Original Research

Factors Effective in Enhancing the Citation Rate of Iranian Journal Articles with Impact Factor Reported by the Journal Citation Reports 2020

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Abstract

Scientific productions result from researchers' thoughts and efforts; when published in credible journals or indexed by valid databases and cited by other researchers, they gain credibility. Publications also gain more credibility when they are indexed in actual and valid citation databases. The publication of scientific products in these databases increases visibility and the possibility and opportunity to increase their citations. The present research aims to investigate the factors effective in citing the articles published in Iranian journals with Impact Factor (IF) indexed in Journal Citation Reports (JCR) 2020. This applied study was done using scientometric indices. The research population consisted of Iranian publications with IF indexed in the JCR in 2020. Microsoft Excel was employed for data collection, and SPSS software was used for data analysis. The results showed that Iran, with 27,446 citations, acquired about 17% of citing Iranian publications with IF indexed in the Web of Science Core Collection (WOSCC). Also, 53.31% of articles had an organizational affiliation (publishers and publishing country) to public universities. The variables "subject area, multiple authorship, number of references, and inter-university cooperation" positively and significantly correlated with the number of citations the Iranian publications with IF indexed in the WOSCC had received (citation rate). Also, the number of keywords, length of article titles, and inter-university scientific collaboration had no significant collaboration with the citation rate.

Keywords: Scientometric, Scientific Publications, Impact Factor (IF), Web of Science Core Collection (WOSCC), Journal Citation Report (JCR), Citation Rate.

Introduction

The ever-increasing number and print circulation of scientific publications, on the one hand, and the wide acceptance, use, and dependence of the scientific community on them, on the other hand, had turned their quantitative and qualitative review into one of the most critical issues of evaluating this type of resources. Due to globalization and information and communication technology development, scientific research has gained an international nature and scope. In other words, it can be stated that sometimes, in scientific and academic societies, the quality of

a researcher's scientific output is measured based on the quality of the publishing publication. Scientific publications play an essential role in exchanging scientific information globally to the extent that different researchers try to conduct valuable research and increase their scientific impacts via publishing in prestigious international journals. Therefore, in such environments, journals that publish scholarly and research outputs are evaluated for hiring individuals, assessing their performance, and promoting their scientific ranks (Erfanmanesh & Nojavan, 2016).

Scientific and technological advances in the present era are owed to the intellectual capital and knowledge that lead to the development and progress of countries. Scientific growth and progress in today's world are the most important priorities and programs of different countries to achieve economic development and improve the lives of their people (Arasteh, 2008). Paying attention to the international dimensions of research is a scientific development and promotion field. The local research results are presented internationally to be evaluated and criticized at the world level, and more people can benefit from it. The results of scientific productions reach the hands of users from different groups of researchers and experts through publications.

For this reason, publications have played an essential role in scientific development and have always been interesting (Zamani & Azizi Khalkhili, 2011). Nowadays, the level of scientific production of researchers in credible international databases is considered one of the crucial indicators for evaluating and ranking countries. Therefore, scientometrics examines, evaluates, and ranks countries based on quantitative and qualitative indicators. The number of scientific and scholarly productions, the number of citations the articles have received, and the average citations per article are quantitative and qualitative indicators of scientometrics in the ranking of countries, subject areas, universities, publications, articles, and authors (Yousefi et al., 2012).

Publications are the primary tools for the development and progress of science and can play a role in disseminating scientific activities. Determining the scientific status of the publications, their participation in developing science, ranking of universities and publications, and other indicators specified in documents, such as the comprehensive scientific map of Iran, is done using scientometric analyses. The measurement and analysis of these indicators play an essential role in formulating and presenting science development policies. Furthermore, measuring and analyzing quantitative and qualitative scientometric indicators significantly determine Iran's scientific direction and approach. The number of articles published in reputable journals is one of the quantitative indicators of science production. One of the essential qualitative indicators of science is citation indicators, such as the number of citations articles have received and the IF of publications, which determine the authors' power and quality of scientific activities, publications, and universities (Kheradmandnia, 2015).

Publications are reviewed and evaluated to create competition and increase the quality of scientific productions. In scientometrics, different models and methods are employed to assess and rank publications, including journal indexing in citation databases (Villas, Macedo-Soares, & Russo, 2008). In the study of the scientific growth of each country, in addition to quantitative indicators, the most important of which is the number of articles published in reputable international journals, qualitative indicators are also essential, the most important of which is the citation of articles (Mohammed Esmaeil, Riahi & Sohbatiha, 2014). In any scientific thinking and research, we may reflect on what others have presented before us, try it from another perspective, interpret it, or correct it. Therefore, in the research world, one cannot claim

invention-- it is only possible to refer to a new synthesis (Davrpanah and Adamian, 2012). As a result, performing any scientific activity requires knowledge of previous related activities: authors use others' productions and ideas related to their work so that they can present a more prosperous work by citing them.

The Chicago Manual of Style prescribes that any work that is not a story or report based on personal experiences is at least partially based on one or more references. Therefore, just as copyright law dictates, ethics also obliges authors and researchers to introduce sources and documents that have played roles in publishing their authorship or research work correctly (The Encyclopedia of Chicago, 1993, as cited in Horri & Shahbodaghi, 2004). No one can produce new knowledge independently and without needing the knowledge produced by others. Therefore, using others' works to create a new research work has a history as old as science, and citing works is as old as age authorship (Horri, 2002). As a result, the history of citation is closely related to that of science, as the development of science has always been done through evidence-based analysis. A considerable part of this evidence is the works of the past, which make it impossible to generate new knowledge except by relying on them (Microsoft Encarta, 2003, as cited in Horri & Shahbodaghi, 2004). Producing scientific information is one of the most essential aspects of sustainable development in any country. Scientific products, as a significant indicator of the activities of the scientific system of the countries, are nowadays the focus of attention of policymakers and decision-makers in the national and international arenas. Accordingly, quality and quantity have been considered (Noroozi Chakoli & Hassanzadeh, 2010).

The number of cited journal articles, the number of articles per year, the number of articles by a specific author), impact metrics (including the total number of citations articles have received, the number of citations per year, the number of citations a particular author has received), hybrid metrics (including the average number of citations per article), and h-index (Hirsch index). However, excessive use of these measures, especially those that overlap, is not logical or scientific (Fattahi, Danesh & Soheili, 2011). Citation analysis is an effective measure to evaluate research performance.

