



Contribution of Iranian scholars to medical sciences: A holistic overview of 140-years publication

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Abstract

Background: This study investigated the trends in the scientific output of Iran published in PubMed indexed journals. To the best of our knowledge, there was no previous study to examine the Iranian scientific output in all fields of health and biomedical sciences.

Methods: Using a bibliometric approach, we tracked 140 years (between 1877 and 2016) of Iranian scientific productions in PubMed. The journals which papers widely published over them were analyzed. The metadata of journals was extracted from Web of Science (WoS), Scopus, and Scimago Journal & Country Rank. The Gross Domestic Product (GDP) data was elaborated from the World Bank to evaluate the relationship with research output. We used Pearson's correlation coefficient at $p < 0.01$ significance level and reported the data in a scatterplot.

Results: We identified 106 226 documents produced by Iranian authors in journals indexed in PubMed since 1877. The number of papers climbed dramatically in 2000 and afterward, and this was consistent with the country's GDP. Although the scientific contribution of Iranian researchers is remarkable, 67% of papers (26 978 out of 106 226) were published in local Journals categorized into quartile 3 and 4 of WoS and Scopus. The study shows that GDP growth has had a positive influence on publication output ($r = 0.738$, $p < 0.001$).

Conclusion: This is the first study with a panorama view of Iran's contribution to biomedical literature. Based on the results of our survey, although the number of Iranian publications rose over time but they are mostly published in low ranked journals. Health policy-makers advise reconsidering the criteria for measuring research activities. Improving policies will help researchers to publish in higher ranked journals.

Keywords: Publications, Publishing trend, Scientific production, Iran, PubMed, Gross domestic product, GDP

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Introduction

Publishing via scientific journals is the main channel to disseminate research results. After publication, results are used by other researchers in related studies, the article receives citations, and this process is continuing (1). The number of citations received by an article is a dominant measure of authors' and journals' performance and quality

(2). Accordingly, researchers consider metrics including impact factor (IF) to select journals not only for publishing their articles but also for reading and citing documents (3). Moreover, measurements and evaluations are required to analyze the quality of publications and to improve scientific productivity at the international level (4).

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↑ **What is "already known" in this topic:**

There are many studies reported the biomedical research outputs of Iran over a limited range of years; however, there is no big picture for the country's publishing trend.

→ **What this article adds:**

This study has a panorama view of the biomedical production trend in Iran. The findings show the increasing rate in the number of publications. However, the Iranian authors mostly tend to publish in low ranked Middle Eastern journals, typically local ones.

Publishing in prestigious journals indexed in sound databases such as Web of Science (WoS), Scopus, and PubMed represents the quality of articles. Moreover, the literature suggests that the papers published via high ranked journals receive more citations compared to others (5-7). Accordingly, analyzing the scientific productivity of scientists at the national level makes it possible not only to evaluate publication activity, but also to predict further methods for the development of science and technology.

Gul et al. investigated the scientific productivity of Middle Eastern countries. They retrieved 1 187 872 papers published by Middle Eastern scientists in journals indexed by Science Citation Index (SCI) in the WoS platform between 1945 and 2014. The authors reported that Israel had the highest number of papers followed by Turkey and Iran (8, 9).

With a rapid growth rate of publication, Iran leaves other fast-developing countries in the dust. For instance, Kharabaf and Abdollahi reviewed scientific output in Iran and reported that Iran accounted for 20 610 publications indexed ISI journals in Thomson Reuters in 2010 (10). While, according to Osareh and Wilson, only a single Iranian paper was published in SCI-indexed journals in 1972, whereas; the number of papers produced by the Iranian authors reached to 610 by the end of 1978 (11). Iranian authors tripled their scientific output from 501 articles in 1996 to 1 830 in 2002 (12). Naghizadeh and Naghizadeh examined the scientific contribution of Iranian authors. Their findings indicated that Iran acquired 17th world-wide ranking with 51 187 items in 2016 and achieved 18th international ranking in the number of citations (28 965) received based on the Scopus database (13). Saboury studied Iranian publications in WoS from 1993 to 2002 and compared the production status of Iran with selected countries. He concluded that the share of Iran's scientific outputs had been increased from 0.015 in 1993 to 0.217 in 2002 (14).

Moein et al. evaluated the scientific output of Iran from 1967 to 2003 and compared with other 15 countries; they showed the relative share of Iran in the scientific output increased from 0.0003% in 1970 to 0.29% in 2003 in the world and it stands on the 13th place among the selected countries (15). As evidence shows, despite there were an increasing rate in Iranian publications; however, citations did not seem to correspond to the growth rate (16).

Sadeh et al. reported the scientific output of Iran from 1997 to 2018 in Scopus. They reported that Iran stands in the twenty-first place in the global scientific publication ranking. Although 22% of papers were published in the health and biomedical field, the average ranks of source journals showed a significant and consistent drop (17).

To sum up, the scientific productivity of Iran increased significantly over time; however, to the best of our knowledge, there have been no big picture for Iranian biomedical publication.

PubMed is the largest open-access database for biomedical literature that comprises more than 28 million citations from Medline, life science journals, and online books. It is worth noting that major medical journals are indexed in PubMed and more than 2 billion searches are performed each year via PubMed. Thus, it is an essential database for

researchers dealing with health-related subjects.

