A Scientometric Analysis of Medical Sciences Research in the Tehran University of Medical Sciences using Papers and Citations

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ABSTRACT: Objective: *Assessment and recognition of a university's research status are essential for the university's research planners and policymakers. This study examines the research productivity of Tehran University of Medical Sciences (TUMS) as one of the best medical universities in Iran. Research outputs are at once a useful lens for education and an important instrument for the exercise of power in service of dominant norms in global higher education. Recent works have not assessed academic output (productivity) of TUMS. So as to rely on historical achievements that may be of more relevance, should focus on recent works, that is, those published in the most recent complete 5-year period.*

Methods: *The data of TUMS' research output are collected from the SCOPUS database, which produced the list of 31253 research journal articles published in different journals since 2012 to 2016, by using different searching techniques. Some bibliometric indicators such as annual growth, subject segregation, authorship pattern, collaboration, degree of collaboration, author productivity etc. had been used to illustrate the research performance of researchers. To this end, a list of published papers at the Tehran University of Medical Sciences for the period from 2012 to 2016 was compiled. The data was analyzed by using SPSS 20.*

Result: *Majority of articles (15.35%) were written on the subject of medicine, 49.4 (%) of the research work had been carried out by collaborative efforts. 437 (1.4%) publications, had been carried out by single author that belonged to TUMS. Majority of the research works (86%) had been produced by the collaboration of other organizations. Research cooperation with the universities of United States was highest, followed by United Kingdom and Canada.*

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

Keywords: Medical Research, Health Sciences Productivity, Collaboraion,

1. 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. Tehran University of Medical Sciences (TUMS) keeps a leading position in the field of medical research in Iran. Since last two decades, TUMS took strong steps to motivate education and develop research through adopting a systematic approach to its evaluation. Current evidence indicates the lack of high quality program evaluation activities in the field of medical education (Gandomkar, et. al. 2015; Mirhosseini, and Vahabi, 2011). Health services and medical & scientific research have been improved along with the growing number of medical institutions (Kadom, et.al., 2018; Al-Ohali and Shin, 2013; Abramo, D'Angelo, and Costa, 2009).

TUMS came into being in 1852, being the first public sector specialized health care university not only in Iran but also in the Middle East Region. TUMS perceives its mission as providing its academic programs in an ideal setting that fosters excellence in innovative learning and scientific research. TUMS 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. Alan Prichard coined the term bibliometric in 1969, it is quantitative research method applied to physical published items. 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" (Hertzel, 2013). The synonyms term scientometrics has also been used, Van-Raan stated, "Scientometrics is the science of measuring and analyzing science or, in other words, the study of the quantitative aspects of science as a discipline."

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 (Akbaritabar, Casnici, and Squazzoni, 2018; Seeber, et. al., 2017). It highlighted the characteristics of academic community e.g. potential publications, authorship pattern, collaboration and other significant detail of any specific literature (Evans., Kandiko Howson, and Forsythe, 2018). Bibliometric studies have been playing important role in medical decision-making in relation to the development of research programs and allocation of resources. 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.

2. Objective

The main objective of this study is

- To depict the research performance of TUMS in different areas or subfields of medical and health sciences by measuring the growth rate of research

3. Research Methodology

This study is conducted to analyze the research output of Tehran University of Medical Sciences (TUMS), and its collaboration with other. It is based on a quantitative analysis of scientific research output published as journal articles, letter, review, conference paper, short survey, book chapter, etc. in the 27 disciplines. The data for the study has been drawn from SCOPUS database. SCOPUS is an international multi-disciplinary database indexing over 31000 titles from more than 5,000 publishers, including 20,000 peers reviewed journals, 390 trade publications, 370 book series, and 5.5 million international conference/ seminar papers. Scopus has a worldwide coverage, of which more than half of the Scopus contents originate from Europe, Latin America and the Asia & the Pacific Region.