Although Iran has a top global rank in the growth rate of scientific production, the statistics show a decrease in the number of citations Iranian articles received during 2000-2010. This issue can indicate a reduction in the impact of Iranian articles among the world scientific community (Noormohammadi, JamaliMahmoui & Asadi, 2013). As a result, more attention should be paid to increasing the publication quality for Iranian authors—they should put aside the "publish or perish" policy and turn to quality instead of quantity of producing knowledge (Sotudeh, 2011) to present rich scientific productions qualitatively prominent at the national and international level.

Scientific productions result from scientific and research studies by researchers; therefore, citing them doubles their importance because it shows the extent of their use by other researchers and the effect of their writings on further studies. Thus, it can be said that nowadays, the reference to the key pillars of knowledge management has changed in universities and research institutes (Heather, 2009).

The high number of citations an article or publication has received can be considered to a large extent as the high quality of that article or publication - citation is an indicator to show the scientific effect of an article or publication. Usually, researchers are trying to have articles that receive more citations and have more impact on science. Regarding the importance of

citation, it should be added that this indicator is traditionally considered an official acknowledgment and acknowledgment of previously published studies. Therefore, the number of citations the article and scientific work have received determines scientific production's impact and significance. Despite the importance of the quality of publications and the need to evaluate them based on known indicators, to maintain and maintain the quality of publications, attention should also be paid to other factors, including the amount of self-citation of publications (Noroozi Chakoli & Jafari, 2015).

Citation analysis can be used as a reliable method to evaluate journal articles via their citation rate-- it is possible to understand authors' degree of scientific and research activity and the impact of their studies. The evaluation results of scientific journals' activities and products, while representing the status of their scientific research activities, can be a useful and efficient element for management and planning in research and development. Newspapers are considered the most favorable platform for new ideas, and the articles presented in them are accepted as the first channel for new ideas in different societies. Therefore, indicators such as the citation rate are still considered one of the most common methods of measuring the quality of articles and publications. Therefore, authors try to increase the citation rate of their articles by using techniques. As a result, with the increase of scientific productions and the ranking of universities, authors, and publications and the introduction of indicators such as citations to articles, it is necessary to research the factors influencing the increase of citations of articles in Iranian publications of various subject areas in the Web of Science Core Collection (WOSCC).

Significance of the study

Today, information and communication technology development has led to the growth of scientific research and its presentation in international arenas. As a result, researchers try to conduct valuable research and increase the impact of their findings by publishing them in reputable journals. One of the complex issues of the age of information explosion is the emerging phenomenon of evaluating research, researchers, and scientists, as well as recognizing and accessing the resources needed by clients among the multitude of available texts. Citation profiles are one of the crucial tools for evaluating scientists, researchers, organizations, universities, faculties, and institutions. In other words, the citation index is one of the platforms that can provide the bibliographic supply of crucial and prominent scientific articles. Also, through citation profiles, one can achieve a quantitative and qualitative evaluation of scientific productions, study the history and structure of science, understand the relationship between citations, and draw the thematic structure of scientific disciplines.

Measuring scientific publications is one of the most common rules for determining the performance of scientific products. Among the indicators describing different countries' research activities and efforts, the number of scientific articles and documents published in valid scientific publications indexed in databases is significant (Gorji et al., 2011). Measuring the number of publications and the effectiveness of scientific productions is usually done based on the documents indexed in the citation databases, especially the citations they receive. An article can advance knowledge that other writers have been influenced by (Sotudeh & Ghadimi, 2015). Citation is a critical element for scientific writing, playing a significant role in producing and publishing information. The main principle of citation is an authorship and research principle; a work can gain the scientific community's attention if it takes the necessary care and attention to comply with this principle so that the cited materials are solid, expressive, and

transparent (Haghighi, 2002).

Today, the position of citing previous valid works has been improved so much that it is mentioned as one of the most important characteristics of an article's validity. In other words, a scientific work is considered valid when it cites previous valid works and texts. In addition to that, a scientific article presented is substantiated when it is compiled by referring to previous documents. Therefore, in practice, claims that rely on valid documents are always recognized as acceptable and valid. Therefore, nowadays, citation is a criterion for measuring the degree of credibility and originality of the content presented in each article. This is one of the most important reasons that all authoritative scientific works, such as journal articles, books, and research reports, cite previous related works. Citing articles has several reasons.

The quality of articles is always the first and most important criterion. High-quality and innovative articles attract readers' attention and can be highly cited. As a result, several factors and indicators are effective in citing articles. Compliance with these indicators may increase article visibility and attract citations. Multi-authorship, publication of an article in a journal with high citation rates, authors' participation in the international arena, the authors' use of names exclusive to themselves during their scientific activity, assignment of keywords to articles, and free online access to articles are the techniques used for enhancing the citation rate (Ebrahimi, Dehghan & Jowkar, 2017).

It is also clear that along with quantitative growth, qualitative growth is the most crucial issue in developing and progressing countries. As a result, the problem of citation and predictive indicators that play a role in increasing the citation of articles is of particular importance. Therefore, the results of this research can shed light on the authors' scholarly activities and guide them toward placing their articles in a framework that increases the probability of enhancing the citation of their articles by other authors. Also, the research findings can help editors-in-chief accept articles that are likely to receive more citations to improve the IF of their journals.

Research objectives

The present study aims to analyze and evaluate the factors that are effective in citing Iranian scientific publications in JCR, 2020. It has the following secondary objectives as well: to investigate the average number of citations per article, self-citation and IF in Iranian publications indexed in the WOSCC, the share of countries and universities in receiving citations, the self-citation of publications, prolific and highly cited authors, verification of being prolific as being highly cited, and variables affecting citation such as keyword, co-authorship, international collaboration, and subject area.

Research questions

1. How were the average number of citations per article, self-citation, and IF in Iranian journals indexed in the WOSCC?

2. How many of the citations that the Iranian journals indexed in the WOSCC were received from Iran?

3. Which universities were the citations the Iranian journals indexed in the WOSCC received?

4. Who were the prolific authors of these journals?

5. Were the prolific authors of Iranian journals with IF indexed in the WOSCC those who

had published highly cited articles?

