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Original article

The Highly Cited Systematic Review and Meta-analysis Articles of Cardiac and Cardiovascular Systems: A Scientometric Study Based on Web of Science

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Abstract

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Introduction: Systematic reviews and meta-analyses have been placed at the summit of the evidence pyramid in the evidence-based medicine paradigm, specifically in Cardiac and Cardiovascular Systems. Scientometric investigation can provide useful insight into the field's scholarly communications. Therefore, this study is an attempt at to scientometric study of the highly cited systematic reviews and meta-analysis articles of cardiac and cardiovascular systems category based on the Web of Science (WoS).

Methods: This scientometric study focused on highly cited articles retrieved from the WoS between July 20 and July 27, 2019. After multiple phases of screening the retrieved articles, 150 articles formed the current research population. This study examined several articles in systematic review and meta-analysis, the publication trend, the status of authors' countries, authors' affiliation, and the published sources of the articles.

Results: Meta-analysis articles account for 52% of the research population. The largest share of the highly cited papers was for 2018. The results showed that 61.3% of the studies were conducted through international cooperation. Researchers in the USA, England, Netherlands, and Canada have conducted most studies—the most significant number of the articles published in the American College of Cardiology and European Heart Journal. Most highly cited articles (79.33%) were published in Q1 journals.

Conclusion: The publication of the highly cited articles has significantly benefited from international collaboration. Researchers from the United States, the Netherlands, England, and Canada significantly contributed to the articles' production. The highly cited papers have been published in the most prestigious journals.

Introduction

Cardiac and cardiovascular diseases are the leading cause of mortality worldwide. According to the World Health Organization (WHO), in 2016 alone, 17.9 million people died from this disease

(1). Evidence-based medicine (EBM) is a new approach that emerged as the gold standard in the healthcare area, and some studies have shown that it can reduce mortality (2) and increase patient safety



(3). The essential component of the EBM approach, along with the two components of Expertise of the decision-makers and Expectations and values of the patients/people, is the Evidence component (4). Evidence refers to the results of well-designed and well-conducted research. However, not all evidence are equally reliable. Systematic review and meta-analysis studies are studies that examine high-quality research and present the results in a concise structure (5). In addition, these studies are at the highest level of evidence and are an essential element in the EBM process (6,7).

Since citation forms the basis of scientometric studies, valuable data can be obtained to measure effective scientific communication by examining the citations of the articles. It is also possible to determine the extent to which scientific works have succeeded in attracting the attention of their potential audiences (8). Awareness of the citation status of the highly cited systematic review and meta-analysis in cardiac and cardiovascular systems can also provide valuable information about effective scientific communication. Therefore, this study is an attempt to examine highly cited systematic review and meta-analysis articles of cardiac and cardiovascular systems category based on Web of Science (WoS) databases.

Methods

This research is a scientometric study that has been conducted using the data of the WoS citation databases. According to the PRISMA guideline, it is necessary to reflect the type of review studies in the title of the study (9,10), so all articles in which the

keywords of systematic review or meta-analysis were used and were in the subject category of cardiac and cardiovascular systems without language and time restrictions were retrieved. The search formula used in this research is listed below.

wc=(Cardiac & Cardiovascular Systems) AND ti=(“systematic review” OR “meta analys*” OR meta-analys*)

Timespan: All years. Indexes: SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH, ESCI.

The search was conducted in the period of 2019/7/20 to 2019/7/27. Ten thousand one hundred ninety articles were retrieved, which remained 9415 articles after analyzing the articles based on the type of document and assigning it to Article, Review, Meeting Abstract, and Proceedings Paper. The remaining articles were then assigned to the highly cited in the field. Thus, 150 articles of highly cited systematic reviews and cardiac and cardiovascular meta-analyses formed the present study’s population. Many articles in systematic review and meta-analysis, the publication trend, the status of authors’ countries, as well as first and corresponding authors, the status of international collaboration, authors’ affiliation, and publication sources of the articles and status of the journal’s Impact Factor (IF) quartile (Q) ranking were examined. VOSviewer version 1.6.10 software was used to map international collaboration.