To sum up, the scientific productivity of Iran increased significantly over time; however, to the best of our knowledge, there have been no reports of Iranians publication trends in PubMed. Therefore, we investigated the country affiliated publication in PubMed to draw the overall picture of Iranian medical scientists' publications. Moreover, we studied the number of publications, the status of journals in citation databases, and the association between Gross Domestic Product (GDP) and research output.

Methods

This study conducted to investigate the scientific productivity of Iranian scholars in PubMed and examine the status of journals that the Iranian papers mostly published over them. Thus, the search was carried out using "Iran" OR "Persia" (the former and ancient name for Iran before the 20th century) syntax in the PubMed affiliation field from inception to December 2016. The data were collected in Jan 2018. All of PubMed publication types were included except book and book chapters (18, 19). In total, 106 226 publications were retrieved and included in the analysis, among which 2 582 were "in press".

Noteworthy, in 6 out of 106 226 papers, the country name in affiliations was "Persia" and for the remaining papers (106 220) authors used "Iran". We exported the data of all articles from PubMed into XML file format and converted to Microsoft Excel to perform the analysis.

We extracted the title of source journals and counted the number of articles for each journal to identify the top 100 journals with the highest number of articles (Appendix 1).

The details of top 100 source journals, which have published the most Iranian papers, including full name, ISSN, country of publisher, category (we mentioned the 1st category of Scopus), CiteScore, Percentile, Quartile (Q) and IF were obtained from the NLM catalog, Scopus, WoS, and Scimago Journal & Country Rank databases. We found that 8 out of the top 100 source journals were Iranian based on the publishers; however, published in a different country, 7 journals published in Netherlands and 1 journal in the UK; we considered them as Iranian journals.

Since the GDP is the key indicator for the economic strength of a country and it is related to the amount spent on research and development and effects on the scientific growth (20), we extracted the GDP data from the World Bank. We used Pearson's correlation coefficient at $p < 0.01$ significance level to evaluate the correlation of GDP and the publication productivity. The data was analyzed by SPSS 22.0 and the results reported with a scatterplot.

Results

1. Overview of Iranian Scholars Publication and GDP

In total, 106 226 papers were identified in PubMed published by Iran until the end of 2016. The first paper was authored by Dr. Lucas in 1877 and published in "The Indian Medical Gazette" journal entitled "Case of Scleroderma" who used the "Her Majesty's Bombay Army, Civil Surgeon, Bushire, Persia" as affiliation (21). Iranian authors published 6 papers until 1922. These papers used Persia as the affiliation. No article was found in PubMed authored by

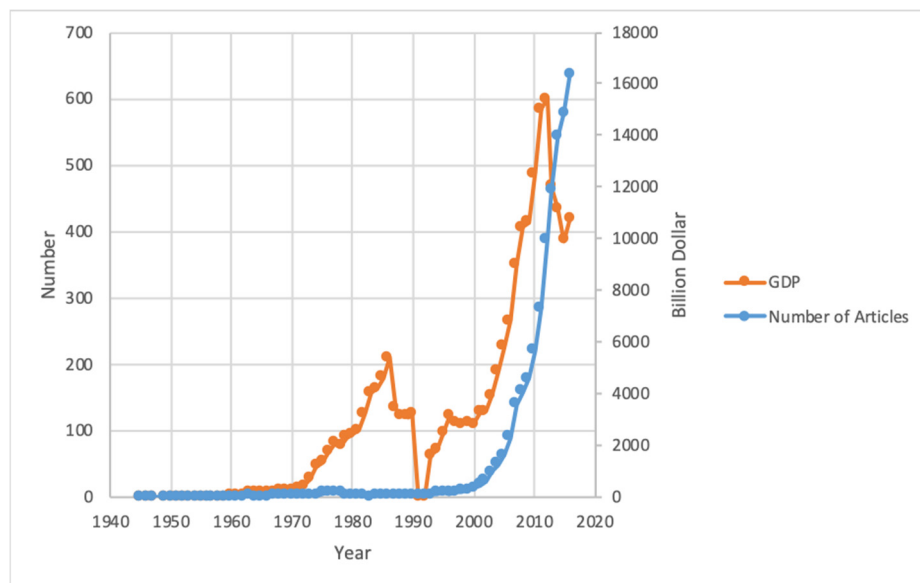


Fig. 1. Comparison of Iranian articles in PubMed with GDP trend 1945-2016

Iranian between 1922 and 1944, and after 22 years, only one paper was published in 1945. The first paper that mentioned “Iran” as affiliation was written in 1954 by M. Baltazard and M. Ghodssi from “Institut Pasteur of Iran” entitled “Prevention of Human Rabies; Treatment of Persons Bitten by Rabid Wolves in Iran”, published in “Bulletin of the World Health Organization” journal (22). The number of publications had increased dramatically after 2000 (Fig. 1).

We obtained the GDP data from the World Bank (23) to examine whether there was any association between the country research productivity and its GDP. Figure 1 presents an overview of Iranian publications and GDP trends during the investigated period. Likewise, the number of publications and the overall GDP rate increased throughout the years.