6. Are organizational Affiliation, co-authorship, international collaboration, inter-university collaboration, the number of keywords, references, the length of the article title, and the subject area predictive variables for receiving citations?

Literature Review

Recognizing authentic scientific journals is a tool for gauging scientific fertility; hence, it is an effective step in providing scientific products. The evaluation results of the activities and scholarly products of scientific journals represent the status of their scientific research activities. They can be an efficient element for the management and planning of research and development. Various studies have been done on this subject in the Iranian context and other countries' platforms.

Mohammadzadeh, Fahimifar, and Hassanzadeh (2021) examined highly cited articles by Iranian authors in the WoS, indicating that the trend of scientific production of highly cited articles was upward. They also showed that fields of study such as engineering, chemistry, and mechanics, as well as Islamic Azad University and Tehran University, contributed the most to producing highly cited articles.

Bahmanbbadi and Bashiri (2020) investigated the citation rate of 33 Iranian English language journal articles in agriculture in the Scopus citation database. They indicated that the citation rate of the investigated publications was at an appropriate level compared to regional countries, and the cited publications had an acceptable quality level. Ebrahimi et al. (2017) studied the predictive indicators of scientific influence in increasing the citation of articles in scientific journals in the field of chemistry in Scopus. The results showed that the "multi-authorship and co-authorship" index is the most robust variable predicting citations, which positively and significantly predicts the number of citations. In addition, there was no relationship between the overlap of keywords and abstract, number of keywords, title length, international cooperations, and type of article with citations in chemistry. Torkaman and Shirmohammadi Khorram (2017) probed the pattern of citation indices of Hamedan University of Medical Sciences researchers to predict the feasibility of scientometric indices. As they demonstrated, the number of publications and citations increased in the study period (2012-2014). The number of publications, citations, and h-index strongly correlate. Negative binomial and zero-inflated negative binomial (ZINB) regression can be suitable models for the number of publications and citations in the Scopus and WoS databases, respectively.

Alemokhtar, Broumand, Parsaei, and Ghafouri (2016) investigated the correlation of self-citation with IF in Iranian journals indexed in the citation database. They found that the journals' self-citation rate was increasing; thus, there is a direct correlation between the citation rate and IF, but its phenomenal rate damages the journals' reputation.

Dehghanizadeh, Haji Zeinolabedini and Hassanzadeh (2016) analyzed Tehran University faculty members' publications in the ISC citation database, showing that out of 1,640 faculty members of Tehran University, 1,237 had 12,477 articles in ISC. The number of times articles have been cited by other works (citation rate) was very low, with 341 citations. The growth of publishing articles was upward from 2006 to 2020. Also, the development of citations went through a downward trend. In an article, Alemokhtar et al. (2016) examined the number of citations to the articles of Isfahan University of Medical Sciences researchers in the Scopus database. The average number of citations per article is more than twice that of the entire degree

produced by the researchers of this university. However, the volume of people's publications did not affect the increase in citation rate, so some authors with small publications received high citation rates. So, it can be stated that the amount of scientific output increased. The researchers of Isfahan University of Medical Sciences, on the one hand, and the increase in the number of references to them, on the other hand, pursue quantitative and qualitative growth.

Zarei et al. (2015) analyzed the citation and content of the articles in the Iranian Journal of National Studies. Their findings showed that the average number of citations per article in this journal is 31.80. Examining information sources showed that books had the highest citation rate among information sources, with 70.99%, while it was expected that citations to journals would be more than books. Regarding language, citing Persian sources was 76.56%, while citing English sources was only 21.80%.

Sharif Moghadam, Ziaee, Salami and Alijani (2015) investigated the authorship pattern and the number of citations received for articles of Iranian journals in surgery indexed in the WoS. Their results demonstrated that the number of authors and the type of articles caused the number of times that articles were cited. Also, the more references used in each article, the higher the citation rate for that article is. The number of pages of an article has no effect on the number of citations the article has received: quantity does not affect the use and reference of international researchers to an article; however, quality and innovation can increase the number of times other works cite an article. Nazarzadeh Zare, Jamali, Arein, Skrouchi and Nasiri Firuz, (2014) investigated the high citation of articles by several Iranian authors compared to articles by a single author. The results of their research showed that multi-authored articles received higher citations than single-authored articles; this difference was statistically significant. Also, the removal of self-citation led to a significant reduction in the number of citations multi-authored and single-authored articles have received. After removing self-citation, the difference in the number of citations that multi-authored and single-authored articles have received lost its significance.

Davarpanah and Adamian (2012) probed the effect of countries' development on the visibility of co-authored articles. They found a positive correlation between the number of cooperating countries in the articles resulting from scientific cooperation and the citation rate. The average number of citations per article in co-authored articles in developed countries is about twice that of developing countries. The results also indicated that scientific cooperation between developing and developed countries positively affected the visibility rate of their articles. Also, there was a significant difference between scientific cooperation patterns in developed and developing countries.

Park and Shea (2020) surveyed the trend of research developments on online, distance. They blended learning over the past ten years through citation analysis, finding that the studies received the most citations in the first half of the ten years. Gupta, Kennedy, Meriwether, Francis, Trowers and Stewart (2020) reviewed 100 highly cited articles in urogynecology and indicated that 50% of the 100 most cited articles are in urology. The highly cited articles were mostly observational rather than interventional studies. Torres-Pruñonosa, Plaza-Navas, Díez-Martín and Beltran-Cangrós (2021) conducted a citation review of social public procurement research. Their results identified the essential articles and publications in this field and identified mutual communication networks through citation analysis. Also, the broadest and narrowest research areas were identified. In addition, the articles that were mentioned explicitly in a certain period were identified.