Results

According to the findings presented in Figure 1, 52% of the reviewed articles are meta-analysis articles.

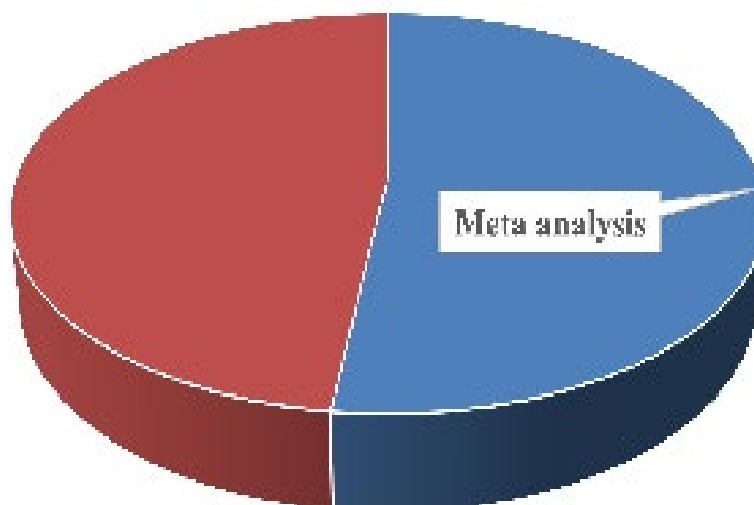


Figure 1. The share of the highly cited systematic review and meta-analysis articles

In terms of the publication trend of the articles, the data are presented in Figure 2. As can be seen in the diagram, the largest share of highly cited systematic review and meta-analysis articles related to cardiac

and cardiovascular systems was published in 2014 and 2018. Notably, due to the time of data collection, not all articles in 2019 have been reviewed.

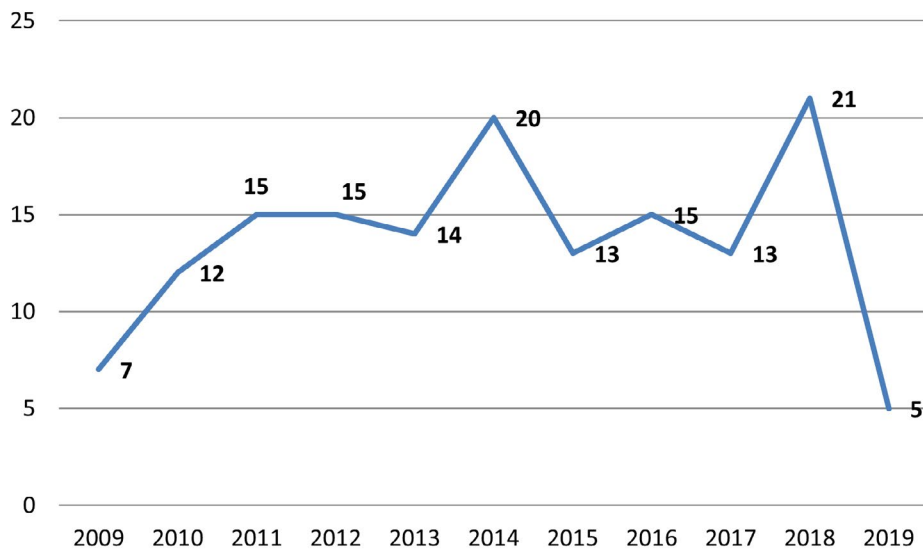


Figure 2. The publication trend of the highly cited systematic review and meta-analysis articles in the cardiac & cardiovascular systems

In general, regardless of the position of the authors, as shown in Table 1, the United States, the Netherlands, the United Kingdom, Canada, and Italy are the five countries that, as the countries of the authors, have the largest share in highly cited articles published for

systematic review and meta-analysis articles in the cardiac and cardiovascular area. The United States (51.33%), the Netherlands (30%), the United Kingdom (29.33%), Canada (19.33%), and Italy (15.33%) were the prolific countries, with at least one author.

