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Bibliometric Analysis of the Top Ten Percent Iranian Medical Researchers Based on the I10-index and the H-index in Web of Science

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ABSTRACT

Objective: The i10-index is one of the newest scientometric indicators used to evaluate researchers in any field of science. The present study analyzes the top ten percent of Iranian medical researchers using the i10-index in the Web of Science database.

Materials and Methods: The present study is descriptive-analytical research conducted using a scientometric approach. The research population includes the top ten percent of Iranian medical researchers whose publications were indexed in the Web of Science database between 2011 and 2020. Descriptive and inferential statistics and i10-index were used to analyze the data using the HistCite and the BibExcel software. Then, the results were sorted in the Excel software. Finally, the h-index and the number of citations of all researchers were compared with their i10-index.

Results: The findings show that in medical sciences, Iran ranked 23rd in the world, sixth in Asia, and first in the Middle East in Web of Science in the period 2011-2020, and the growth of scientific publications shows an upward trend. Moreover, there is a direct and positive relationship between the h-index and the i10-index of the top ten percent of medical researchers. This is confirmed with a correlation of 0.645. Also, a correlation of 0.269 shows a direct and positive relationship between the number of citations and the i10-index of the top ten percent of medical researchers.

Conclusion: The results show that there is a positive and direct relationship between the h-index and the number of citations of the top ten percent of Iranian medical researchers with their i10-index.

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Introduction

Bibliometrics, scientometrics, and informetrics are derived from the terms book, science, and information, respectively. They are quantitative methods for scientifically evaluating and comparing countries, universities, scientific institutes, journals, fields, and researchers. The aforementioned terms are directly related to science and depend on methods used to measure it. That is why, in many cases, they overlap each other a lot. Scientometric, as a scientific method, has been significantly developed. Scientometric is a quantitative research method for evaluating and analyzing scholarly literature. For example, this method can be used to evaluate the distribution of publications by a particular researcher in a particular field or the relationship between two or more researchers or several works (Mujumdar, 2006).

One of the most important indicators of scientific research publications is the quantitative study of scientific outputs, especially research articles. Scientometric study through the evaluation of articles indexed in science citation indexes is one of the most efficient ways to investigate scientific outputs and, thereby, the status of research. In this type of study, the quantitative measurement of scientific publications to some extent determines the frequency and the growth trend of research in each country, each field, and for each individual.

Despite the many advantages of scientometric for researchers, research groups, organizations, universities, and governments, there has been much criticism about its use for evaluating scientific research activities and the validity of its findings. The criticism has cast doubt on theoretical foundations and raised the following question: whether everything in scientometric really has a solid scientific basis and follows a certain logic, or is based on practice and derived from traditional (or perhaps obsolete) approaches of epistemology (Moed, 2006). Therefore, to optimally use scientometric indicators, it is useful to revise, rethink, and redevelop the rules by examining them according to the specific criteria. This issue becomes especially important because today, using new methods and tools presented for scientometric studies challenges the validity of applying its classical rules.

The i10-index is one of the newest scientometric indicators used to evaluate researchers in any field of science by Google Scholar. Google Scholar introduced this indicator in 2011. It refers to the number of publications with at least 10 citations (Dhamdhere, 2018; Kaur, 2018; Noruzi, 2016).

Identifying the most prolific and influential researchers effectively makes scientific, research, and technological structures more fruitful and useful. Therefore, the present study aims to investigate the gap between the quantity and quality of scientific publications in the field of medical sciences in Iran. The reason for selecting the field of medical sciences as the case study was the high number of articles published by Iranian researchers in this field compared to other fields.

Given the possibility of using these rules as scientific documents for scientific policy-making, it is important to check their accuracy. Therefore, in this study, the top ten percent of medical researchers were used as a component of quantity measurement and the i10-index as a component of quality measurement. Moreover, it was tried to evaluate the use of this indicator in various dimensions and, if necessary, redevelop and complete the methodology of their implementation.