Guo, Ma, Ch., Shi & Zong (2018) studied the relationship between the length of the titles of scientific articles and the number of citations they received. They examined 300,000 article titles during the period 1956-2012. The results demonstrated that the correlation between the length of article titles and the number of citations the articles had received was negative during the period 1956-2000 but positive after 2000, when online searches became the dominant document retrieval method. Ni and An (2018) evaluated the relationship between international cooperation and the number of citations articles received, showing a positive correlation between the number of partner countries and the number of citations. Also, articles published by high-income countries received the most citations. Therefore, there was a positive correlation between the economic status of the first authors and the number of citations the articles received. Tahamtan, Safipour Afshar and Ahamdzadeh (2016) investigated the factors affecting the citation of articles in four databases: WoS, Scopus, PubMed, and Medline. Their results showed that article quality, journal IF, multiple-authorship, and international cooperation were strong predictor variables for the number of citations the articles had received.

So, Jiyong, Sangki and Han (2015) investigated the factors affecting citation networks in science and technology. They sought to identify the factors that affect the citation by evaluating the citations of several articles. Their study showed that five variables, i.e., the number of authors, number of affiliations, number of references, number of pages, and number of keywords, positively affect the citation rate. Mêgnigbêto (2013) examined the international cooperation of West African countries in scientific production. The results showed that single-authored articles are decreasing and six-authored articles are increasing. It was also found that articles with multiple authors received higher citations than others. Banateppanvar, Biradar and Kannappanavar (2013) analyzed the citation analysis of doctoral dissertations in botany at Kumpo University in India. They pointed out that in evaluating the citation pattern of resources, citing journals was higher than 74.77%, citing books was higher than 16.20%, and conference articles were higher than 4.48%. Citing journals by botany researchers is consistent with Bradford's law.

Many researchers have sought to identify and introduce the factors affecting the citation rate of highly cited articles. Their findings showed that multiple authorship is an effective factor in enhancing the citation rate. In other words, many highly cited articles are publications by more than one author. International scientific cooperation, title length, use of different keywords in the article, article length or number of pages, length of abstracts, number of references, journal rank, and review research are also among the indicators that many researchers have studied and confirmed their effect on the number of citations journal articles have received.

Much research has been done in Iran examining the citation impact and citation indicators, focusing on domestic publications in different subject areas indexed in domestic databases. Therefore, the present study aims at analyzing and examining Iranian publications with IF reported in the JCR.

Materials and Methods

This research is of an applied type, which was carried out using scientific methods and indicators and with an analytical approach. The researcher-made checklist tool was utilized to collect data, and quantitative content analysis was used to analyze the data extracted from the JCR and WOSCC. Microsoft Excel and SPSS were employed for data process and analysis.

The research population consisted of Iranian publications with 5-year IF, reported in JCR in 2020. The data were extracted and analyzed to check their citation rate and factors during 2015-2019. The citation rate was the dependent variable, and the number of keywords, references, multiple-authorship, inter-university cooperation, and subject area of publications were introduced as independent variables. The number of authors was classified into two categories: one author and two authors, and more than two authors to measure the variable of multi-authorship. The number of Iranian publications indexed in the WOSCC was 151, among which 40 publications were with IF. In the five years, 205 publications, and each publication had an average of 70 articles with an average of 14,350 published articles. After selection, each publication was searched in JCR, and the data related to the number of authors, keywords, references, authors' organizational affiliations, and the number of citations were extracted and recorded in Microsoft Excel. Then, the relevant data were entered into SPSS to be processed and analyzed.

Results

In response to the research questions, they are divided into two categories: descriptive and analytical. At first, the first five questions were explained, then the last question was analyzed with the tests, and the SPSS software was answered.

Table 1 presents 40 Iranian publications with IF indexed in the WOSCC (of the 151 Iranian journals indexed in the WOSCC, 40 journals had IF). It shows their data along with the average IF and self-citation of the publications.

Table 1
Journals with IF reported by JCR

	Journal Title	Category	2020 JIF	Average per item	Self-citation
1	Journal of Nanostructure in Chemistry	Materials Science, Multidisciplinary - SCIE; Chemistry, Multidisciplinary	6.391	22.01	44
2	International Journal of Health Policy and Management	Health Policy & Service – SSCI[1]; Health Care Sciences & Services - SCIE	5.007	7.75	627
3	BioImpacts	Pharmacology & Pharmacy - SCIE	3.831	12.74	43
4	Daru-Journal of Pharmaceutical Sciences	Pharmacology & Pharmacy - SCIE	3.117	9.91	32
5	International Journal of Environmental Science and Technology	Environmental Science - Scie	2.86	8.83	737
6	Iranian Journal of Basic Medical Sciences	Pharmacology & Pharmacy – SCIE Medicine, Experimental research - SCIE	2.699	8.23	226
7	International Journal of Environmental Research	Environmental Science - SCIE	2.479	7.72	51
8	Cell Journal	Cell Biology - SCIE	2.479	7.72	51
9	Journal of Environmental Health Science and Engineering	Environmental Sciences - SCIE; Engineering, Environmental - SCIE	2.13	8.32	75
10	Iranian Journal of Fuzzy	Mathematics - SCIE;	2.1	6.67	105

	Journal Title	Category	2020 JIF	Average per item	Self-citation
	Systems	Mathematics, Applied - SCIE			
11	International Journal of Civil Engineering	Engineering, Civil - Scie	2.081	6.53	572
12	Journal of the Iranian Chemical Society	Chemistry - Multidisciplinary - Scie	2.019	6.33	507
13	Iranian Polymer Journal	Polymer Sciences - Scie	1.899	7.09	277
14	Journal of Research in Medical Sciences	Medicine, General & Internal - Scie	1.852	6.04	109
15	Iranian Journal of Pharmaceutical Research	Pharmacology & Pharmacy - Scie	1.696	6.24	256
16	Iranian Journal of Biotechnology	Biotechnology & Applied Microbiology - SCIE	1.671	5.06	7
17	Iranian Journal of Immunology	Immunology - SCIE	1.603	4.45	6
18	Iranian Journal of Science and Technology-Transactions of Mechanical Engineering	Engineering, Mechanical - SCIE	1.596	4.18	84
19	Urology Journal	Urology & Nephrology- SCIE	1.51	4.21	243
20	Iranian Journal of Science and Technology-Transactions of Civil Engineering	Engineering, Civil - SCIE	1.465	3.56	126
21	Iranian Journal of Allergy Asthma and Immunology	Immunology - SCIE; Allergy - SCIE	1.464	4.74	48
22	Scientia Iranica	Engineering, Multidisciplinary- SCIE[2]	1.435	3.85	537
23	Iranian Journal of Public Health	Public, Environmental & Occupational Health - Scie; Public, Environmental & Occupational Health - Scie	1.429	3.11	167
24	Journal of Applied Fluid Mechanics	Thermodynamics - Scie; Mechanics - Scie	1.405	4.74	328
25	Iranian Journal of Veterinary Research	Veterinary Science - Scie	1.376	4.13	29
26	Iranian Journal of Science and Technology-Transactions of Electrical Engineering	Engineering, Electrical & Electronic - SCIE	1.376	4.02	64
27	Archives of Iranian Medicine	Medicine, General Internal - SCIE	1.354	5.66	128
28	Journal of Arthropod-Borne Diseases	Public, Environmental & Occupational Health - SCIE; Parasitology- SCIE	1.198	5.3	104
29	Iranian Journal of Science and Technology Transaction A-Science	Multidisciplinary Science - SCIE	1.194	3.68	100
30	Journal of Agricultural Science and Technology	Agricultural, Multidisciplinary - SCIE	1.098	3.81	214
31	Veterinary Research Forum	Zoology - SCIE	1.054	4.02	17