Table 1. Countries of highly cited systematic review and meta-analysis articles in the cardiac & cardiovascular systems

Affiliated countries of at least one author	Number of articles (from 150)	Percentage
USA	77	51.33%
Netherlands	45	30.00%
England	44	29.33%
Canada	29	19.33%
Italy	23	15.33%
Germany	22	14.67%
Switzerland	19	12.67%
Australia	18	12.00%
France	18	12.00%
Denmark	12	8.00%
Sweden	10	6.67%
Scotland	9	6.00%
Greece	8	5.33%
Norway	7	4.67%
Japan	7	4.67%
Korea	7	4.67%
China	5	3.33%
Brazil	5	3.33%
Spain	5	3.33%
26 other countries	50	33.33%

The data are presented in Table 2 to identify the authors for the highly cited articles in the cardiac and countries of the first authors and corresponding cardiovascular systems.

Table 2. Countries of the first authors and corresponding authors of the highly cited systematic review and meta-analysis articles in cardiac & cardiovascular systems

Affiliated country	First author	Percentage	Corresponding author	Percentage
USA	45	30.00%	50	33.33%
Netherlands	20	13.33%	19	12.67%
England	19	12.67%	20	13.33%
Canada	11	7.33%	11	7.33%
Italy	11	7.33%	7	4.67%
Australia	8	5.33%	9	6.00%
Germany	6	4.00%	6	4.00%
Switzerland	4	2.67%	5	3.33%
Greece	3	2.00%	3	2.00%
Austria	2	1.33%	2	1.33%
China	2	1.33%	2	1.33%
New Zealand	2	1.33%	2	1.33%
Norway	2	1.33%	2	1.33%
Scotland	2	1.33%	2	1.33%
Belgium	1	0.67%	1	0.67%
Brazil	1	0.67%	1	0.67%
Denmark	1	0.67%	1	0.67%
France	1	0.67%	1	0.67%
Japan	1	0.67%	1	0.67%
Korea	1	0.67%	1	0.67%
Lithuania	1	0.67%	0	0.00%
Poland	1	0.67%	1	0.67%
South Africa	1	0.67%	0	0.00%
Spain	1	0.67%	1	0.67%
Sweden	1	0.67%	1	0.67%
Cameroon	0	0.00%	1	0.67%
Total	150	100.00%	150	100.00%

As shown in Table 2, the United States has the largest share in the country of the first author (30%) and corresponding author (34%) of the reviewed articles, followed by the United Kingdom (13.3%, 12.7%), the Netherlands (12.7%, 13.3%) and Canada (7.33%, 7.33%), Italy (7.33%, 4.67%) are in the next ranks.

In terms of international collaboration in producing the studied articles, the researchers' findings showed that 61.3% of the highly cited systematic review and meta-analysis articles in cardiac and cardiovascular systems are the collaborative product of more than one country. Figure 3 shows a map of collaboration between different countries.