Although, there was a fall in the mid 1980s since the oil price dropped drastically, and this impressed the GDP in Iran and other oil-producing countries.

2. Analysis of Top 100 Contributing Journals to the Iranian Papers

This is worth mentioning that Iranian papers were published in 5 625 journals indexed in PubMed. The top 100 source journals were selected based on the number of papers published. We found that 38% of papers (40 160 out of 106 226) had been published in these 100 journals.

Analysis of the regional distribution for source journals showed that 61 journals from 100 titles are based in Middle Eastern countries, 23 journals in European Union, 7 journals in Northern America, and 9 in other countries (Fig. 2). Fifty-nine of these 100 journals were published in Iran while 41 were published in other countries (Fig. 3).

2.1 Web of Science analysis: Findings revealed that 71 of the top 100 source journals were indexed in WoS; however, only 51 of the journals had an IF based on Journal Citation Report (JCR 2016). The IF of 32 journals (out of 51) were higher than 1.00 according to data obtained from the WoS

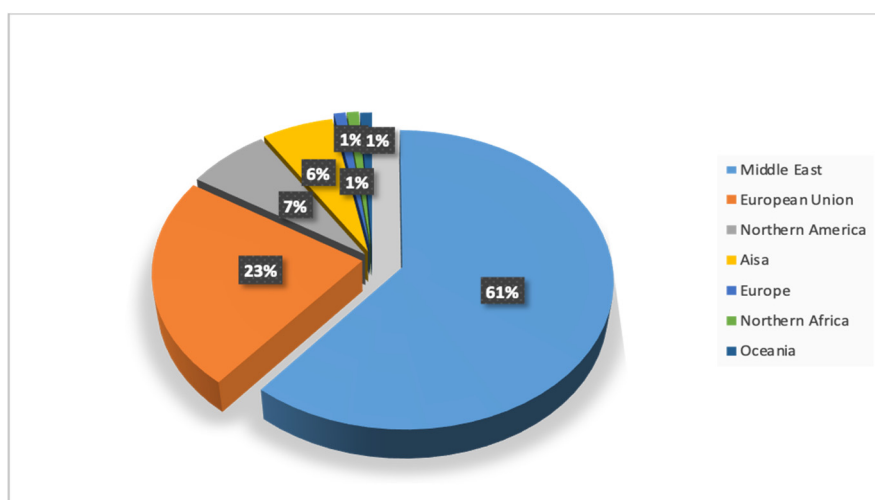


Fig. 2. Regional distribution of top 100 source journals Iranian researchers tend to publish

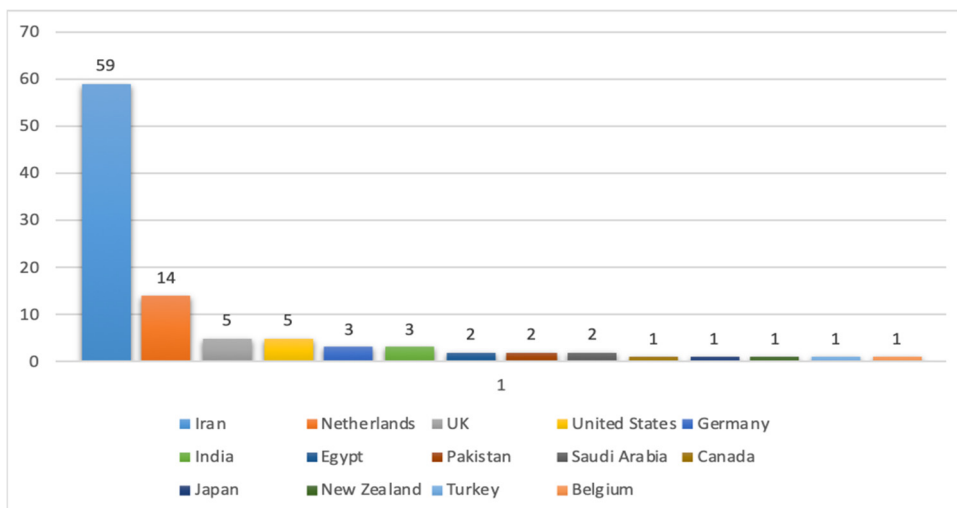


Fig. 3. Country distribution of top 100 source journals

Platform. The highest IF belonged to the journal of “Biosensors & Bioelectronics” (IF=7.78) from Elsevier and 0.004% of the papers (175 out of 106 226) were published in it. The average IF of the top 100 source journals was 2.1. Sixty-one journals (61%) were ranked in quartile 3 (Q3) and quartile 4 (Q4) in WoS.

2.2 Scopus analysis: Eighty-seven of the top 100 source journals were indexed in Scopus. As demonstrated in Figure 4, category of “General Medicine” with 25% has the highest contribution, “Public Health” (4%), and “Analytical Chemistry” (2%) respectively. The CiteScore of 53 journals (out of 87) which indexed in Scopus were higher than 1.00 and “Biosensors & Bioelectronics” journal obtained the highest CiteScore (7.22). The average CiteScore of journals was 1.75.