	Journal Title	Category	2020 JIF	Average per item	Self-citation
32	Iranian Journal of Parasitology	Parasitology - SCIE	1.012	4.41	80
33	Iranian Journal of Kidney Diseases	Urology & Nephrology - SCIE	0.892	4.31	45
34	Iranian Journal of Fisheries Science	Fisheries - SCIE	0.801	2.8	150
35	International Journal of Radiation Research	Radiology, Nuclear Medicine & Medical Imaging - SCIE	0.779	2.51	115
36	Iranian Journal of Chemistry & Chemical Engineering - International English Edition	Engineering, Chemical - SCIE; Chemistry, Multidisciplinary - SCIE	0.759	3.38	354
37	Hepatitis Monthly	Gastroenterology & Hepatology - SCIE	0.66	5.21	160
38	Iranian Red Crescent Medical Journal	Medicine, General & Internal - SCIE	0.611	3.44	66
39	Iranian Journal of Pediatrics	Pediatrics - SCIE	0.364	2.22	33
40	Iranian Journal of Radiology	Radiology, Nuclear Medicine & Medical Imaging - SCIE	0.212	1.68	13

RQ 1. How many of the citations that the Iranian journals indexed in the WOSCC were received from Iran?

According to the present citation analysis, it seems that Iranian scientific productions should strive to reach the global standard in terms of quantity and quality. Despite the scientific capacity of Iranian researchers, Iran needs to strive to reach the desired standards because Iran's presence in international scientific productions has been one of its main priorities for several years. In the last few years, when this issue has been placed on the officials' agenda, the scientific productions of Iranians on international bases have proliferated. With a brief look at the country's scientific production statistics in the databases, it can be concluded that the slope of the growth curve of Iranian scientific production in the ISI database has been higher than the world average in these few years. However, in scientific policies, in addition to quantitative growth, more attention should be paid to the qualitative development of scientific productions so that Iranian scientific productions reach a level acceptable for use and reference by researchers of all countries. As Table 2 shows, with 27,446 citations, Iran had 17% of citing Iranian publications with IF indexed in the WOSCC (citation rate of 17%), while China, India, America, and Turkey were in the list of the top five countries with citation rates of 14.58, 7.81, 6.20 and 3.22% of Iranian publications with IF indexed in the WOSCC, respectively. In the following table, the 30 countries with the highest number of times of citing Iranian publications with IF indexed in the WOSCC (citation rate) are mentioned: Saudi Arabia, Pakistan, Egypt, England, Italy, Australia, Canada, Brazil, Spain, Malaysia, South Korea, Poland, Germany, France, Japan, Taiwan, South Africa, Russia, Mexico, Vietnam, Nigeria, Thailand, Portugal, Netherlands, and Iraq.

Table 2
Countries citing Iranian publications with IF indexed in the WoS

Row	Country	Record Count	%
1	Iran	27446	16.44
2	people's Republic of China	24339	14.58
3	India	13031	7.81
4	USA	10348	6.20
5	Turkey	5370	3.22
6	Saudi Arabia	4596	2.75
7	Pakistan	4245	2.54
8	Egypt	4218	2.53
9	England	4011	2.40
10	Italy	3742	2.24

RQ 2. Which universities were the citations the Iranian journals indexed in the WOSCC received?

Today, one of the world's most important centers of science and culture is a university, which has effective social, political, and cultural roles and functions in addition to scientific tasks. Table 3 lists 30 universities with the highest citations. Islamic Azad University ranks first with 4,546 documents, Egypt Database with 4,111 documents, and Tehran University of Medical Sciences with 3,917 documents. The table below presents the names of other universities and the citation rates and percentage of participation. In the meantime, the University of Tehran ranks eighth with 1587 documents.

Table 3
Universities citing Iranian journals with IF indexed in the WOSCC

	University & Research institution	Publication (Freq.)
1	Islamic Azad University	4546
2	Egyptian Knowledge Bank	4111
3	Tehran University of Medical Sciences	3917
4	Shahid Beheshti University of Medical Sciences	2580
5	Chinese Academy of Sciences	1813
6	Tabriz University of Medical Sciences	1664
7	Iran University of Medical Sciences	1663
8	University of Tehran	1587
9	Mashhad University of Medical Sciences	1423
10	Shiraz University of Medical Sciences	1394

RQ 3. Who were the prolific authors of Iranian publications with IF indexed in the WoS?

As Table 4 presents, the names of the top 30 authors with the highest scientific productions in Iranian publications with IF indexed in the WOSCC are observed: Alavian and Mohammadi (co-authors), Mohebali, and Vatandoust were among the first to third prolific authors with 81, 61, and 59 productions, respectively. Malekzadeh, Akhondzadeh, Faghihzadeh, Kamali, Hajebi, and Noorbala are among the top ten prolific authors with 46, 41, 37, 36, and 35 documents, respectively; the difference between the scientific productions of the first author and the third author is 62 documents.

