

Research Productivity at King Saud bin Abdul Aziz University for Health Sciences, Kingdom of Saudi Arabia: A Bibliometric Appraisal

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Abstract

Background: To examine the research outcome having an authorship affiliated with KSAU-HS, its teaching hospital and King Abdullah International Medical Research Centre (KAIMRC) since the inception of the university to December 2015.

Method: Data retrieved from Institute of Scientific Information (ISI) Web of Science, InCite™ Database of Thomson Reuters, which produced the list of 775 research documents published in 346 different journals. Some bibliometric indicators such as annual growth, subject segregation, authorship pattern, collaboration etc. had been used to illustrate the research performance of researchers. The data was analyzed by using SPSS 20.

Results : Majority of articles (15.35%) were written on the subject of medicine, bulk (94%) of the research work had been carried out by collaborative efforts. In 475 (61.29%) publications, the principal author belonged to KSAU-HS. Majority of the research work (64.65%) had been produced by the collaboration of other organizations. Research cooperation with the universities of United States was highest, followed by Canada and Pakistan.

Conclusion: There is promising growth in biomedical publication and collaborating research trends are increasing.

Key words: Biomedical publications, Saudi Arabia, Research productivity

Introduction

Bibliometric studies have been carried out to assess the research productivity and pattern of publications in different fields of knowledge and this method is extensively used in medical research. Kingdom of Saudi Arabia keeps a leading position in the field of medical research in all Arab States. Since last two decades, government took strong steps to motivate education and develop research through the implementation of National Science Technology and Innovation Program, whose aim is to deliver the

infrastructure necessary to develop an advanced knowledge-based economy. Health services and medical & scientific research have been improved with the vivid advance along with the growing number of medical institutions.¹

King Saud bin Abdul Aziz University for Health Sciences (KSAU-HS) came into being in 2005, being the first public sector specialized health care university not only in KSA but also in the Middle East Region. KSAU-HS perceives its mission as providing its academic programs in an ideal setting that fosters excellence in innovative learning and scientific research. KSAU-HS tries hard toward evolving strong-grounded research culture within the university, and encouraging collaborative research activities. Bibliometric studies have been conducted increasingly for research assessment.² Alan Prichard coined the term bibliometric in 1969, it is quantitative research method applied to physical published items.³ Harrods's Library Glossary and Reference Book describes bibliometric as "application of statistics and mathematics to the study of the use made of books and other media within and between library systems".⁴ The synonyms term scientometrics has also been used, Van-Raan stated, "Scientometrics is the science of measuring and analysing science or, in other words, the study of the quantitative aspects of science as a discipline."⁵

Bibliometric investigations have been conducted by information scientists to appraise and calculate the research productivity of the published literature for the defined period under study to understand the tendency. It highlighted the characteristics of academic community e.g. potential publications, authorship pattern, collaboration and other significant detail of any specific literature.⁶ Bibliometric studies have been playing important role in medical decision-making in relation to the development of research programmes and allocation of resources.⁷ Research publications of the teaching staff, researchers and students of any university constitute a fundamental measure of the

achievements frequently regarded as an index of university prestige. ⁸

Materials and Methods

This was an observational study conducted at College of Dentistry, KSAU-HS, KSA from May to Oct 2016. The research documents produced by the researchers of the KSAU-HS, were browsed using bibliometric indicators from In Cites™ database Institute of Scientific Information (ISI's) Web of Science. ISI's Web of Science is a multidisciplinary research platform covering journal literature from 1945 to present. It indexes 11365 major journals across 234 disciplines belongs to 81 countries. This database produces the list of 775 documents having an authorship affiliation with KSAU-HS, its teaching hospitals and King Abdullah International Medical Research Centre (KAIMRC) published during the period under study. The data were analyzed using SPSS 20. Data used in this report was retrieved from ISI's Web of Science database having authorship affiliation with KSAU-HS with the period of 2005-2015.

Results

There had been a gradual increase in the publications during the early five years, but the amount of research had rapid growth in the last three years (Table 1). The annual average growth rate was recorded 31.66% in the last seven years. This research work published in 346 different journals. Most of the articles appeared in Saudi Medical Journal (46) (Table 2). There were only eight journals, where more than 10 articles had been published. There were 230 journals where only one was article published by our researchers (Table 2). Majority of articles (15.35%) were written on the subject of Medicine, followed by Public Health (8.77%), Oncology (5.80%) and Gynecology (5.67%). Good numbers of research articles had also been produced in Pediatrics, Genetics, Cardiology, Health / Medical Informatics, Medical Education, Pharmacology, Biochemistry, and Urology / Nephrology (Table 3).