Currently, one of the common indicators used for displaying the quality of a researcher's publications and evaluating his/her scholarly output and performance is the Hirsch Index (h-index). Using this indicator, researchers are evaluated based on the number of citations. Although this indicator complements other scientometric indicators, it has weaknesses, one of which is the ineffectiveness of a researcher's highly cited articles. If the number of publications and citations of a researcher is high, poorly-cited publications will be ineffective in the h-index. In the present study, to show the quality of the researchers' articles, those articles with more than 10 citations were considered, and the i10-index was used instead of the h-index. The i10-index distinguishes the highly productive researchers with a high number of citations from other researchers(Aithal, 2017; Currin & Ingram IV, 2021). Regarding the comparison of top researchers based on the i10-index, the study by Waqas et al. (2019) showed that highly prolific researchers have the greatest number of citations(Waqas, Siddiqui & Shamim, 2019). According to Kaur (2018) and Tamizhchelvan et al. (2020), the top ten percent researchers have an i-10 index. These two indices confirm the high quantity and quality of a small number of highly prolific researchers (Kaur, 2018; Tamizhchelvan & Anbalagan, 2020). Also, according to the studies by Waqas et al. (2019) and Radha (2020), there is a positive and significant relationship between the i10-index and the number of citations (Radha, 2020; Waqas et al., 2019).

The present study seeks to determine to what extent the distribution of Iranian researchers in the field of medical sciences in Web of Science is according to their i10-index and to identify the top ten percent researchers in medical sciences. Another purpose of this study was to determine to what extent the top ten percent researchers can be identified with their i10-index. As a result of meeting these purposes, the i10-index can be used as an indicator or criterion to confirm or reject the quality of scientific publications in medical sciences.

Materials and Methods

The present study is descriptive-analytical research quantitatively carried out using a scientometric approach. The research population included the top ten percent Iranian medical researchers whose scientific publications were indexed in the Web of Science database. The research population data were examined using a census method. Thus, data were extracted from the Web of Science database. To extract data In the Advanced Search section, the phrase (PY = 2011-2020) was searched in March 2021, and all information was extracted from the science citation index in which

medical products are indexed. Then, in the analysis of the results, from the thematic categories of Web of Science, the topics related to the field of medicine, which included eighteen thematic categories, were selected after matching with the medical subject heading and in consultation with the subject specialist. After accurately determining the articles of each organization (according to the organizational affiliation of the university and the aggregated information of the same organizational affiliations), the top ten percent Iranian medical researchers were identified. Next, the i10-index of the top ten percent Iranian medical researchers was calculated and the comparison was performed.

To introduce the top one percent of researchers, it was referred to the Essential Science Indicators (ESI) in the Web of Science database. In this database, to determine the top researchers, the information of the past 10 years is always considered. The top researchers are selected based on the number of citations they have received in 12,000 journals in 22 specific fields of research in the Web of Science database. To select top researchers in the field of medical sciences, first, the citation threshold in the field of medical sciences was considered in the Essential Science Indicators, and then those researchers whose number of citations had reached the citation threshold were extracted from the Web of Science database. Moreover, to select the top ten percent researchers, 10% of data were selected after sorting them based on the number of citations in descending order. Then, Iranian medical researchers were identified.

Next, the i10-index of Iranian medical researchers was calculated and finally, the h-index and the i10-index of the top 10% and 1% of Iranian medical researchers were compared. After calculating the i10-index of the Iranian medical researchers using the HistCite and the BibExcel software, it was compared with the h-index and the number of citations using the SPSS software and the Spearman test. Data analysis was performed in two sections: descriptive and inferential statistics. In the "descriptive statistics" section, statistics such as the frequency of researchers in the subject area of Iranian medical sciences, the mean and standard deviation of variables in different subject areas were used to describe the dispersion and the general characteristics of the population studied. In the "inferential statistics" section, the relationships between variables were examined by performing statistical tests such as the Kolmogorov-Smirnov test. This study has obtained its ethical approval from the Research Ethics Committee of Semnan University of Medical Sciences (Code: IR.SEMUMS.REC.1399.047).

Results

Table 1 shows the number of scientific publications in the field of medical sciences by country in the Web of Science for the period 2011-2020. This table indicates that Iran (with 61932 documents) ranked 23rd in the world. In the following tables and figures, Iran's scientific documents are discussed in detail. The total number of documents retrieved for all countries is 19624159

documents. The table below shows the top 30 countries for scientific publications in the field of medical sciences.

Table 1 shows that the United States (with 2003098 documents) ranked first in the world, followed by China (569497 documents), the United Kingdom (478322 documents), and Germany (389051 documents), respectively. Interestingly, the three Asian countries of China, Japan, and India, are among the world's most prolific countries in medical sciences in the Web of Science.