Table 4
Prolific authors of Iranian publications with IF indexed in the WoS

Rank	Author	Publication
1	Alavian SM	81
2	Mohammadi M	81
3	Mohebali M	61
4	Vatandoost H	59
5	Malekzadeh R	46
6	Akhondzadeh S	41
7	Faghihzadeh S	37
8	Kamali K	36
9	Hajebi A	35
10	Noorbala AA	35

RQ 4. Did the prolific authors of Iranian publications with IF indexed in the WOSCC also publish highly cited articles?

Table 5 lists the names of the most cited authors and researchers, showing the number of citations their articles received and citation rates. To answer RQ 4, none of the prolific authors are among the thirty most cited authors.

Table 5
Highly cited authors of Iranian publications with IF indexed in the WOSCC

Rank	Author	Citation (Freq.)
1	Zhang Y	530
2	Wang Y	508
3	Liu Y	422
4	Wang J	404
5	Wang L	401
6	Li Y	399
7	Zhang J	374
8	Kumar A	322
9	Li J	312
10	Li L	303

Table 6 lists the names of prolific authors along with their received citations. Alaviyan, a prolific writer at the top of the list with 98 citations, Mohammadi with 195 citations, and Hosseini with 143 citations, are among the authors with an acceptable number of citations. In comparison, the average citation other prolific writers received was fewer than 50 citations.

Table 6
The list of prolific authors of Iranian publications with IF indexed in the WOSCC and the number of citations they received

Rank	Author	Publication (Freq.)	Citation (Freq.)
1	Alavian SM	81	98
2	Mohammadi M	81	195
3	Mohebali M	61	76
4	Vatandoost H	59	55
5	Malekzadeh R	46	66
6	Akhondzadeh S	41	41
7	Faghihzadeh S	37	39

Rank	Author	Publication (Freq.)	Citation (Freq.)
8	Kamali K	36	37
9	Hajebi A	35	42
10	Noorbala AA	35	36

To be further processed, cleaned, and analyzed, the raw data should be converted into valuable and practical information via statistical analysis. Data analysis examining the accuracy of assumptions is significant for any research and is considered one of the most critical parts of research-- different statistical methods play an important role in the conclusions and generalization of the results. First, the existence or non-existence of the relationship between the research variables is checked to analyze the collected data, interpret them, and accept or reject the proposed hypotheses. In this research, influential indicators such as multiple-authorship and co-authorship, number of keywords, number of references, title length, international scientific cooperation, and subject area were considered as predictive variables, and the number of citations (citation rate) as variables. Also, the number of keywords, references, pages, length of article titles, and authors' organizational Affiliation were quantitatively measured. The multiple-authorship, subject area, and international and inter-university scientific cooperation were qualitatively measured. In this research, an effort was made to investigate the answers to the research questions through regression analysis; therefore, qualitative variables (with the value 0 or 1) were employed.

Variable analysis
Table 7 describes the research variables.

Table 7
Research variables

Definition	Symbol	Research variables
citation rate	Y	Dependent variable
Organizational affiliation (publications and publishing country)	X1	Independent variable
multiple authorship	X2	
multinational scientific cooperation	X3	
inter-university scientific cooperation	X4	
number of keywords	X5	
number of references	X6	
length of the article titles	X7	
the subject area of the publication	X8	

Descriptive analysis
The variables are described to better understand the considered statistical population.

Citation rate
The results showed that 5.7% of the Iranian publications with IF indexed in the WoS did not receive citations, 64.0% received between 1 and 10 citations, 28.0% between 10 and 50 citations, and 2.3% more than 50 citations, showing that the articles have an acceptable citation rate (Table 8).

Table 8
Citation rate Iranian journals with IF indexed in the WoS

Citation	%
Without citation	5.7
Between 1 to 10 citations	64
Between 10 to 50 citations	28
More than 50 citations	2.3
Total	**100**

Organizational affiliations (publishers and publishing country)

The results showed that 53.31% of the articles had organizational affiliations (publishers and publishing country) to public universities, 40.30% had organizational affiliations (publishers and publishing country) to private universities, and 6.39% had organizational affiliations (publishers and publishing country) to other institutions (Table 9).

Table 9
The statistical sample in terms of organizational Affiliation (publishers and publishing country)

Organizational Affiliation (publications and publishing country)	%
Public universities	53.31
Private Universities	40.30
other	6.39
Total	100

Multiple authorship

Multiple authorship, co-authorship, or shared authorship can be defined as works done and published by two or more named persons. As data analysis showed, 11.3% of the Iranian publications with IF indexed in the WoS did not have multiple authorships, and 88.7% had multiple authorships (Table 10).

Table 10
Iranian journals with IF indexed in the WOSCC in terms of multiple authorship

Multiple authorship	%
Without multiple authorship	11.3
Multiple authorship	88.7
Total	**100**

International scientific cooperation

The results displayed that 78% of Iranian publications with IF indexed in the WoS did not have international scientific cooperation, and 22% had international scientific cooperation (Table 11).

Table 11
Frequency distribution of Iranian publications with IF indexed in the WOSCC in terms of international collaboration

International collaboration	%
Without international collaboration	%78
International collaboration	%22
	100

Inter-university collaboration

The results demonstrated that 53.4% of Iranian publications with IF indexed in the WOSCC did not have inter-university collaboration, and 46.6% had inter-university collaboration.

Table 12
Iranian publications with IF indexed in the WoS according to inter-university scientific cooperation

inter-university collaboration	%
Without inter-university collaboration	53.4
inter-university collaboration	46.6
Total	100

Number of keywords

The results showed that 12.6% of Iranian publications with IF indexed in the WoS had three or fewer keywords, 67.8% had four to five keywords, and 19.6% had six or more (Table 13).

Table 13
Frequency distribution of statistical sample members according to the number of keywords

Number of keywords	%
3 keywords or fewer	12.6
Between 4 to 5 keywords	67.8
6 keywords or more	19.6
Total	100

Number of references

The results indicated that 15.3% of Iranian publications with IF indexed in the WoS had 20 or fewer references, 44.8% had between 20 and 40 sources, and 39.9% had more than 40 references (Table 14).

Table 14
Iranian publications with IF indexed in the WoS in terms of the number of references

Number of references	%
20 references or fewer	15.3
Between 20 and 40 references	44.8
More than 40 references	39.9
Total	100

Length of article titles

The results show that 2.2% of the articles had a title of 5 words or less, 58.9% between 5 and 10 words, and 38.9% more than 10 words (Table 15).