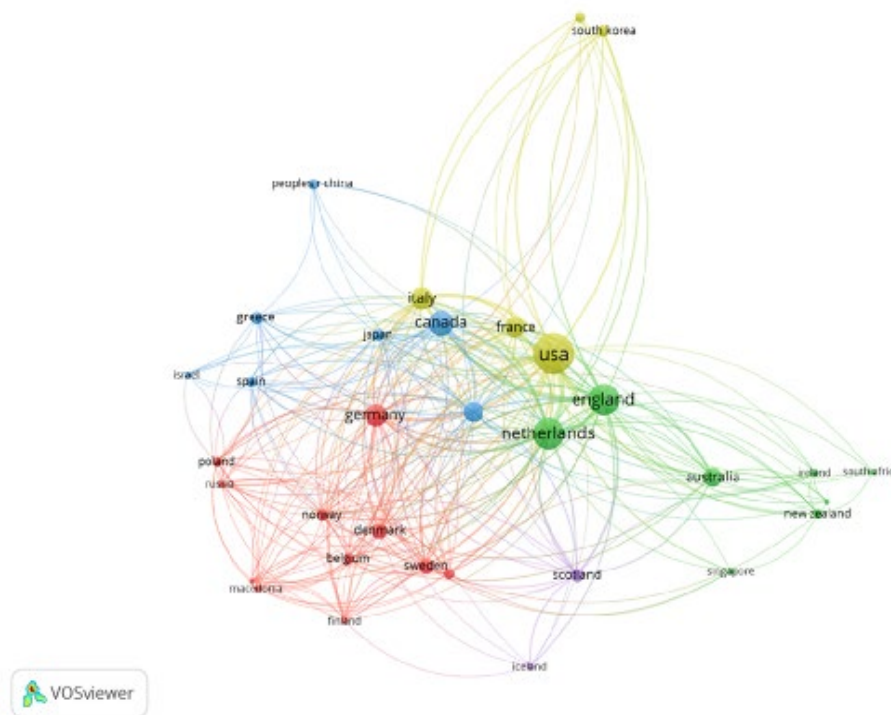


Figure 3. International collaboration network in the highly cited systematic review and meta-analysis articles on cardiac & cardiovascular systems

Further studies showed that the highest rate of international collaboration was between American researchers and Netherlands researchers (21 articles), followed by the United Kingdom (17 articles), Canada (16 articles), Italy (14 articles), and Germany (12 articles), respectively.

The Netherlands also had the highest co-authorship with the United States in 21 articles, followed by the United Kingdom in 18, Canada in nine, Italy and France in eight, and Germany in seven.

Researchers in the United Kingdom had the most collaborations with the Netherlands in 18 articles, followed by the United States in 17 articles, Italy in ten articles, France in nine articles, Australia in seven articles, Canada, Scotland, and Switzerland in six articles.

Canadian researchers also had the most

collaborations with US researchers in 16 articles, the Netherlands in nine articles, Switzerland in seven articles, and the United Kingdom and Italy in six articles.

Further studies showed that the highest rate of co-authorship has been between Italian researchers and the United States (in 14 articles), followed by the United Kingdom (in 10 articles), Netherlands (8 articles), Canada (6 articles), and Germany (12 articles), respectively.

According to the authors' affiliation, the previous studies showed that the institutions that collaborated most in producing articles were Harvard University (in 18 articles) and Erasmus University (in 15 articles), respectively. Additional results are presented in Table 3. Erasmus University ranks first in terms of corresponding authors' affiliations.

Table 3. Authors' affiliation with the highly cited systematic review and meta-analysis articles in cardiac & cardiovascular systems

Affiliated organization	At least one of the authors	First author	Corresponding author
Harvard Univ	18	6	6
Erasmus Univ	15	7	7
Columbia Univ	9	3	7
McGill Univ	6	4	4
Univ Cambridge	7	4	4
Oxford Univ	9	2	3
Johns Hopkins	7	2	2

In terms of publication sources, as shown in Table 4, most articles were published in the Journal of the American College of Cardiology (31 articles), followed by the European Heart Journal (30 articles) and Circulation (21 articles), respectively.

Table 4. Publication sources of the highly cited systematic review and meta-analysis articles in cardiac & cardiovascular systems

Journals	Number of the highly cited articles
Journal of the American College of Cardiology	31
European Heart Journal	30
Circulation	21
Heart	7
Circulation-Cardiovascular Quality and Outcomes	5
Journal of the American Heart Association	5
European Journal of Heart Failure	4
JAMA Cardiology	4
American Heart Journal	3
American Journal of Cardiology	3
Eurointervention	3
JACC-Cardiovascular Interventions	3
Cardiovascular Diabetology	2
Circulation Research	2
European Heart Journal-Acute Cardiovascular Care	2
Heart Rhythm	2
International Journal of Cardiology	2
JACC-Heart Failure	2
Journal of the American Society of Echocardiography	2
Nutrition Metabolism and Cardiovascular Diseases	2
Other journals	15
Total	150