The research output data of TUMS is collected by using different searching facilities provided by the SCOPUS database. Research papers has been collected from the beginning 2012 to 2016. In the study, advanced bibliometric indicators are used to assess the research output and productivity. For the analysis of data following indicators has been used:

Collaborative Index (CI) is the number of authors per paper CI = Np/Na (Number of papers/Number of authors)

Degree of Collaboration (DC)
DC: $Nm/Nm+Ns$
Nm = Number of multi-authored publication published during the year

Ns = Number of single-authored publication published during the year

Collaborative Coefficient (CC)

$$CC = [K_1 + K_1/2 + K_3/3 + \dots K_n/n]/V$$

K_1 = Single authored papers

K_2 = Double authored papers

K_3 = Three authored papers

V = Total number of publications

4. Results

There had been a gradual increase in the publications during the five years and the amount of research had a growth in these five years (Table 1). The annual average growth rate was recorded 0.9 % in the last five years. Table. 1 depicts the distribution of publication growth in the duration of every year from 2012 to 2016. The table clearly presents an increase, in research publications, this period is known as fast growth period, in this period of 5 years the number of publication was increased from 3935 to 4840. In last five years 905 papers are added in the research output which indicates high growth and highly productive period.

Year	Number of Documents (%)	Annual Average Growth Rate (%)
2012	3935 (19%)	18.7 %
2013	4056 (19.5%)	3 %
2014	3958 (18.9%)	2.4 %
2015	4050 (19.4%)	2.3 %
2016	4840 (23.2%)	19.5 %
Total	20839 (100%)	9.18 %

Table 1. Year wise distribution of published documents (2012-2016)

Most of the articles appeared in Acta Medica Iranica (515) (Table 2). There were only eight journals, where more than 10 articles had been published. There were 230 journals where only one article was published by our researchers (Table 2).

Journal	Articles Published (%)
Acta Medica Iranica	515 (2.4%)
Iranian Journal of Public Health	432 (2 %)
Archives of Iranian Medicine	362 (1.8 %)
Iranian Red Crescent Medical Journal	335 (1.6 %)
Tehran University Medical Journal	301 (1.4 %)
Medical Journal of The Islamic Republic of Iran	253 (1.2 %)
Asian Pacific Journal of Cancer Prevention	223 (1 %)

Table 2. Journals with High Publication Percentage (2012-2016)

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).

Subject Area	Publications - 2012-2016	Publications (growth%) 2012-2016
Medicine	15671	20.1
Biochemistry, Genetics and Molecular Biology	3380	40.8
Pharmacology, Toxicology and Pharmaceutics	2220	47.3
Immunology and Microbiology	1769	36.2
Chemistry	952	50
Neuroscience	888	72.1
Engineering	841	115.8
Environmental Science	765	41.6
Agricultural and Biological Sciences	608	16.8
Chemical Engineering	585	68.2
Nursing	579	53.9
Materials Science	511	93.8
Dentistry	448	26.5
Health Professions	441	0.98
Physics and Astronomy	345	56.5
Social Sciences	299	18.9
Computer Sciences	207	2.2
Psychology	180	23.7
Multidisciplinary	134	-21.6
Veterinary	121	-25
Arts and Humanities	104	53.8

Mathematics	63	54.5
Energy	45	100
Earth and Planetary Sciences	33	-30
Business, Management and Accounting	26	60
Decision Sciences	22	-40
Economics, Econometrics and Finance	16	

Table 3. Subject Wise Distribution of Articles (2012-2016)

Region	Collaborating Institutions	Co-authored publications	Quantity %
Africa	95	138	0.89
Asia Pacific	337	674	4.36
Europe	669	1564	10.13
Middle East	220 (117 Iran)	14102	91.3
North America	355	1594	10.32
South America	66	87	0.56
Worldwide	1742	15439	

Table 4. Distribution of National and International Collaboration Pattern

5. Discussion

Tehran University of Medical Sciences (TUMS) 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 Scimago Country Rank, TUMS stood on 3rd number in 2012, now its reaches on 2th position in 2017. In this study, publication productivity and collaboration of TUMS had been assessed during 2012-2016. TUMS University created 31,253 papers during 2012-2016, whereas the highest number (5,671) belongs to Medicine disciplines. Research collaboration numbers with USA institutions was high (7%) followed by UK (2.5%), Canada (2.1%) and Germany (1.7%). In our research, USA had been the major partner in research productivity. This study describes that 49.4% of TUMS research has been produced in collaboration with International and Iranian Institutions. Their research pointed out that most of the articles were published in Acta Medica Iranica (515), followed by Iranian Journal of Public Health (432), our investigation had also proved these two journals were on the top. Although there had been increased in research productivity in TUMS but still needed to enhance the research quality in the university. This paper suggested that "there is dire need to develop national research policy to foster and support collaborations among researchers, universities, and countries."

