site (1 versus >1). The findings were examined by a chi-squared test and significance was determined when p was less than 0.05. The Social Sciences Statistics site[5] was used for the statistical analysis. **Table 1** shows the adjusted ranking of the top 50 countries in the world in clinical neuroscience research during the period 1996-2014. The list integrates the 3 rankings: total publications, total citations, and h-index. The calculation of the mean was validated by the strongly positive correlation between the top 50 rankings based on total publications and total citations (R=0.9469), total publications and h-index (R=0.9215) and total citations and h-index (R=0.9908). According to the findings of this study, KSA is ranked fortieth in the world and fourth in the Middle East in clinical neuroscience research.

The productivity of KSA researchers compared to the rest of the world was as follows: total publications 1,189 [range 1- 174,187 (median 37)], total citations 8,820 [range 0- 4,406,449 (median 371)] and h-index 40 [range 0- 410 (median 11)]. The KSA country-related features compared to those ranked in the top 50 were; population in million: 29 [range 2- 1394 (median 23.5)], GDP/capita: $52,000 [range $6,000- $83,000 (median $31,500)], number of universities in world top 500: 4 [range 0- 164 (median 3)] and number of clinical neuroscience journals listed in the SCR site:[2] [range 0- 94 (median 1)]. Furthermore, the results showed that being ranked in the upper or the lower half of the top 50 in the world in clinical neuroscience research was not influenced by the country's population being higher or equal and lower than 23.5 million (60% versus 40%) (p=0.1573). However, countries ranked 1-25 versus those ranked

doi: 10.17712/nsj.2016.3.20160001

Table 1 - Top 50 countries in the World in Clinical Neuroscience Research (Rank by SCR in August 2015).

Adjusted Rank	Country	SCR Ranks** (Mean)	Population (million)	GDP/ capita ($1000)	Universities in world top 500	Journals listed in SCR
1	USA	1,1,1(1)	323	55	164	94
2	UK	4,2,2 (2.7)	63	40	38	67
3	Germany	3,3,3 (3)	83	46	39	29
4	Canada	7,4,4 (5)	36	45	21	1
5	Japan	2,5,9 (5.3)	127	37	19	11
6	Italy	5,6,7 (6)	61	35	21	13
7	France	6,7,5 (6)	65	40	21	13
8	Netherlands	10,8,6 (8)	17	47	13	30
9	Australia	11,9,8 (9.3)	24	46	19	1
10	Spain	8,11,12 (10.3)	47	34	12	4
11	Switzerland	14,12,11 (12.3)	8	58	7	12
12	Sweden	17,10,10 (12.3)	10	46	11	1
13	China	9,18,19 (15.3)	1394	13	44	4
14	Austria	19,13,14 (15.3)	9	46	6	3
15	Belgium	18,14,16 (16)	11	43	7	0
16	Brazil	12,20,20 (17.3)	202	16	6	5
17	Finland	24,15,13 (17.3)	5	40	5	0
18	Denmark	22,16,15 (17.7)	6	44	5	0
19	South Korea	15,19,21 (18.3)	50	35	10	4
20	Israel	21,17,17 (18.3)	8	33	6	0
21	Turkey	13,22,22 (19)	76	20	1	7
22	Norway	25,21,18 (21.1)	5	67	3	0
23	Taiwan	20,23,24 (22.3)	23	46	0	1
24	India	16,24,30 (23.3)	1267	6	1	5
25	Poland	23,25,28 (25.3)	38	25	2	5
26	Portugal	31,26,23 (26.6)	11	27	3	1
27	Hungary	32,30,29 (27)	10	25	2	2
28	Ireland	33,28,25 (28.7)	5	49	3	1
29	Greece	27,29,31 (29)	11	26	2	0
30	Argentina	29,31,27 (29)	42	23	1	0
31	New Zealand	34,27,26 (29)	5	35	4	0
32	Czech Republic	26,33,33 (30.7)	11	30	1	3
33	Mexico	28,34,35 (32.3)	124	18	1	3
34	Hong Kong	35,32,32 (33)	7	55	0	0
35	Singapore	36,35,34 (35)	6	83	2	0
36	Iran	30,38,40 (36)	78	17	1	2
37	Russia	38,37,36 (37)	142	25	2	2
38	South Africa	41,36,37 (38)	53	13	4	0
39	Chile	40,39,38 (39)	18	23	2	1
40	Saudi Arabia	37,41,44 (40.7)	29	52	4	2
41	Thailand	43,40,39 (40.7)	67	14	0	0
42	Egypt	39,42,43 (41.3)	83	11	1	4
43	Croatia	42,44,41 (42.3)	4	21	0	1
44	Slovenia	47,43,45 (45)	2	30	1	0
45	Colombia	48,46,48 (47.3)	49	13	0	0
46	Slovakia	45,48,50 (47.7)	5	28	0	0
47	Lebanon	53,47,46 (48.7)	5	18	0	0
48	Bulgaria	54,45,47 (48.7)	7	18	0	0
49	Cuba	44,49,54 (49)	11	6	0	0
50	Malaysia	50,53,52 (51.6)	30	25	2	1