Table 1. Number of documents in the field of medical sciences in the world from 2011 to 2020 (by country)

Row	Countries	Documents
1	United States	2003098
2	China	569497
3	England	478322
4	Germany	389051
5	Japan	295579
6	Italy	289103
7	Canada	278865
8	Australia	248829
9	France	248256
10	Spain	204921
11	Netherlands	193126
12	South Korea	169452
13	Brazil	150352
14	India	146055
15	Swiss	135307
16	Turkey	120174
17	Sweden	103309
18	Belgium	90025
19	Denmark	80257
20	Taiwan	77767
21	Poland	73431
22	Austria	64781
23	Iran	62024
24	Scotland	60583
25	Israel	53181
26	Russia	49980
27	Portugal	49645
28	Ireland	49470
29	Greece	48970
30	Norway	46595

Table 2 shows the ten most prolific countries in medical articles in Asia and the Middle East from 2011 to the end of 2020. Table 2 indicates that Iran ranks sixth in Asia after China, Japan, South Korea, India, and Turkey. The findings of this study also show that Iran ranks second after Turkey in the Middle East. It is noteworthy that there is a gap between Iran and the first and second Asian countries, namely China with 569497 documents (ranks 2nd in the world) and Japan with 295579 documents (ranks fifth in the world). In other words, the number of Chinese and Japanese scientific documents is 9 and almost 5 times greater than Iranian scientific documents, respectively.

Table 2. Number of scientific documents in the field of medical sciences in Asia and the Middle East from 2011 to 2020 (by country)

Row	Countries	Documents
1	China	569497
2	Japan	295579
3	South Korea	169452
4	India	146055
5	Turkey	120174
6	Taiwan	77767
7	Iran	62024
8	Israel	53181
9	Singapore	36741
10	Egypt	33432

Figure 1 shows the growth trend of Iranian medical researchers' scientific documents indexed in the Web of Science database from 2011 to the end of 2020. According to this figure, most of Iran's scientific products in this field are related to 2020. In general, an upward trend in Iran's scientific documents in the field of medical sciences can be observed.

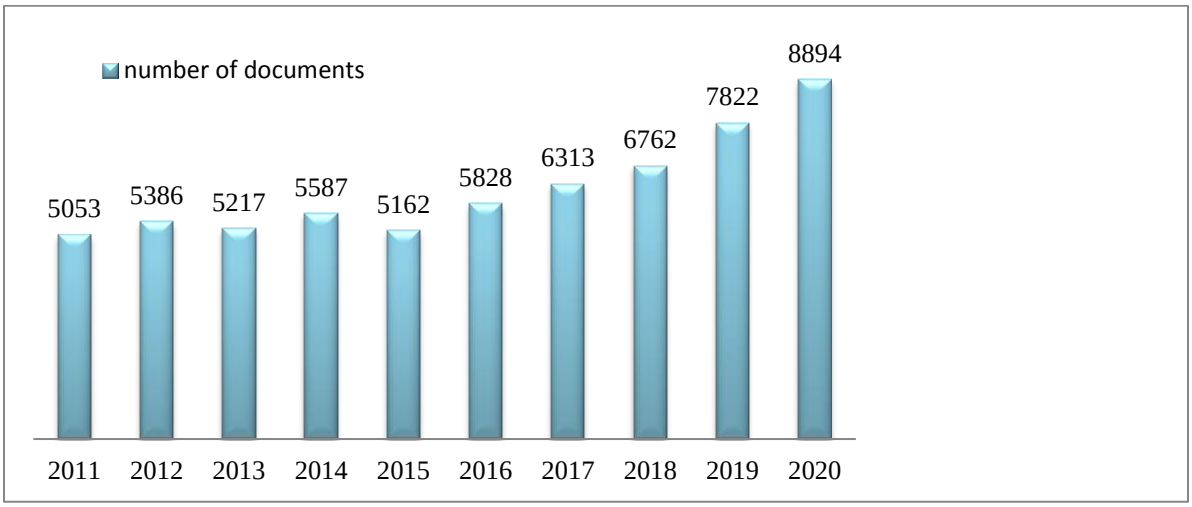

Figure 1. The annual growth rate of Iran's scientific documents in medical sciences from 2011 to 2020