Twenty-two percent of journals indexed in Scopus were

ranked in Q1 based on CiteScore Percentile. The CiteScore Percentile of two journals; “Journal of Hazardous Materials” and “Biosensors & Bioelectronics”, were 99%; which means that they are in top one percent in their fields, however only 0.01% of total papers (568 of 106 226) were published in these two journals.

The H-index of top 100 source journals ranged between 0 and 218. The highest H-index (218) belonged to “PLOS One” published by Elsevier and the lowest (0) was for “Iranian Journal of Neurology” published by “Tehran University of Medical Sciences”. The average H-index was 46.2.

2.3 Status of Iranian journals among top 100 source journals: Fifty-nine titles of the source journals were published in Iran, which included 67% of total published articles (26 978 of 106 226) in PubMed. In other word, Iranian scholars

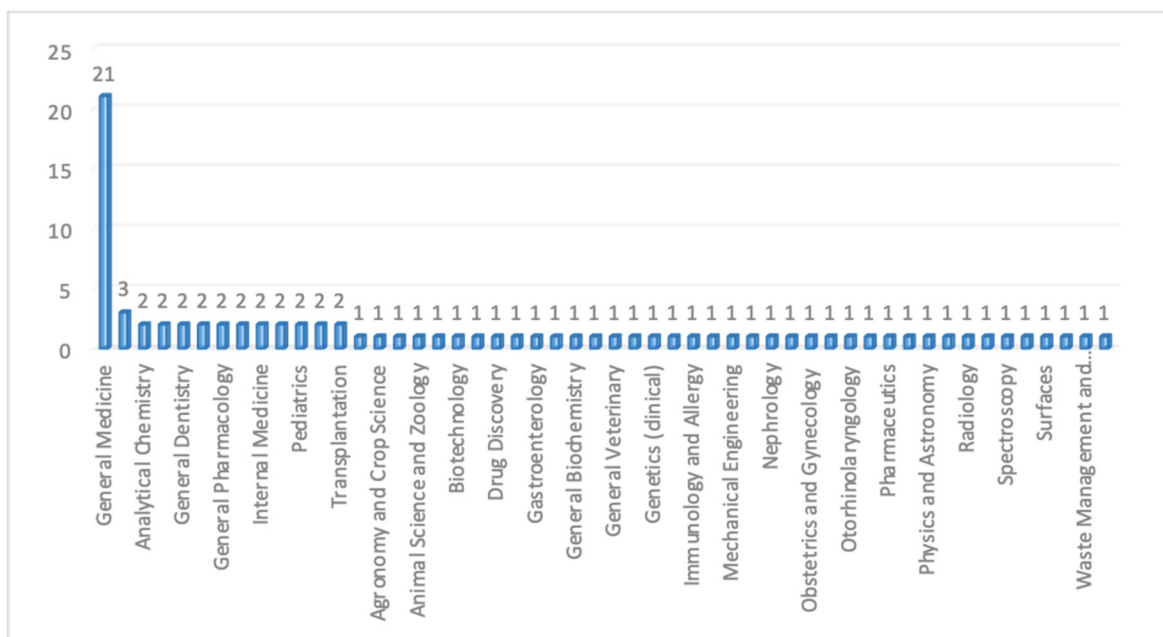


Fig. 4. Category distribution of top 100 source journals

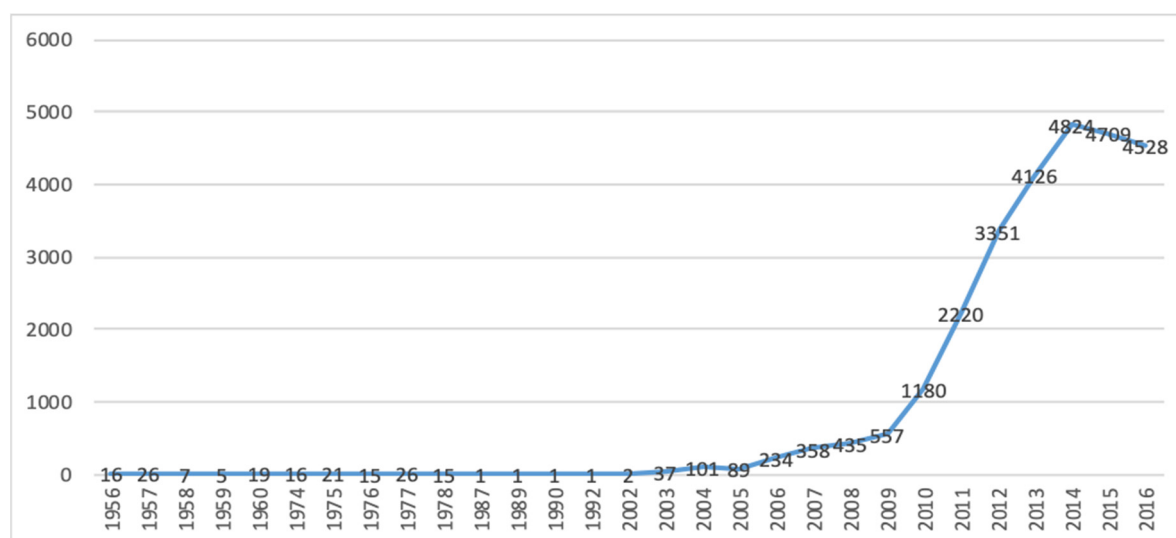


Fig. 5. The trend of Iranian publications in local journals from 1956 to 2016

often tend to publish their papers in local journals rather than other countries. As illustrated in Figure 5, Iranian scholars started to publish in local journals from 1956 in the *Acta Medica Iranica* which is the oldest scientific medical journal of the country in English language (24). Evidence showed the growing tendency to publish in local journals which tripled in 2003 and doubled between 2009 and 2010.