Table 5. Quartile ranking of the publication sources of the highly cited systematic review and meta-analysis articles in Cardiac & Cardiovascular Systems

Quartile score	Number of the highly cited articles	Percentage
Q1	119	79.33%
Q2	27	18.00%
Q3	4	2.67%
Q4	-	-
Total	150	100%

The publication sources of the articles were also classified based on the Q ranking, the results of which are shown in Table 5. Accordingly, most articles (79.33%) have been published in the Q1 journals, and none have been published in the Q4 journals.

Discussion

Clinical decision-making is a complex and

challenging process for physicians and health professionals. Time constraints are the biggest obstacle to evidence-based practice, and physicians try to overcome this limitation in clinical decisions by using the highest levels of evidence (11). For this reason, systematic review and meta-analysis articles, among the highest evidence level (6,7,12), are particularly essential in clinical decisions. Physicians



in EBM always strive to make better clinical decisions by combining this valuable evidence with their own experiences and understanding of patients' conditions and preferences (13). Therefore, due to the growing importance of evidence-based practice (14,15) and the position of systematic review and meta-analysis articles at the top of the evidence levels (7,12), the production and publication of this type of study have become a necessity (16), in particular, meta-analysis articles for which a specific statistical strategy is used to collect the results of several studies in an integrated estimate (17,18). Besides, this study showed that out of 150 highly cited systematic review and meta-analysis articles on cardiac and cardiovascular systems, 52% are dedicated to meta-analysis articles. Zhang's study reviewed systematic review and meta-analysis articles on tuberculosis (19), and Gogos's study reviewed highly cited systematic review and meta-analysis articles on dentistry (20); there is no mention of the share of these articles separately.

In terms of the process of publishing articles, the research findings indicated that the highly cited articles are systematic reviews and meta-analyses in cardiac and cardiovascular-related to 2014 and 2018. Indicatively, it is impossible to deduce an increasing or decreasing pattern from the publication trend of these articles.

The research findings revealed that the United States, the Netherlands, the United Kingdom, Canada, and Italy are the five countries that, as the authors' countries, have the largest share in the publication of highly cited systematic review and meta-analysis articles in cardiac and cardiovascular systems. In Khan's study, which examined the highly cited articles in the field of interventional cardiology from 1953 to 2012, the United States, with a significant difference from other countries, had the highly cited articles, followed by Germany, the Netherlands, England, and Canada, respectively (21). According to the results of a study by Liao et al., conducted to review the highly cited articles on coronary heart disease from 1970 to 2015, the United States ranked first, the United Kingdom second, Germany fourth, Canada fifth, and Italy sixth, and the Netherlands seventh in highly cited articles (22). In another study by Khan et al., on 100 top-cited articles on cardiovascular magnetic resonance, the United States and the United Kingdom had the largest share in producing articles, respectively (23). In Shuaib's study, the United States and the United Kingdom were had highly cited cardiovascular articles (24). In Kantek's study of 100

top-cited nursing articles, the United States, the United Kingdom, and Canada were the most productive countries (25). Gogos's study examined highly cited systematic review and meta-analysis articles on dentistry, and the United States ranks first among the most productive countries (20). In the study of Zhang, based on highly cited systematic review and meta-analysis articles on tuberculosis, the United States ranks first, followed by Canada in second place, and the United Kingdom in fourth place with the largest share of highly cited articles (19). Comparing the present study results with the studies mentioned above, this research inferred that the United States, the United Kingdom, and Canada have a considerable position in producing highly cited articles in various fields. Notably, none of these studies have mentioned the countries of corresponding authors and first authors of articles, but the research of Vishwanathan et al. has shown that the United States, China, and the United Kingdom, as the country of first authors, have the largest share in producing the one-hundred top-cited articles on diabetes mellitus and Covid-19 (26). The present study results also showed that the United States, the United Kingdom, and the Netherlands had the largest share in the countries of corresponding authors and the first authors of highly cited articles in cardiac and cardiovascular, respectively.