Study carried out on research productivity by Ranjbar and Zarei (2016) University's publication based on ISI Web of Science during 2004-2014. Total 8465 articles were retrieved which were published in 2 main subjects, clinical medicine and pharmacology & toxicology.

Authorship Pattern	Single authored papers	Double authored papers	Three authored papers	Four authored papers	Five authored papers	Six authored papers	Seven authored papers	Eight authored papers	Nine authored papers	Ten authored papers	Collaborative Coefficient (CC)
2012	125	280	501	755	730	578	388	221	143	220	**0.023**
2013	87	253	524	729	707	655	406	267	139	288	**0.022**
2014	88	218	466	679	758	612	405	280	193	282	**0.021**
2015	70	223	452	70	704	735	461	312	167	307	**0.018**
2016	67	227	539	838	886	741	551	369	214	394	**0.025**
Average											0.022

Table 5. Distribution of Authorship Pattern 2012-2016

Journal	Articles Published (%)
United States	1433 (7%)
United Kingdom	515 (2.5%)
Canada	436 (2.1%)
Germany	350 (1.7%)
Australia	281 (1.35%)
Sweden	275 (1.32%)
Netherlands	244 (1.17%)

Table 6. International Comparison of Research Productivity 2012-2016

6. Conclusion

1. Research productivity of the faculty members of university has been constituted a critical measure of its academic achieve

ments. 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 not 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 UK.

References

[1] Abramo, G., D'Angelo, C. A., Costa, F. D. (2009). Research collaboration and productivity: Is there correlation? *Higher Education*, 57 (2) 155-171.

[2] Akbaritabar, A., Casnici, N., Squazzoni, F. (2018). The conundrum of research productivity: a study on sociologists in Italy. Scientometrics, 114 (3) 859-882.

[3] Al-Ohali, M., Shin, J. C. (2013). Knowledge-based innovation and research productivity in Saudi Arabia. *In:* Higher Education in Saudi Arabia (p. 95-102). Springer, Dordrecht.

[4] Evans, C., Kandiko Howson, C., Forsythe, A. (2018). Making sense of learning gain in higher education, Higher Education Pedagogies 3 (1) 1-45, DOI: 10.1080/23752696.2018.1508360

[5] Hertzel, DH. (2013). Bibliometric History. *In:* Drake M, eds. Encyclopedia of library and information science. 2nd ed. New York:CRC.

[6] Gandomkar, R., Mirzazadeh, A., Jalili, M., Sadighpour, L. (2015). Developing comprehensive course evaluation guidelines in Tehran University of Medical Sciences. *Journal of advances in medical education & professionalism*, 3 (3) 150-151.

[7] Ranjbar-pirmousa, Z., Zarei, H. (2016). Situation of Articles Published and their Citations of Tehran and Shahid Beheshti Universities of Medical Sciences in Web of Science Database. *Rme*, 8 (3) 24-33

[8] Kadom, N., Tigges, S., Wagner, S. B., Vey, B. L., Straus, C. M. (2018). Research Mentoring of Medical Students: A Win-Win. *Journal of the American College of Radiology*: JACR.

[9] Seeber, M., Cattaneo, M., Meoli, M., Malighetti, P. (2017). Self-citations as strategic response to the use of metrics for career decisions. Research Policy.

[10] Mirhosseini, Z., Vahabi, F. (2011). Investigating the Scientific Productions of Iranian Type I Pharmacy Faculty Members Indexed in the Institute for Scientific Information (ISI). 363-372.