Table 3 shows the most prolific Iranian researchers in the field of medical sciences in the Web of Science from 2011 to the end of 2020. Table 3 shows a list of 30 Iranian researchers with their organizational affiliations, who have contributed to the publication of at least 200 articles in the field of medical sciences. It should be noted that a single article may have been written by several researchers. Table 3 also indicates the h-index of the most productive Iranian researchers in the field of medical sciences in the Web of Science from 2011 to the end of 2020. According to Table 3, "Amir Hossein Sahebkar" from the Mashhad University of Medical Sciences, "Nima Rezaei" from the Tehran University of Medical Sciences, and "Moslem Mohammadi" from the Mazandaran University of Medical Sciences are among the top researchers in the field of medical sciences in

Iran and the world, each of which has more than 350 publications indexed in the Web of Science in the period studied.

Table 3. The most prolific Iranian researchers in medical sciences in Web of Science from 2011 to 2020

Row	Authors	Organizational Affiliation	Documents	H-Index
1	Sahebkar, Amirhossein	Mashhad Univ Med Sci	573	63
2	Rezaei, Nima	Univ Tehran Med Sci	540	36
3	Mohammadi, Moslem	Mazandaran Univ Med Sci	379	30
4	Abdollahi, Mohammad	Univ Tehran Med Sci	359	37
5	Azizi, Fereidoun	Shahid Beheshti Univ Med Sci	329	28
6	Sadeghi, Masoumeh	Isfahan Univ Med Sci	325	21
7	Malekzadeh, Reza	Univ Tehran Med Sci	281	61
8	Sahraian, Mohammad Ali	Univ Tehran Med Sci	281	35
9	Ahmadi, Ali	Shahrekord Univ Med Sci	276	29
10	Soleimani, Masoud	Tarbiat Modares Univ	275	27
11	Aghamohammadi, Asghar	Univ Tehran Med Sci	271	29
12	Mahmoudi, Morteza	Univ Tehran Med Sci	270	25
13	Taheri, Morteza	Iran Univ Med Sci	269	21
14	Hosseini, Seyed Mostafa	Univ Tehran Med Sci	268	27
15	Kelishadi, Roya	Isfahan Univ Med Sci	263	33
16	Mohammadi, Ali	Tabriz Univ Med Sci	276	28
17	Salehi, Mona	Univ Tehran Med Sci	259	23
18	Ghorbani, Mostafa	Alborz Univ Med Sci	256	52
19	Amini, Mohsen	Univ Tehran Med Sci	253	25
20	Safiri, Saeid	Tabriz Univ Med Sci	253	31
21	Hashemi, Mohammad	Zahedan Univ Med Sci	242	27
22	Dehpour, Ahmad Reza	Univ Tehran Med Sci	236	25
23	Sabour, Siamak	Shahid Beheshti Univ Med Sci	231	19
24	Yousefi, Mehdi	Tabriz Univ Med Sci	231	27
25	Hashemi, Mehrdad	Islamic Azad Univ, Tehran Med Sci	218	25
26	Yaseri, Mohammad	Univ Tehran Med Sci	217	29
27	Ahmadi, Majid	Tabriz Univ Med Sci	216	22
28	Larijani, Bagher	Univ Tehran Med Sci	211	26

Table 4 shows a list of highly-cited Iranian researchers in the field of medical sciences, that is, a list of 30 Iranian researchers who have received at least 2,000 citations to their research and review articles indexed in the Web of Science. It also shows the h-index of highly-cited Iranian medical researchers in the Web of Science from 2011 to the end of 2020. According to Table 4, "Farshad Farzadfar", and "Reza Malekzadeh" from Tehran University of Medical Sciences, and "Maziar Moradi Lakeh" from Iran University of Medical Sciences each received more than 40,000 citations in the Web of Science in the period studied and have the highest h-index among other Iranian medical researchers.