Table 15
Iranian publications with IF indexed in the WoS in terms of the length of article titles

the length of article titles	%
5 words or fewer	2.2
Between 5 to 10 words	58.9
More than 10 words	38.9
Total	100

Inferential analysis

The inferential analysis seeks to answer the following research question.

Are organizational Affiliation, co-authorship, international collaboration, inter-university collaboration, number of keywords, references, length of the article title, and subject area predictive variables for receiving citations?

The following regression analysis was used to answer the above questions:

$Y = \beta_0 + \beta_1 (X_1) + \beta_2 (X_2) + \beta_3 (X_3) + \beta_4 (X_4) + \beta_5 (X_5) + \beta_6 (X_6) + \beta_7 (X_7) + \beta_8 (X_8) + \varepsilon$

Where Y is the dependent variable (receiving citations) and X1 to X8 are independent variables (, organizational affiliation (publishers and publishing country), multiple authorship, international scientific cooperation, inter-university scientific cooperation, number of keywords, number of references, length of article titles, and subject area, respectively). First, descriptive statistics such as mean, standard deviation, and minimum and maximum values of the measured variables were calculated. Then, the correlation coefficient test and regression analysis were performed. The results of calculating descriptive statistics are presented in Table 16.

Table 16
Descriptive statistics of the research variables

Maximum	Minimum	Standard deviation	Average	Variable
360	0	16.922	10.735	Citation
1	0	0.317	0.887	Multiple authorship
1	0	0.414	0.220	Multinational Scientific cooperation
1	0	0.499	0.466	Inter-university Scientific cooperation
9	2	1.097	4.726	Number of keywords
306	6	27.165	40.872	Number of references
26	4	3.248	10.359	Length of the article titles

Source: authors' findings

Model fitting

The model's coefficient of determination (R^2), the adjusted coefficient of determination, the significance statistic of the model, and its significance level are presented in Table 17. The null and alternative hypotheses are as follows:

$\begin{cases} H_0: \text{The model is not significant.} \\ H_1: \text{The model is significant.} \end{cases}$

Table 17
Model fitting results

r^2	r^2 Modified	Statistic F	$P - Value$
0.561	0.553	6.639	***0.0001

*** Significant at the 5% level. Sources: Authors' calculations

According to the table above, the regression model is significant according to the F statistic obtained (because it is less than the significance level of 0.05, so it is statistically significant). This issue shows the significance of the model. Also, the coefficient of determination of the model is equal to 0.561, which shows that 56.1% of the changes in the dependent variable (citation receipt) are due to independent variables, which is an acceptable amount: the statistical model for predicting citations based on influence indicators was identified as significant. The mentioned model explains 56.1% of the variance of the dependent variable, i.e., the citation rate. According to the R² value of 0.561, 56.1% of the variations in the dependent variable, citation rate, were due to an organizational affiliation (publications and publishing country), multiple authorship, international scientific cooperation, inter-university scientific cooperation, number of keywords, number of references, length of article titles, and subject area. In other words, the model could predict 56% of variations in the citation rate.

Testing the significance of the correlation coefficient

If a coefficient is not significant in the regression model, it means that in the regression model, that variable does not affect the dependent variable. This test is performed using the p-value obtained in Table 18 prescribed in front of each coefficient-- if the p-value is less than α, the coefficient becomes significant. If the p-value is bigger than α, the coefficient does not become significant.

$$\begin{cases} H_0: \beta_i = 0 \\ H_1: \beta_i \neq 0 \end{cases}$$

Table 18
Regression model results

$P - Value$	Statistic t	Value	Variable
***0,027	2,257	1,398	Fixed effects model
***0,0001	3,041	0,156	Organizational Affiliation (publications and publishing country)
***0,0001	3,120	0,198	Multiple authorship
***0,032	2,220	0,109	International collaboration
0,435	0,043	0,008	Inter-university collaboration
0,380	0,167	0,061	Number of keywords
***0,0001	3,346	0,298	Number of references
0,123	0,901	0,090	Length of the article titles
***0,0001	3,472	0,311	Subject area of the publication

*** *Significant at the 5% level. Sources: Authors' calculations*

The table shows that the publication's subject area is the most important and influential independent variable that can positively and significantly predict the citation rate. In other words, the publication's subject area in the article increases the possibility of citation. The number of references is the second independent variable that positively and significantly predicts the citation rate: the more the number of references in an article, the higher the possibility of more citations that the article receives (higher citation rate). Multiple authorship is another independent variable that positively and significantly predicts citations -- if an article has multiple authors, the possibility of receiving more citations increases. Organizational affiliation is another independent variable predicting the citation rate positively and

significantly. If an article has organizational affiliations, especially to prestigious universities, it is more likely to receive more citations. International collaboration has a positive but insignificant effect on the citation rate. Other variables, such as inter-university cooperation, number of keywords, and length of the article titles, do not significantly affect the citation rate. Finally, the estimation of the regression model is as follows:

$$Y = 1.398 + 0.156 (X1) + 0.198 (X2) + 0.109 (X3) + 0.008 (X4) + 0.061 (X5) + 0.298 (X6) + 0.090 (X7) + 0.311 (X8)$$

Discussion

As the R^2 value of organizational Affiliation (publications and publishing country) is 0.156, and the p-value is smaller than the significance level of 0.05, the correlation is statistically significant. Therefore, organizational affiliation (publishing and publishing country) can be a predictor variable for the number of times an article has been cited in other works (the citation rate).

Since the R^2 value of multiple authorship is 0.198, and the p-value is smaller than the significance level of 0.05, the correlation is statistically significant. Therefore, this variable can predict the number of citations an article has received (the citation rate). The correlation is statistically significant as the R^2 value of international collaboration is 0.109, and the p-value is smaller than the significance level of 0.05. Therefore, it can be a predictor variable for the number of citations an article has received (the citation rate).

The correlation is statistically significant as the R^2 value of inter-university collaboration is 0.008, and the p-value is bigger than the significance level of 0.05. Therefore, inter-university collaboration cannot be a predictor variable for the number of times an article has been cited in other works (the citation rate). The correlation is statistically significant according to the R^2 value of the number of keywords as 0.061, and the p-value is smaller than the significance level of 0.05. As a result, it can be said that the variable cannot be a predictive variable for the number of times an article has been cited in other works (the citation rate).

