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Original Article

Bibliometric evaluation based on scopus database: Global analysis of publications on diabetic retinopathy and comparison with publications from Turkey

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ABSTRACT

Objectives: In this study, we aimed to review the scientific literature on Diabetic retinopathy (DR).

Materials and methods: Scopus bibliometric database was searched in English. Original research articles made between 1941-2021 containing the keywords "diabetic", "DM" and "retinopathy" and "article" in the title, abstract, and keywords were found. Publications were evaluated in terms of the institution, author, publication year, subject, number of citations, and the journal in which they were published.

Results: It was determined that there were 58,516 publications on DR, and the first publication was published in 1941. 41,996 of them were research papers. Only research articles were evaluated in our study. It was determined that there was an increase in the number of articles after the 1960s and that the year 2020 was the year in which the highest number of articles were published (6.3%). The United States (21.9%) and China (10.6%) were the countries with the highest number of articles. Turkey ranked 13th. The journals in which the highest number of articles were published were Investigative Ophthalmology and Visual Science (3.1%) and Ophthalmology (1.9%). The third leading institution with the most articles; Harvard Medical School (1.4%), University of Melbourne (1.1%), and Wilmer Eye Institute (1%).

Conclusion: The increase in scientific research on DR, both on treatment and prevention, causes an increase in the number of publications. The ranking of our country should be raised to higher levels in this regard.

Keywords: Bibliometric analysis, diabetic retinopathy, Scopus analysis.

Diabetic retinopathy (DR) is the most common complication of diabetes mellitus (DM). It has long been considered a microvascular disease.[1] Diabetic retinopathy is one of the long-term complications of diabetes and the major leading cause of vision loss among the working-age population in industrialized societies. As of 2010, this complication affects more than 100 million people globally and is estimated to increase to >190 million by the year 2030.[2] This disease, especially in the early stages, is largely asymptomatic and causes patients with diabetes not to be diagnosed in a timely manner. After the disease develops, regular eye screening is needed to ensure its management.[3] The increased number of affected people has resulted in an increase in scientific research on this topic.

Developing evidence-based clinical, pathological, and experimental data from the last 20 years has now led to an expanded view of how diabetic retinopathy develops. However, most of the available treatments focus on the late-stage.[2] This makes the treatment of DR difficult.[1] A better understanding of the pathophysiology associated with diabetes should therefore provide opportunities to prevent the disease at a much earlier stage. It is predicted that in the coming years, new pharmacological treatments based on understanding the causal mechanisms of DR

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will be developed and meet the need for both vascular and neuroprotection.[1] Laboratory and clinical evidence has shown that, in addition to microvascular changes, inflammation and retinal neurodegeneration may contribute to diabetic retinal damage in the early stages of DR. Further investigation of the underlying molecular mechanisms may provide targets for the development of new early interventions.[2,4]

In this study, we aimed to analyze the publications about diabetic retinopathy which is an important health problem worldwide, and compare Turkey's status.

MATERIALS AND METHODS

Research model

The research model is a situation analysis study, which is one of the qualitative research methods. The purpose of this study is to reveal results related to a specific situation. In order to create a model, Arıca et al.[5]'s study was taken as a model. With this evaluation method; studies on the subject are analyzed mathematically on the basis of various research parameters, including publication years, themes, authors and institutions, keywords, funding institutions, citations, methods, and samples.[5] In our study, we aimed to evaluate the current situation regarding DR research articles worldwide. The study was conducted in accordance with the principles of the Declaration of Helsinki.

The Scopus bibliometric database was searched in English using the same method as in a similar study. In the study, original research articles with the keywords "diabetic", "DM" and "retinopathy" and "article" in their title, abstract, and keywords were found between January 1, 1941, and June 9, 2021. Duplications were included in the review only once. The obtained data were analyzed in the Excel spreadsheet created by the researcher.

Data analysis

Using the bibliometric data analysis technique; mathematical and statistical analyzes (frequency and percentage) were performed. Publications were evaluated in terms of the country, institution, author, publication year, subject, number of citations, and the journal in which they were published. In addition, a special evaluation was made for Turkey.

Ethics approval

The study complied with the Helsinki Declaration, which was revised in 2013. Ethics committee approval is not required as there is no human or animal research.

RESULTS

It was determined that there were 58,516 publications on diabetic retinopathy and the first publication was published in 1941. Of these publications, 41,996 were research papers. Only research articles were evaluated in our study. It was found that the number of articles increased after the 1960s and 2020 was the year in which the highest number of articles were published (n=2,643, 6.3%) (Figure 1).