Table 4. Highly-cited Iranian medical researchers from 2011 to 2020

Row	Authors	Organizational Affiliation	Citations	H-Index
1	Farzadfar, Farshad	Univ Tehran Med Sci	63246	55
2	Malekzadeh, Reza	Univ Tehran Med Sci	62708	61
3	Moradi-Lakeh, Maziar	Iran Univ Med Sci	44225	47
4	Esteghamati, Alireza	Univ Tehran Med Sci	39360	39
5	Tavakoli-Yaraki, Masoumeh	Iran Univ Med Sci	38009	29
6	Ghorbani, Mostafa	Alborz Univ Med Sci	36135	52
7	Sahraian, Mohammad Ali	Univ Tehran Med Sci	20661	35
8	Sahebkar, Amirhossein	Mashhad Univ Med Sci	19202	63
9	Safiri, Saeid	Tabriz Univ Med Sci	18659	31
10	Yaseri, Mohammad	Univ Tehran Med Sci	17967	29
11	Mohammadi, Ali	Tabriz Univ Med Sci	16552	28
12	Kelishadi, Roya	Isfahan Univ Med Sci	13280	33
13	Ahmadi, Ali	Shahrekord Univ Med Sci	9655	29
14	Azizi, Fereidoun	Shahid Beheshti Univ Med Sci	9051	28
15	Abdollahi, Mohammad	Univ Tehran Med Sci	6201	37
16	Ahmadi, Majid	Tabriz Univ Med Sci	6052	22
17	Rezaei, Nima	Univ Tehran Med Sci	5938	36
18	Mohammadi, Moslem	Mazandaran Univ Med Sci	5858	30
19	Larijani, Bagher	Univ Tehran Med Sci	4970	26
20	Hosseini, Seyed Mostafa	Univ Tehran Med Sci	4243	27
21	Mahmoudi, Morteza	Univ Tehran Med Sci	4046	25
22	Aghamohammadi, Asghar	Ghazvin Univ Med Sci	3293	29
23	Ramezani, Mohammad	Mashhad Univ Med Sci	2964	30
24	Yousefi, Mehdi	Tabriz Univ Med Sci	2910	27
25	Soleimani, Masoud	Tarbiat Modares Univ	2646	27
26	Hashemi, Mohammad	Zahedan Univ Med Sci	2545	27
27	Dehpour, Ahmad Reza	Univ Tehran Med Sci	2499	25
28	Hashemi, Mehrdad	Islamic Azad Univ, Tehran Med Sci	2442	25
29	Amini, Mohsen	Univ Tehran Med Sci	2304	25
30	Sadeghi, Masoumeh	Isfahan Univ Med Sci	2204	21

Table 5 shows the results of the Kolmogorov-Smirnov test applied to examine the normality of the research variables. To examine the normality of the data, the null hypothesis stating that the data distribution is normal at the .05 level is tested. Therefore, the null hypothesis will be accepted if the statistic is estimated to be ≥ 0.05. In other words, the data distribution will be normal. According to Table 5, since the significance level is < 0.05 for the research variables, the distribution of research variables is normal. Normal distribution of research variables is one of the basic prerequisites for non-parametric tests.

Table 5. Results of Kolmogorov-Smirnov test for research variables

Citations	H-Index	I-10		
56000	56000	*56000*	N	
689.68	2.99	*1.18*	Mean	*Normal Parameters*[a,b]
3199.052	3.769	*2.587*	Std. Deviation	
0.429	0.299	*0.334*	Absolute	
0.429	0.262	*0.334*	Positive	*Most Extreme Differences*
-0.416	-0.299	*-0.324*	Negative	
0.429	0.299	*0.334*	Test Statistic	
0.000[c]	0.000[c]	0.000[c]	Asymp. Sig. (2-tailed)	

Table 6 shows the relationship between the h-index and the i10-index of 56,000 researchers. The total number of documents extracted from the Web of Science database was 560,000 documents that in the present study, 10% of them were selected after sorting them based on the number of citations in descending order. Then, according to the function presented in the "method" section, the i10-index of the Iranian medical researchers in the period studied was calculated and compared with their h-index using the SPSS software. The results indicate that Spearman's correlation coefficient was estimated to be 0.645 (sig = 0.000, allowable error=0.01, 99% confidence level), showing a direct and positive relationship between the h-index and the i10-index.

Table 6. Relationship between h-index and i10-index of the top ten percent Iranian medical researchers

H-Index	I10		
-.645**	1	Correlation	I10
-.000	---	Sig. (2-tailed)	
56000	56000	N	
1	0.645**	Correlation	H-Index
---	0.000	Sig. (2-tailed)	
56000	56000	N	

Table 7 shows the relationship between the h-index and the i10-index of the top one percent Iranian medical researchers. According to the obtained results, the Spearman correlation coefficient was estimated to be 0.582 (sig = 0.000, allowable error=0.01, 99% confidence level), showing a direct and positive relationship between the h-index and the i10-index of Iranian medical researchers.