As the R^2 value of the number of references is 0.298, and the p-value is smaller than the significance level of 0.05, the correlation is statistically significant. As a result, it can be said that the number of references can be a predictor variable for the number of times an article has been cited in other works (the citation rate).

Since the R^2 value of the length of article titles is 0.090, and the p-value is smaller than the significance level of 0.05, the correlation is statistically significant. Thus, it can be said that the variable cannot be a predictor of the number of citations an article has received (the citation rate).

As the R^2 value of the subject area is 0.311, and the p-value is smaller than the significance level of 0.05, the correlation is statistically significant. As a result, it can be said that the subject area can be a predictor variable for the number of times an article has been cited in other works (the citation rate). The R^2 value of the model is 0.76, showing that 76% of the variations in the dependent variable (citation rate) are due to the independent variables, which is much higher than the previous model-- the statistical model for predicting the citation rate based on IF was identified as significant. Also, the model explains 76% of the variance of the dependent variable (citation rate).

Also, the findings of the research show that if we want to consider the articles of all

publications in general, it should be said that there is a positive and meaningful relationship between "multi-authorship" and "rate of citation" to articles in all subject areas. In other words, the presence of two or more authors will increase the citation of articles. Research by Ebrahimi et al. (2017), Sharif Moghadam et al. (2015), Davarpanah and Admiyan (2011), Nazarzadeh Zare et al. (2014), So et al. (2015) confirm the findings of this research. This point should be kept in mind: the presence of a large number of authors in an article is not always proof of the quality of that work, and other components should also be considered. Articles with multiple authors in some fields or some years receive more citations, and this issue cannot be generalized to articles in all fields. However, in the current research, in all subject areas in general and each of the areas separately, the "multi-authorship" component has a significant and positive relationship with citation. This issue can be introduced as a model for articles in Persian publications because, according to the results of this research, "multi-authorship" in articles, that is, the use of the thoughts, experiences, and knowledge of several people in one article, which can cause the richness of that article and to some extent it plays a role in the citation of that article.

In the current research, no significant relationship was found between the number of "keywords and article title length" of the articles and the "rate of citation" to them in any of the subject areas. As a result, it is not possible to predict the number of citations to the article with the number of keywords in the articles. This can also be presented as another model in the citation behavior of Persian authors. The research findings of So et al. (2015) confirm this issue. Meanwhile, the findings of Ebrahimi et al. (2017) and Ebrahim (2013) state the opposite of this issue. But regarding the relationship between the variable "number of sources" of articles and "the number of citations," it should be said that the situation is different in different subject areas. In general, regardless of the subject area, there is a positive relationship between the number of sources of articles and their citations, in such a way that the more the number of sources used in each article, the number of citations to that article will also increase. The findings of Sharif Moghadam et al. (2015) and Ibrahim (2013) confirm this issue. In other words, it can be said that the more sources and references are in an article, the more the citation rate of that article increases. But let's consider the articles in the eight subject areas. The index of the "thematic area of the publication" is an independent variable that can positively and significantly predict the number of citations. In other words, the subject area of the publication in an article increases the possibility of citation. The "number of sources" index is the second independent variable that positively and significantly predicts citations. That is, if the number of sources in an article is more, the probability of citation of that article also increases. The "Multi-authorship" index is the next independent variable that positively and significantly predicts citations. That is, if an article has several authors, the probability of citation of that article increases. The "Organizational Affiliation" index is the next independent variable that positively and significantly predicts citation. That is, if an article has organizational affiliation, especially to prestigious universities, the possibility of citation of that article increases. The index of multinational scientific cooperation has a positive effect but not very much. The research of Ketzler and Zimmerman (2013) showed that scientific cooperation when goes beyond an institution and organization and becomes inter-institutional in citations. Articles have a positive effect, and the rest of the indicators, including inter-university collaboration, the number of keywords, and the length of the article title, do not have a great impact on the possibility of citations.

In general, with the research that was conducted on the articles of Iranian publications with the impact factor of 2020 in JCR, these results were obtained that the variables "subject area, multi-authorship, number of sources and international cooperation" have a significant and positive relationship with citation. In other words, these variables can predict the amount of citations. There is no significant relationship between the variable "keyword, article title length, and inter-university collaboration" and the "citation rate" of that article. As a result, by considering the effective indicators in the citation of articles, it is possible to measure the quality of the articles and predict the number of citations to them in the future.

This research has evaluated the effective factors in the citation of Iranian publications during a specific period. It cannot be generalized to publications of other languages because the citation behavior is different in different languages. As a result, it is suggested that:

- A similar study be conducted in the publications of other countries, and a comparative study be done with the present study;

- Similar research be done in the Scopus and Google Scholar databases;

- Funding and financial support for group and collaborative research be provided; and

- The communication and cooperation of researchers of universities and national, inter-institutional, national, and international research institutions with each other be facilitated to improve the quality and quantity of scientific productions.

Conclusion

Generally speaking, by investigating the articles of Iranian journals with the IF indexed in the WoS (2020), these results were obtained that the subject area, multi-authorship, number of references, and international collaboration variables had a positive and significant correlation with the number of citation the articles had received. In other words, these variables can predict the citation rate. However, no significant correlation was observed between the number of keywords, length of article titles, and inter-university collaboration with the citation rate. As a result, by considering the effective variables in the citations the articles have received, it is possible to measure their quality and predict the number of citations they can receive.

Suggestions for future research

This research has evaluated the effective factors in the citation of Iranian publications during a specific period. It cannot be generalized to publications of other languages because the citation behavior is different in different languages. As a result, it is suggested that:

- A similar study be conducted in the publications of other countries, and a comparative study be done with the present study;

- Similar research be done in the Scopus and Google Scholar databases;

- Funding and financial support for group and collaborative research be provided; and

- The communication and cooperation of researchers of universities and national, inter-institutional, national, and international research institutions with each other be facilitated to improve the quality and quantity of scientific productions.

Endnotes
1. Social Science Citation Index (SSCI)
2. Science Citation Index Expanded (SCIE)

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