There is a dire need to record more studies on orthopedics (0.51) and surgery (0.90). The subjects of medical research, geriatric medicine and medical ethics were least interested by the researchers. Majority (95%) of the research had been carried out in collaboration, only 46 (5.98%) research items had been written by single author, 84 (10.86%) articles were reported by two authors, three authors portion consisted on 102 (13.16%), and followed by four authors 95 (12.25%).

Majority (58.38%) of the research had been produced by five or more than five authors (Table 4). In 61.29% articles, the principal author belonged to KSAU-HS and its associated hospital and research centre. There were 194 organizations of 40 countries, where KSAU-HS researchers worked together in producing research papers. Most of KSAU-HS researcher contributed their research with the scholars of King Saud University (9.54%), followed by King Faisal Specialist Hospital and Research Center (2.19%), King Abdul Aziz University (1.93%) and American University of Beirut (1.67) (Table 5). KSAU-HS researchers had collaborated with 194 universities, hospitals and organizations of 40 countries (Table 6).

Table -1 :Year wise distribution of published documents

Year	Total n = 775 (%)	Annual Average Growth Rate (%)
2005	1 (0.12%)	
2006	4 (0.51%)	---
2007	8(1.03%)	---
2008	28(3.61%)	---
2009	41(5.29%)	46.42
2010	65(8.38%)	58.53
2011	77(9.93%)	18.46
2012	83(10.70%)	7.79
2013	125(16.12%)	50.60
2014	165(21.29%)	32
2015	178(22.96%)	7.87
	775 (100%)	Ave 31.66

Table -2 :Journals with High Publication Percentage

Journal / Source Name	Articles Published (%)
Saudi Medical Journal	46 (6.13%)
Annals of Thoracic Medicine	31 (4.00%)
European Heart Journal Supplements	29 (3.74%)
Annals of Saudi Medicine	19 (2.45%)
American Journal of Respiratory and Critical Care Medicine	16 (2.06%)
Journal of Infection and Public Health	12 (1.54%)
Plos One	11 (1.41%)
Journal of Clinical Oncology	10 (1.32%)

Table -3:Subject Wise Distribution of Articles

Journal / Source Name	Articles Published (%)
Medicine	119(15.35%)
Community Medicine / Public Health	68(8.77%)
Oncology	45(5.80%)
Gynaecology	44(5.67%)
Paediatrics	43(5.54%)
Genetics	41(5.29%)
Cardiology	33(4.25%)
Pathology	33(4.25%)
Health Information	29(3.74%)
Medical Education	29(3.74%)
Pharmacology	27(3.48%)
Biochemistry	25(3.22%)
Urology / Nephrology	23(2.96%)
Neurology	20(2.58%)
Gastroenterology	19(2.45%)
Dermatology	18(2.32%)
Respiratory Medicine	15(1.93%)
Dentistry	14(1.80%)
Microbiology	12(1.54%)
Nursing	12(1.54%)
Anesthesiology	9(1.16%)
Chemistry	9(1.16%)
Neurosurgery	7(0.90%)
Surgery	7(0.90%)
Cardiac Imaging	6(0.77%)
Physiology	6(0.77%)
Computer Science	5(0.64%)
Paediatric Surgery	5(0.64%)
Cardiac Surgery	4(0.51%)
Orthopaedics	4(0.51%)
Paediatric Cardiology	4 (0.51%)
Paediatric Neurology	4 (0.51%)
Quality Control	4 (0.51%)
Rehabilitation Medicine	4 (0.51%)
Infectious Diseases	3 (0.38%)
Mathematics	3 (0.38%)
Medical Research	3 (0.38%)
Otolaryngology	3 (0.38%)
Geriatric Medicine	2 (0.25%)
Health Education	2 (0.25%)
Hematology	2 (0.25%)
Physics	2 (0.25%)
Plastic Surgery	2 (0.25%)
Psychiatry	2 (0.25%)
Anatomy	1 (0.12%)
Cell Biology	1 (0.12%)
Language	1 (0.12%)
Medical Ethics	1 (0.12%)