Despite 63% (37 of 59) of Iranian journals were indexed in WoS, only 26 journals (38%) had IF. The highest IF was 2.5 related to “Asian Pacific Journal of Cancer Prevention: APJCP” and the average IF was 1.1. All of the 59 journals were in Q3 and Q4 of WoS ranking.

Eighty percent (47 of 59) of Iranian journals were indexed in Scopus. The highest CiteScore was 2.1 and obtained by “Advanced Pharmaceutical Bulletin” journal. The average CiteScore was 1.1 and the H-index ranged between 0 and 55 (Average=14.4). Sixty-seven percent of 59 journals were ranked in Q3 and Q4 of Scopus and only 3 journals (6%) were in Q1.

2.4. Top prolific journals: 10.92% of papers published in the top 10 journals (Table 1) and all of them published in the Middle Eastern and Asia countries. Eight out of 10 were Iranian local journals and two of them belonged to India

and Pakistan. The most of papers (approximately 1.5 %) were published via “Archives of Iranian Medicine”.

3. Influence of GDP on the scientific productivity

Iran is the second largest economy in the Middle East and North Africa (MENA) after Kingdom of Saudi Arabia, this is evidenced by Iran’s GDP which is US\$ 418.977 billion in 2016 (23) and is estimated to reach US\$ 451 billion in 2020 (25). We found a positive and strong correlation between the GDP and number of publications ($r = .738$, $p < 0.001$) using a Pearson’s correlation coefficient test, it presented in a scatterplot (Fig. 6).

Discussion

Most of the previous studies have been conducted in a specific subject, domain, or in the limited time frame. Therefore, in this scientometric study, the quantity and quality characteristics of Iran affiliated documents indexed in PubMed were examined and we visualized a big picture of medical publishing of the country over nearly a century and a half.

The socio-cultural factors in 19th century contributed in emergence of the first Iranian PubMed-indexed paper in

Table 1. The 10 top journals which Iranian authors tend to publish in

| Journal Name | No of Article | Country | Scopus | CiteScore 2016 | Q in Scopus | WoS | JCR 2016 | IF | Q in WoS |
|--|---------------|----------|--------|----------------|-------------|-----|----------|-------|----------|
| 1 Archives of Iranian medicine | 1546 | Iran | Yes | 1.26 | Q2 | Yes | Yes | 1.200 | Q3 |
| 2 Iranian Red Crescent medical journal | 1425 | Iran | Yes | 1.10 | Q2* | Yes | Yes | 0.865 | Q3* |
| 3 Iranian journal of public health | 1401 | Iran | Yes | 0.85 | Q3 | Yes | Yes | 0.768 | Q4 |
| 4 Acta medica Iranica | 1242 | Iran | Yes | 0.72 | Q2* | No | No | - | - |
| 5 Pakistan journal of biological sciences | 1197 | Pakistan | Yes | 0.77 | Q3 | No | No | - | - |
| 6 Journal of research in medical sciences | 1168 | Iran | Yes | 1.47 | Q2 | Yes | Yes | 1.237 | Q3 |
| 7 Iranian journal of pharmaceutical research | 1013 | Iran | Yes | 1.70 | Q1* | Yes | Yes | 1.507 | Q4 |
| 8 Asian Pacific journal of cancer prevention | 991 | Iran | Yes | 1.87 | Q2 | Yes | Yes | 2.514 | Q3 |
| 9 Advanced biomedical research | 823 | India | No | - | - | No | No | - | - |
| 10 Iranian journal of basic medical sciences | 799 | Iran | Yes | 1.63 | Q3 † | Yes | Yes | 1.424 | Q3* |

Note: Authors double checked the quartiles of the journals after the whole data analysis based on latest Scimago and JCR data, some ranks is changed as specified.

*The quartile fell down one class.

† The quartile improved one class.