Table 7. Relationship between the h-index and the i10-index of the top one percent Iranian medical researchers

H-Index	I10		
0.582**	1	Correlation	I10
0.000	---	Sig. (2-tailed)	
5600	5600	N	
1	.582**	Correlation	H-Index
---	.000	Sig. (2-tailed)	
5600	5600	N	

Table 8 shows the relationship between the number of citations and the i10-index of the top ten percent Iranian medical researchers. The results show that the Spearman correlation coefficient was estimated at 0.269 (sig = 0.000, allowable error=0.01, 99% confidence level), showing a direct and positive relationship between the number of citations and the i10-index.

Table 8. Relationship between the number of citations and the i10-index of the top ten percent Iranian medical researchers

I10	Citations		
.269**0	1	Pearson Correlation	Citations
.0000	---	Sig. (2-tailed)	
56000	56000	N	
1	0.269**	Pearson Correlation	I10
---	.0000	Sig. (2-tailed)	
56000	56000	N	

Table 9 shows the relationship between the number of citations and the i10-index of the top one percent Iranian medical researchers. The results indicate that the Spearman correlation coefficient was estimated to be 0.148 (sig = 0.000, allowable error=0.01, 99% confidence level), showing a direct and positive relationship between the number of citations and the i10-index of the top one percent Iranian medical researchers.

Table 9. Relationship between the number of citations and the i10-index of the top one percent Iranian medical researchers

I10	Citations		
0.148**	1	Correlation	Citations
0.000	---	Sig. (2-tailed)	
5600	5600	N	
1	0.148**	Correlation	I10
---	0.000	Sig. (2-tailed)	
5600	5600	N	

Discussion

The results showed that the world's total number of scientific documents was estimated at 19624160 between 2011 and 2020, of which 6,064,770 documents were in the field of medical sciences in the Web of Science. In addition, in the same period, 61,932 research and review articles of Iranian researchers were indexed in the Web of Science. So, Iran ranks 23rd in the world in scientific publications. Ranking countries showed that the United States with 2,003,098 documents ranks first in the world, followed by China (569,497 documents), the United Kingdom (47,832,222 documents), and Germany (389,051 documents), respectively. Interestingly, the three Asian countries of China, Japan, and India are among the world's most productive countries in the field of medical sciences in the Web of Science. The results also showed that Iran ranks sixth among Asian countries after China, Japan, South Korea, India, and Turkey, and second in the Middle East.

Moreover, it is worth noting that there is a gap between Iran and China with 56,9497 documents (ranks first in Asia and second in the world) and Japan with 295,579 documents (ranks second in Asia and fifth in the world). In other words, the number of Chinese and Japanese scientific articles is 9 and almost 5 times greater than Iranian scientific documents, respectively. The growth of scientific publications in the field of medical sciences in Iran shows an upward trend, most of which are related to 2020.

The findings indicated that "Amir Hossein Sahebkar" from the Mashhad University of Medical Sciences, "Nima Rezaei" from the Tehran University of Medical Sciences, and "Moslem Mohammadi" from the Mazandaran University of Medical Sciences are among the top researchers in the field of medical sciences in Iran and the world, each of which has more than 350 articles indexed in the Web of Science. About the highly-cited researchers, the results of Table 4 showed that "Farshad Farzadfar" and "Reza Malekzadeh" from the Tehran University of Medical Sciences

and "Maziar Moradi Lakeh" from the Iran University of Medical Sciences each received more than 40,000 citations in the Web of Science in the period 2011-2020 and have the highest h-index among other Iranian medical researchers. The results of this study are consistent with the study by Waqas et al. who showed that three authors had the greatest impact on the publication and citation of articles on neurosurgery in Pakistan(Waqas et al., 2019).

About the relationship between the h-index and the i10-index, the results showed that the Spearman correlation coefficient was estimated to be 0.645 (sig = 0.000, allowable error=0.01, 99% confidence level), showing a direct and positive relationship between the i-index and the i10-index. As a result, the high value of the i10-index in the field of medical sciences not only does not deny the h-index but also confirms that the i10-index is a more reliable indicator for evaluating researchers since it, unlike other indices, is used for all scientific publications of researchers with at least ten citations. These results are consistent with the studies by Currin et al. (2021) and Pitsolanti et al., who showed that there is a direct relationship between the h-index and the i10-index (Currin & Ingram IV, 2021; Pitsolanti, Papadopoulou & Tselios, 2017), as well as a study by Geo et al. (2021) who showed there is no significant difference between the two indices (Jiao et al., 2021).