Table -4: Authorship pattern and percentage

Number of Contributors	Articles Published (%)
Single author	46 (5.98%)
Two authors	84 (10.86%)
Three authors	102 (13.16%)
Four authors	95 (12.25%)
More than four authors	448 (58.38%)

Table 5: KSAU-HS collaboration with some major universities, hospitals and organizations

Universities, Hospitals and Organization's Name	Country	Quantity (%)
King Saud University	KSA	74 (9.54%)
King Faisal Specialist Hospital and Research Center	KSA	17 (2.19%)
King Abdulaziz University	KSA	15 (1.93%)
American University of Beirut	Lebanon	13 (1.67%)
University of Melbourne	Australia	12 (1.54%)
University of Toronto	Canada	12 (1.54%)
McGill University	Canada	10 (1.29%)
University of British Columbia	Canada	10 (1.29%)
The University of Queensland	Australia	8 (1.03%)
University of Alberta	Canada	8 (1.03%)
Hospital for Sick Children	Canada	7 (0.90%)
Riyadh Military Hospital	KSA	7 (0.90%)
Um Al Qura University	KSA	7 (0.90%)
University of California	USA	7 (0.90%)
University of Cape Town	South Africa	7 (0.90%)
University of Auckland	New Zealand	6 (0.77%)
University of Jordan	Jordan	6 (0.77%)
Hospital Universitario de Getafe	Spain	5 (0.64%)
King Fahad Medical City	KSA	5 (0.64%)
McMaster University	Canada	5 (0.64%)
Ziauddin Medical University	Pakistan	5 (0.64%)

Table 6:KSAU-HS collaboration with other universities of different countries

Country Name	Quantity (%)
United States of America (USA)	39 (20.10%)
Kingdom of Saudi Arabia (KSA)	35 (18.04%)
Canada	23 (11.85%)
Pakistan	12 (6.18%)
United Kingdom (UK)	11 (5.67%)
Australia	9 (4.63%)
Egypt	6 (3.09%)
Jordan	5 (2.57%)
Three Organizations from each following countries:Germany, Japan, Kuwait, Malaysia, Spain and United Arab Emirate (UAE)	3 (1.54%) each country
Two Organizations from each following countries:China, Finland, France, Lebanon, Netherland, Norway, Qatar, South Africa and Switzerland.	2 (1.03%) each country
One Organization from each following countries:Argentina, Belgium, Colombia, Greece, Hungary, India, Iran, Iraq, Italy, Libya, Lithuania, New Zealand, Oman, Singapore, Sudan, Syria, Turkey and Yemen	1 (0.51%) each country

Discussion

Saudi Arabia has been investing huge amount and doing progressive efforts to improve the quality of higher education and research output during the last two decades. According to Scimagojr Journal and Country Rank, Kingdom of Saudi Arabia stood on 50th number in 2005, now its reaches on 33rd position in 2015.⁹In this study, publication productivity and collaboration of KSAU-HS had been assessed. Shehatta and Mahmood revealed that out of 88,506 papers produced by KSA during 1980-2014, 24,937 belongs to clinical, Pre-Clinical and Health disciplines. King Saud University created 27,302 (30.85%) papers, whereas the share of KSAU-HS is 573 (0.65%). Out of 65 KSA research producing organizations, KSAU-HS stands on 23. Research collaboration ratio with USA was high (23.31%) followed by Egypt (22.95%), UK (9.54%) and Canada (7.42%).¹⁰In our research, USA had been the major partner in research productivity. This research described that 81.1% of KSA research had been produced in collaborative efforts, whereas in our study this ratio was 95%. Their research pointed out that most of articles were published in Saudi Medical Journal (3,599), followed by Annals of Saudi Medicine (2,081), our investigation had also proved these two journals were on the top. This paper suggested that "there is dire need to develop national research policy to foster and support collaborations among researchers, universities, and countries."¹⁰

Study carried out on research productivity by Sambalpur University's publication based on ISI Web of Science during 2007-11. Total 170 articles were retrieved and analyzed, which were published in 101 different journals, large number of articles (10%) were published in "Astrophysics and Space Science". Chemistry was most preferred area of research (27.65%) and major collaborative partner in research was USA (5.29%).¹¹Dikak, et al investigated the quality and quantity of scientific publications of the medical faculty at the American University of Beirut (AUB) during 1996-2001, 881 publications were obtained through Medline search by 203 faculty members. Eighteen percent of the faculty members did not contribute any research in this period. Collaboration with international researchers produced in more original publications than work done only at AUB.¹²