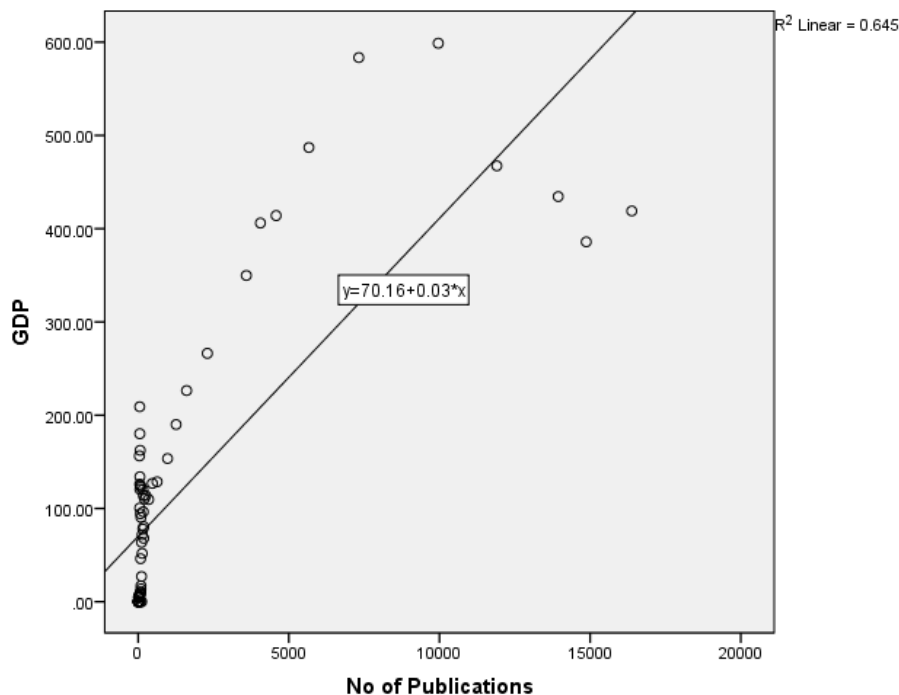


Fig. 6. Correlation between the GDP of Iran and Iranian publications from 1960 to 2016

1877. In this period, relations between Iran and Europe expanded (26) and movement toward modernity was started (27). The long-term publication output trends indicate that contribution to global knowledge production had slow growing rate until 1922 since only six papers published in PubMed by Iran from 1877 to 1922. It is noteworthy the authors of all six papers was foreigner who worked as researcher in Iran.

From 1922 to 1945 there was a stagnation period in the academic publication. World War I and II and regime changes from Qajar to Pahlavi dynasty occurred between 1914 and 1945 (28, 29), could be the main reasons for publication stagnation for 23 years in Iran.

From 1945, the Iranian scholars restarted academic publishing with slow rate until 2000. During this period, country experienced unstable political relationship due to Islamic revolution occurred in 1979 and Iran-Iraq war (1980-1988). Therefore, the growth was interrupted and according to Habibi et al report, the number of publications authored or coauthored by Iranian researchers decreased clearly during and consequent upon the long-lasting war (30). The Joint Comprehensive Plan of Action (JCPOA) in July 2015 by Iran and a group of six other countries, with the aim of lifting sanctions against Iran, fueled the hopes for improvement and progress in the scientific and research productions in Iran (31).

As the past studies reported, despite the sanctions against Islamic Republic of Iran, there is increasing rate in number of publications from 2000 to 2016 (343 to 16 382 paper) (32). The number of governmental universities, non-governmental institutions (eg, Islamic Azad University), and students, developed in this period (33); thus the number of scientific publication increased, subsequently.

Regardless of the growing number of publications, the

Iranian scholars tend to publish their works in local journals which categorized in Q3 and Q4 of Scopus and WoS rank, thus the quality is questionable. This finding is consistent with Mansoori and Sadeh et al. results that Iranian researchers have high contribution in the journals with low IF (17, 34).

Similarly, the reports show that although the titles of Iranian medical journals approved by Commission for Accreditation and Improvement of Iranian Medical Journals (CAIMJ) increased over the past 10 years (from 113 journals in 2007 to 212 in 2011, and 415 titles in 2018), the quality improvement of journals is slow, whereas only 2% of Iranian medical journals were indexed in WoS and Scopus in 2007. The rate increased to 12% (26 of 212) for journals indexed in WoS and 39% (82 of 212) for Scopus in 2011. Even though the quantity is doubled in 2018, the number of journals indexed in WoS increased only 5% (from 12% in 2011 to 17% in 2018) and the percentage of Iranian Scopus journals dropped from 39% in 2011 to 25% in 2018 (35, 36). Davarpanah also reported the low visibility of the local journals. Consequently, the number of citations can affect and falls under the visibility limitation (37). An increasing tendency to publish in local journals with less credibility is the dark side of scientific production in Iran.

Further studies should be conducted to investigate the cause and effect of publishing in low ranked local journals. Nevertheless, in most of Iranian universities, quantitative criteria, e.g. number of documents published in prestigious databases such as PubMed, WoS, or Scopus, are the mere tools to evaluate the research performance of researchers (38). Consequently Iranian researchers tend to publish in journals with high acceptance rate (34). Other studies suggest that Iranian scholars are the main contributors to the

predatory journals (39) and the country seemed to be the origin of a relatively large number of papers and authors in predatory journals according to Research Papers in Economics (RePEc) archives published in 2015 (40).

Further evaluation revealed that there is a strong effect of GDP on scientific output in Iran. This resembles the findings reported in the past literature (41-45).

The time for scientific flourishing in Iran was shortened since the United States left the Iran nuclear deal and re-imposed sanctions against Iran in 2018. Based on previous studies, sanctions have had negative impact on the quantity and quality of publications in Iran because of accessibility to the scholarly works as well as limitations in the scientific collaboration between Iran and international researchers (46), purchasing laboratory materials and equipment (47) and the other economic problems caused by sanctions.