The findings of this study showed that, in general, in terms of international collaboration in the production of articles, 61.3% of the highly cited systematic review and meta-analysis articles in the fields of cardiac and cardiovascular systems are the result of cooperation from more than one country. A study by Khan et al. stated that 26% of the one-hundred top-cited articles in interventional cardiology resulted from international collaboration (21).

The present study observed the highest level of international collaboration between American researchers and researchers from the Netherlands, the United Kingdom, Canada, Italy, and Germany. Liao's research also reported the highest international collaboration between US researchers and researchers in the United Kingdom, followed by Canada (22), somewhat in line with the present study.

In terms of authors' affiliation, surveys showed that Harvard University topped the list, followed by Erasmus University, Columbia Univ, McGill Univ, Cambridge Univ, and Oxford Univ, respectively. Correspondingly, Shahid et al., in their research, have shown that Harvard University, as an authors' affiliation, has had the largest share in publishing

highly cited articles in the heart failure area (27). In the study of Liao, Harvard University ranked first, and Oxford University ranked second in authors' affiliation of highly cited articles on coronary heart disease, respectively (22).

According to the present study's findings, the Journal of the American College of Cardiology has published the most highly cited systematic review and meta-analysis articles in the cardiac and cardiovascular area, followed by the European Heart and Circulation journals. In Liao's study, the Journal of the American College of Cardiology is not included in the list of published sources for the one-hundred top-cited articles on coronary heart disease, but Circulation is in third place, and the European Heart Journal is in fifth place (22). In Khan's study, conducted on the highly cited articles in interventional cardiology, Circulation was ranked second in the list of journals that published highly cited articles in this field, and the Journal of the American College of Cardiology was ranked fourth (21). In Shuaib's study, the Journal of Circulation, followed by the European Heart Journal, had highly cited articles in cardiac and cardiovascular (24). A study by Khan et al. also indicated that the Journal of Circulation and the Cardiology Journal of the American College published over two-thirds of the 100 top-cited articles on cardiovascular magnetic resonance (23). In the study by Shahid et al., the Journal of Circulation is in third place, the Journal of the American College of Cardiology is in fifth place, and the European Heart Journal is in sixth place, which had published highly cited articles on heart failure (27). The researchers found that the three journals, the Journal of the American College of Cardiology, the European Heart Journal, and Circulation, which published the highly cited systematic review and meta-analysis articles, were in Q1 in terms of IF score. In general, the research findings showed that 33.79% of the reviewed articles in the Q1-related journal and no articles in the Q4-related journal were published.

Conclusion

Given the inclusion of systematic review or meta-

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analysis articles in the list of highly cited articles, it could mean that the authors of such articles have been able to directly or indirectly influence the evidence-based decision-making process. This study found 150 systematic review and meta-analysis articles that could be included in the highly cited cardiac and cardiovascular systems. Regardless of the author's position, the United States and the United Kingdom have the most significant of these articles, and in the position of the corresponding author and the first author, the first and second ranks are assigned to these two countries, respectively. 61.3% of the reviewed articles are the result of international collaboration. Accordingly, the most international collaboration has been done between American researchers with researchers from the Netherlands, the United Kingdom, Canada, Italy, and Germany. In terms of authors' affiliation, Harvard University in the United States ranks first. The Journal of the American College of Cardiology has published the most highly cited systematic and meta-analysis articles in cardiac and cardiovascular, which is in Q1 journals. In general, 33.79% of the reviewed articles have been published in Q1 journals.

Declarations

Acknowledgement

NA

Conflicts of Interests

The authors declare that they have no conflict of interests.

Ethical statement

The authors have observed all the ethical issues in writing and publishing.

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None.

Authors' contributions

All authors contributed to designing, running, and writing all parts of this project

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