Alhaider et al. assessed the scientometric analysis of pharmaceutical research from KSA during 2001-2010. Total 1386 articles were retrieved from the Scopus international multidisciplinary bibliographical database. The international collaboration share was 40.55%, largest number of research had been carried

out with the association of Egypt and USA. Most of the papers were written on the subject of Cancer, tailed by Heart Diseases, Diabetes and Respiratory Medicine.¹³ Latif carried out the study on medical and biomedical research productivity from KSA during 2008-2012 based on peer-reviewed journals indexed in PubMed. There were 1562 articles published in targeted period, more than half (54.3%) of the research had been created from Riyadh. Majority of publications (40.9%) were originated from King Saud University followed by King Abdul Aziz University (13.6%) and KSAU-HS (9.8%). Paper concluded that although there had been increased in research productivity in KSA but still needed to enhance the research culture in the country.¹⁴

Meo, SA et al. reported the research outcome of KSA in medical sciences during 1996-2012 based on ISI's Web of Science and SCI-mago/Scopus databases. Results revealed that 27246 research papers were published, major area of research was Medicine (16196), followed by Biochemistry, Genetics and Molecular Biology (5399) and Dentistry (631). Paper highlighted the factors subsidizing to the growth of research; like increase in the number of universities and research institutions, escalation in funding, international collaboration, research grants, rewards and more enrolments in post-graduation.¹⁵Our study also reported that most of the articles were written on the subject of Medicine.

Al-Bishri evaluated the biomedical research in KSA between 2010 and 2011 grounded on PubMed results. There were 1905 articles published during this period, majority of articles (65.3%) originated from Riyadh and bulk of studies (15.5%) were related to Community Medicine followed by Pathology (13.1%), Medicine (13.2%) and Dentistry (4.7%). King Saud University had largest share (20.89%) in research tailed by King Faisal Specialist Hospital and Research Centre (9.23%), King Abdul Aziz University Hospital (7.45%) and King Abdul Aziz Medical City, Riyadh (6.71%). He exposed that although KSA stands 16th in medical research with reference to population size but still lagging behind in comparison with other high income countries in the field of medical research.¹⁶

Bibliometric studies on Journal of Pakistan Medical Association from 2009 to 2013 explained that out of 913 original articles, most of the papers had been written on the subject of Community Medicine (15.3%) followed by Medicine (14.7%). Majority of research (87%) was produced by collaborative efforts, 13% research was carried out by single author pattern. More than half of the contributors (52%) belonged to Sindh,

Pakistan.¹⁷Bibliometric study had been conducted on the research productivity of University College of Medical Science, University of Delhi based upon the data retrieved from Scopus from 1975-2013. Database produced the 2557 research papers, most of the research work (99%) had been produced in collaborative efforts. USA was the big partner in collaborative research.¹⁸

Tadmouri and Tadmouri discussed the biomedical research output in KSA during 1982-2000 through ISI's Web of Science and PubMed databases. Results showed that half of the research articles were produced by two organizations, King Saud University (29.5%) and King Faisal Specialist Hospital (21.5%), most of the research papers (70%) were generated from Riyadh followed by Jeddah (7.6%).¹⁹Jamjoom conducted a bibliometric assessment of 46 medical speciality research in Saudi Arabia based on SCImago Journal and Country Rank during 1996-2014. Fourteen (30%) specialities were designated as the positive relative contribution specialties in KSA, among them Ophthalmology, Medicine (miscellaneous), and Paediatrics were on top. Author explained the reason of relatively low ranking for KSA's medical specialties by the trend for KSA researchers to publish in low impact factor local journal. He motivated the researchers to publish their quality papers in high impact factor journals.²⁰

Conclusion

1. Research productivity of the faculty members of university has been constituted a critical measure of its academic achievements. Although citation tracking database cannot give a complete data picture, so this data may be treated as large sample indicating research trends.
2. Most of the research had been done on the subject of medicine, whereas anatomy and medical ethics were least interested topic by researchers.
3. Most of the research work were carried out by multi-authors and USA was the most preferred country for research collaboration, followed by Canada and Pakistan.

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