Overall, while the quantity of Iranian medical papers is remarkably significant, based on the country's publishing pattern, quality-related issues need to be investigated further to improve.

Limitations: The study had two limitations. First, since the GDP data was introduced from 1945, we selected the mirror publication data for correlation test and the data before 1945 were excluded in the related analysis. The second limitation originate from the PubMed indexing method which some of the papers may appear later. Although research data were extracted in January 2018 it is likely to say that some data were missed in current study.

Conclusion

This is the first study with panorama view of the medical publishing in Iran, one of the largest economies in the world in terms of natural oil and gas reserves. We discussed that a significant positive trend exists for PubMed indexed documents in Iran and the GDP growth has had positive influence on quantity of publications. However, more than half of journals which Iranian scholars tend to publish, were categorized into Q3 and Q4 rank of WoS and Scopus. The Iranian medical research policy-makers are encouraged to support revising the tenure and promotion criteria of faculty members and researchers as a result the Iranian scholars will concentrate quality of their publications rather than quantity.

Conflict of Interests

The authors declare that they have no competing interests.

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Appendix 1. Top 100 source journals' data published the most Iranian papers in PubMed

| | Journal Title | No of Articles | ISSN | Country |
|----|---|----------------|-----------|---------------|
| 1 | Archives of Iranian medicine | 1546 | 1029-2977 | Iran |
| 2 | Iranian red crescent Medical journal | 1425 | 2074-1804 | Iran |
| 3 | Iranian journal of public health | 1401 | 0304-4556 | Iran |
| 4 | Acta medica Iranica | 1242 | 0044-6025 | Iran |
| 5 | Pakistan journal of biological sciences | 1197 | 1028-8880 | Pakistan |
| 6 | Journal of research in medical sciences | 1168 | 1735-1995 | Iran |
| 7 | Iranian journal of pharmaceutical research | 1013 | 1735-0328 | Iran |
| 8 | Asian Pacific journal of cancer prevention | 991 | 1513-7368 | Iran |
| 9 | Advanced biomedical research | 823 | 2277-9175 | India |
| 10 | Iranian journal of basic medical sciences | 799 | 2008-3866 | Iran |
| 11 | International journal of preventive medicine | 783 | 2008-7802 | Iran |
| 12 | Iranian journal of pediatrics | 751 | 2008-2142 | Iran |
| 13 | Iranian journal of kidney diseases | 732 | 1735-8582 | Iran |
| 14 | Iranian journal of nursing and midwifery research | 656 | 2228-5504 | Iran |
| 15 | Spectrochimica acta. Part A, Molecular and biomolecular spectroscopy | 624 | 1386-1425 | UK |
| 16 | Iranian journal of allergy, asthma, and immunology | 621 | 1735-1502 | Iran |
| 17 | Iranian journal of medical sciences | 567 | 0253-0716 | Iran |
| 18 | Eastern Mediterranean health journal | 563 | 1020-3397 | Egypt |
| 19 | Talanta | 562 | 0039-9140 | Netherlands |
| 20 | Medical journal of the Islamic Republic of Iran | 558 | 1016-1430 | Iran |
| 21 | Global journal of health science | 530 | 1916-9736 | Canada |
| 22 | Iranian journal of parasitology | 498 | 1735-7020 | Iran |
| 23 | Iranian journal of reproductive medicine | 471 | 1680-6433 | Iran |
| 24 | Jundishapur journal of microbiology | 467 | 2008-3645 | Iran |
| 25 | Urology journal | 467 | 1735-1308 | Iran |
| 26 | Plose One | 466 | 1932-6203 | United States |
| 27 | Iranian endodontic journal | 451 | 1735-7497 | Iran |
| 28 | Transplantation proceedings | 442 | 0041-1345 | United States |
| 29 | Hepatitis monthly | 413 | 1735-143X | Iran |
| 30 | Journal of hazardous materials | 411 | 0304-3894 | Netherlands |
| 31 | Journal of dentistry | 396 | 1735-2150 | Iran |
| 32 | Materials science & engineering. C, Materials for biological applications | 396 | 0928-4931 | Netherlands |
| 33 | International journal of biological macromolecules | 389 | 0141-8130 | Netherlands |
| 34 | Journal of ophthalmic & vision research | 378 | 2008-2010 | Iran |
| 35 | Dental research journal | 373 | 1735-3327 | Iran |
| 36 | Iranian journal of microbiology | 363 | 2008-3289 | Iran |
| 37 | Iranian journal of radiology | 359 | 1735-1065 | Iran |
| 38 | Electronic physician | 350 | 2008-5842 | Iran |
| 39 | Iranian biomedical journal | 350 | 1028-852X | Iran |
| 40 | Saudi journal of kidney diseases and transplantation | 349 | 1319-2442 | Saudi Arabia |
| 41 | Environmental monitoring and assessment | 337 | 0167-6369 | Netherlands |
| 42 | Cell journal | 330 | 2228-5806 | Iran |
| 43 | Ultrasonics sonochemistry | 328 | 1350-4177 | Netherlands |
| 44 | Journal of education and health promotion | 327 | 2319-6440 | Iran |
| 45 | Iranian journal of immunology | 322 | 1735-1383 | Iran |
| 46 | Analytica chimica acta | 317 | 0003-2670 | Netherlands |
| 47 | Saudi medical journal | 317 | 0379-5284 | Saudi Arabia |
| 48 | ARYA atherosclerosis | 308 | 1735-3955 | Iran |
| 49 | Journal of dental research, dental clinics, dental prospects | 308 | 2008-210X | Iran |
| 50 | Advanced pharmaceutical bulletin | 291 | 2251-7308 | Iran |
| 51 | Caspian journal of internal medicine | 276 | 2008-6164 | Iran |
| 52 | Daru : journal of faculty of pharmacy | 266 | 1560-8115 | Iran |
| 53 | Zootaxa | 266 | 1175-5326 | New Zealand |
| 54 | Anesthesiology and pain medicine | 265 | 2228-7523 | Netherlands |
| 55 | Iranian journal of otorhinolaryngology | 262 | 2251-7251 | Iran |
| 56 | European journal of pharmacology | 259 | 0014-2999 | Netherlands |
| 57 | Iranian journal of psychiatry | 254 | 1735-4587 | Iran |
| 58 | The journal of Tehran heart center | 254 | 1735-8620 | Iran |
| 59 | Physical review. E, Statistical, nonlinear, and soft matter physics | 250 | 1539-3755 | United States |
| 60 | Iranian journal of cancer prevention | 246 | 2008-2398 | Iran |