Regarding the relationship between the number of citations and the i10-index of the top ten percent Iranian medical researchers, the results showed a direct and positive relationship between the two variables. This result is consistent with the studies by Radha (2020)(Radha, 2020), Currin et al. (2021) (Currin & Ingram IV, 2021), and Tamizhchelvan et al. (2020) (Tamizhchelvan & Anbalagan, 2020)who showed that the higher the number of citations, the higher the i10-index. In their study, Mondal et al. (2019) reported a positive and significant relationship between the number of citations and the i10-index of journals in the field of information science and knowledge management (Mondal & Maity, 2019). Regarding the relationship between the number of citations and the i10-index of the top one percent Iranian medical researchers, the results showed a direct and positive relationship. This implies the agreement between the i10-index of the top one percent and ten percent of medical researchers. This result is consistent with the studies by Imran et al. (2018) (Imran, Haglind, Asim & Alvi, 2018)who examined the growth rate of articles in the Organic Rankine Cycle (ORC) technology.

Conclusion

Using scientometric analyses, the present study indicated that the world's medical publications accounted for 30% of the total scientific documents in the Web of Science database between 2011 and 2020, and one percent (62,024 articles) of the total scientific output in this field belonged to Iranian researchers. The top ten percent Iranian medical researchers were considered to calculate the i10-index and compare it to the h-index and the number of citations.

After calculating the i10-index of the researchers using the HistCite and the BibExcel software, it was compared with the h-index and the number of citations using the SPSS software and the Spearman test. All the top ten percent of medical researchers had an i10-index, meaning that each researcher had at least one article with ten citations. The comparison of the i10-index with the h-index indicated that there is a direct and positive relationship between them, meaning that those researchers with a high h-index had a high i10-index.

To confirm this claim, the top one percent medical researchers were evaluated based on the number of citations. The results showed that there is a direct relationship between these two indices. However, it should be noted that according to Tables 6 and 7, the correlation obtained for the top one percent medical researchers was less than that of the top ten percent medical researchers, indicating a relatively large difference between the h-index and the i10- index. Since the i10-index is equal to or greater than the h-index, one can claim that it is a more accurate and better indicator for evaluating the productivity of researchers in the field of medical sciences and other highly-cited fields, such as chemistry. So, the i10-index can be added to the Web of Science database as a key indicator for evaluating researchers.

The present study is a substantial step to examine the status of scientific publications in the field of medical sciences, as one of the most productive and key scientific fields in Iran, in the Web of Science database prepared by Clarivate Analytics using the i10-index. Since the results of scientometric studies can be used in planning and macro-scientific policy-making of universities, scientific communities, and the country, researchers must pay special attention to the various dimensions of science publications. Accordingly, more research should be carried out on the status, quality, and quantity of scientific articles in the field of medical sciences using quantitative and qualitative scientometric indicators and various ranking, functional, structural, financial, human, and similar indicators. The results of such research can be effective in promoting the scientific, economic, and political authority of the country.

Author Contributions

Conceptualization, M.F. and A.N.; methodology, M.A. and M.F.; software, M.A., M.F. and A.V.; validation, M.A., A.N., M.F., S.S. and A.V.; formal analysis, M.A., M.F., S.S. and A.V.; investigation, M.A., A.N., M.F., S.S. and A.V.; resources, M.A., A.N., M.F., S.S. and A.V.; data curation, M.A., M.F., S.S. and A.V.; writing—original draft preparation, M.A., M.F., S.S. and A.V.; writing—review and editing, M.A., A.N., M.F., S.S. and A.V.; visualization, M.A., M.F., S.S. and A.V.; supervision, A.N. and A.V.; project administration, M.A. and A.V.; funding acquisition, M.A. and A.V. All authors have read and agreed to the published version of the manuscript.

Data Availability Statement

Not applicable.

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Ethical considerations

Ethics approval was made by the Ethics Committee of Semnan University of Medical Sciences (IR.SEMUMS.REC.1399.047).

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Conflict of interest

The authors declare no conflicts of interest.

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