SCR- SCImago Journal & Country Rank, GDP/ capita- gross domestic product at purchasing power parity per capita, **Rankings based on total publications, total citations and h-index, USA- United States of America, UK- United Kingdom

26-50 had the following significant features: more than $31,500 GDP/capita (80% versus 20%) (p<0.0001), more than 3 universities in the world top 500 (80% versus 12%) (p<0.0001) and more than one journal listed in the SCR site (64% versus 28%) (p=0.0107). To rank amongst the top in the world in any medical specialty research a country must produce publications of high quality and of sufficient quantity. KSA research activity had increased during 2008-2012, but the tendency had been to publish in regional journals with low IF.[6] In a review of 1562 KSA

papers that were published over a 5 year period Latif[6] reported that only 0.26% were published in journals with IF≥7. Al-Bishri[7] searched Pubmed and ranked KSA as sixteenth in the world based on numbers of biomedical research articles published in 2010-2011 with reference to population size. Most publications were from the fields of Community Medicine, Pathology, Medicine and Surgery.[7] The current study demonstrated that KSA was ranked relatively low in the world in clinical neuroscience research despite satisfying a number of country-related features that are normally associated with a higher rank. These are having a GDP/capita more than $31,500, having more than 3 uuniversities in the world top 500 and having more than one specialty journal listed in SCR site. Such findings would suggest that clinical neuroscience research in KSA may be lagging behind. The issue of the difficulties clinicians face in the execution of high quality research in KSA has been examined not infrequently in the past. The explanations are multifactorial and involve lack of capability, time and appeal as well as restricted logistic and economic backing. In addition the absence of qualified Saudi clinicians holding higher research degrees as well as the dilution of the clinical load due to the non-regionalization of the highly specialized services had been considered as barriers to conducting quality research in KSA. It is accepted that some articles produced by researchers from a number of countries may not have been visible to the international scientific community in terms of citation. Factors affecting the visibility of research in a specific field by a certain country have been examined in a recent study.[8] In addition to the quality of the research, it is recognised that citation counts are influenced by the citation performance of the cited references,[9] the language and profile of the publishing journal,[8,9] the sub-specialty,[5] the reputation of the authors[9] and the geographical realm of the research.[8] Furthermore, it is acknowledged that enhanced collaboration with countries stronger in science is a key factor behind the progress of scientific activity in a developing country in order to achieve a higher world ranking.[4]

There are a number of limitations to this study. The study was dependent on the accuracy of the web site search engine SCR. It is possible that there were errors particularly with multi-national publications. Ranking was based on findings from wide range of clinical neuroscience journals of varying country of origin, age, sub-specialty and academic strength. In addition, it can be argued that total publications, total citations and h-index may not provide true reflection of the quality of research. Furthermore, the exact role of KSA researchers particularly the multi-national publications was not assessed.

In conclusion, KSA is ranked fortieth in the world, fourth in the Middle East in clinical neuroscience research during the period 1996-2014. Allowing for its GDP/capita, number of universities in the world top 500 and number of neuroscience journals listed in SCR, KSA is considered lagging behind in clinical neuroscience research. Saudi clinical neuroscience researchers are short of the innovative ideas required for publication in high impact medical journals. KSA needs to promote "research culture" and to establish clinical academic departments staffed by Saudi PhD-holders. KSA universities need to create strong PhD programs that are liked to highly ranked international universities.

Received 4th January 2015. Accepted 2nd February 2016.

From the Section of Neurosurgery, Department of Surgery, King Khalid National Guards Hospital, Jeddah, Kingdom of Saudi Arabia. Address correspondence and reprints request to: Prof. Abdulhakim B. Jamjoom, Department of Surgery, King Khalid National Guards Hospital, Jeddah, Kingdom of Saudi Arabia.
E-mail: jamjoomab@gmail.com

References

1. SCImago Journal & Country Rank, SCImago, 2007. [Cited date 20th August 2015; Updated date 15th December 2015]. Available from: http://www.scimagojr.com
2. Population 2014. [Cited date 20th August 2015; Updated date 15th December 2015]. Available from: http://www.worldometer.info
3. World Economic Outlook Database, April 2015. [Cited date 20th August 2015; Updated date 15th December 2015]. Available from: http://www.imf.org/external/index.htm
4. Academic ranking of world universities 2014. [Cited date 20th August 2015; Updated date 15th December 2015]. Available from: http://www.Shanghairanking.com
5. Social Sciences Statistics. [Cited date 20th August 2015; Updated date 15th December 2015]. Available from: http://www.socscistatistics.com
6. Latif R. Medical and biomedical research productivity in the Kingdom of Saudi Arabia(2008-2012). ***J Family Community Med*** 2015; 22: 25-30.
7. Al-Bishri J. Evaluation of biomedical research in Saudi Arabia. ***Saudi Med J*** 2013; 34: 954-959.
8. Chinchilla-Rodríguez Z, Miguel S, Moya-Anegón F. What factors are affecting the visibility of Argentinean publications in human and social sciences in Scopus? Some evidences beyond the geographic realm of the research. ***Scientometrics*** 2015; 102: 789-810.
9. Bornmann L, Shier H, Marx W, Daniel H-D. What factors determine citation counts of publications in chemistry besides their quality? ***Journal of Informetrics*** 2012; 6: 11-18.