Appendix 1. Ctd

| | Journal Title | No of Articles | ISSN | Country |
|-----|---|----------------|-----------|---------------|
| 61 | Journal of separation science | 245 | 1615-9306 | Germany |
| 62 | Veterinary research forum | 245 | 2322-3618 | Iran |
| 63 | Journal of research in health sciences | 243 | 2228-7795 | Iran |
| 64 | Iranian journal of neurology | 241 | 2252-0058 | Iran |
| 65 | Journal of chromatography. A | 239 | 0021-9673 | Netherlands |
| 66 | The scientific world journal | 239 | 1537-744X | Egypt |
| 67 | Molecular biology reports | 237 | 0301-4851 | Netherlands |
| 68 | Gastroenterology and hepatology from bed to bench | 232 | 2008-2258 | Iran |
| 69 | International journal of fertility & sterility | 230 | 2008-076X | Iran |
| 70 | Middle East journal of digestive diseases | 220 | 2008-5230 | Iran |
| 71 | Iranian journal of psychiatry and behavioral sciences | 219 | 1735-8639 | Iran |
| 72 | Research in pharmaceutical sciences | 219 | 1735-5362 | Iran |
| 73 | The Journal of the Pakistan medical association | 218 | 0030-9982 | Pakistan |
| 74 | Journal of clinical and diagnostic research | 216 | 0973-709X | India |
| 75 | Trauma monthly | 216 | 2251-7464 | Iran |
| 76 | Journal of parasitic diseases : official organ of the Indian Society for Parasitology | 212 | 0971-7196 | India |
| 77 | Tanaffos | 210 | 1735-0344 | Iran |
| 78 | Iranian journal of child neurology | 209 | 1735-4668 | Iran |
| 79 | Journal of diabetes and metabolic disorders | 201 | 2251-6581 | Iran |
| 80 | Avicenna journal of phytomedicine | 196 | 2228-7930 | Iran |
| 81 | Journal of environmental health science & engineering | 195 | 2052-336X | UK |
| 82 | Avicenna journal of medical biotechnology | 194 | 2008-2835 | Iran |
| 83 | Biological trace element research | 191 | 0163-4984 | United States |
| 84 | Journal of dentistry | 188 | 2345-6485 | Iran |
| 85 | Nephro-urology monthly | 187 | 2251-7006 | Netherlands |
| 86 | Food chemistry | 184 | 0308-8146 | Netherlands |
| 87 | Journal of colloid and interface science | 181 | 0021-9797 | United States |
| 88 | Carbohydrate polymers | 180 | 0144-8617 | UK |
| 89 | Experimental and clinical transplantation : official journal of the Middle East Society for Organ Transplantation | 180 | 1304-0855 | Turkey |
| 90 | Journal of cardiovascular and thoracic research | 177 | 2008-5117 | Iran |
| 91 | Biosensors & bioelectronics | 175 | 0956-5663 | UK |
| 92 | Journal of medical signals and sensors | 174 | 2228-7477 | Iran |
| 93 | Tumour biology: the journal of the international society for oncodevelopmental biology and medicine | 171 | 1010-4283 | Germany |
| 94 | Analytical sciences: the international journal of the Japan society for analytical chemistry | 169 | 0910-6340 | Japan |
| 95 | Communications in agricultural and applied biological sciences | 169 | 1379-1176 | Belgium |
| 96 | Colloids and surfaces. B, Bio interfaces | 168 | 0927-7765 | Netherlands |
| 97 | Natural product research | 168 | 1478-6419 | UK |
| 98 | Addiction & health | 167 | 2008-4633 | Iran |
| 99 | Parasitology research | 167 | 0932-0113 | Germany |
| 100 | Journal of caring sciences | 164 | 2251-9920 | Iran |