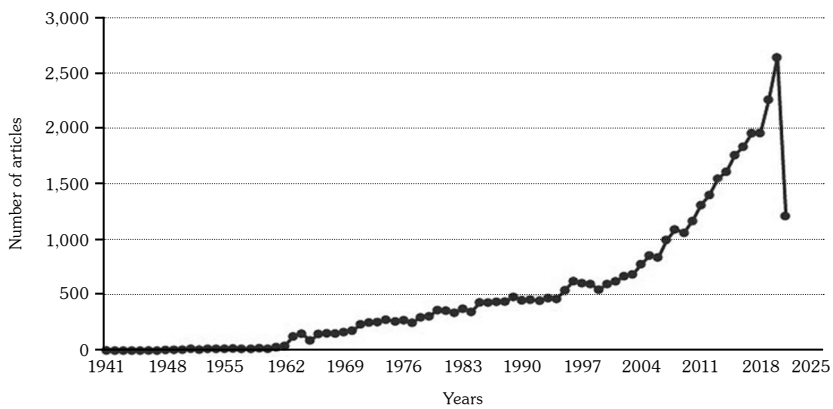

Figure 1. Distribution of articles by year.

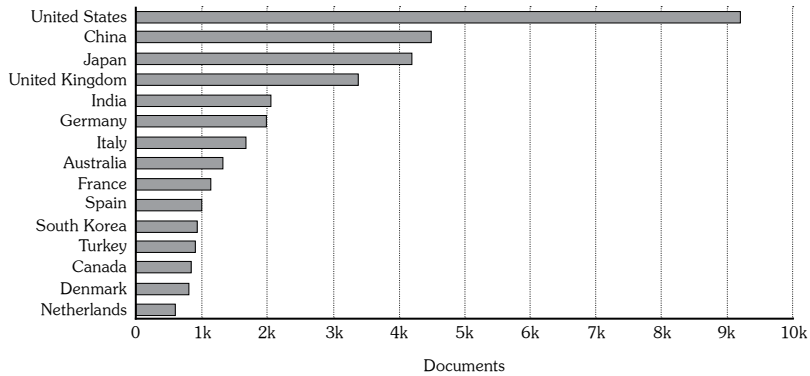

Figure 2. The number of publications by country.

The majority of the articles (n=34,125, 81.2%) were written in English. Chinese (n=1,585, 3.8%), Japanese (n=1,521, 3.6%), German (n=1,219, 2.9%), French (n=1,163, 2.8%), Spanish (n=548, 0.93%) Russian (n=535, 0.91%) were also the languages in which the most articles were published.

The United States (USA) (n=9,212, 21.9%), China (n=4,485, 10.6%), Japan (n=4,213, 10.3%), England (n=3,379, 8%), India (n=2,068, 4.9%) were the top five countries with the most articles on this topic. Turkey was in the 13th place with 905 articles (2.1%) (Figure 2).

12,483 (29.7%) of the articles were published in open access (OA) journals. The highest number of articles on DR were published in the journals of Investigative Ophthalmology and Visual Science (n=1,309). The highest number of articles on DR in this journal was in the year 1998 (Figure 3).

Articles were published in 28 different subject areas. Medicine (n=36,325, 86.5%), biochemistry/genetics/molecular biology (n=8,185, 19.5%), neuroscience (n=5,137, 12.2%), pharmacology/toxicology (n=1,619, 2.76%), nursing (n=1,266, 3%), engineering (n=1,161, 2.7%) were the areas with the highest number of publications.

The first three journals with the highest number of articles published were Investigative Ophthalmology and Visual Science (3.1%), Ophthalmology (1.9%), and Diabetes Care (1.8%) journals (Table 1).

The most repeated keywords in the articles were diabetic retinopathy (n=33,044, 78.6%) and human (n=33,983, 80.9%).

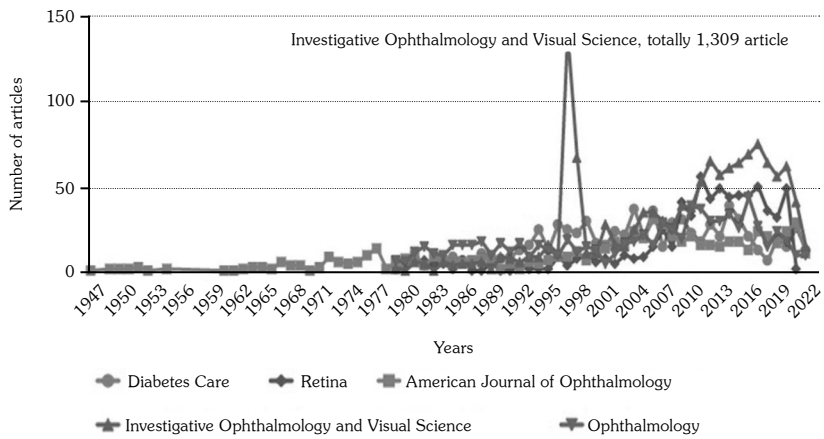

Figure 3. Distribution of the number of articles by years and journals.

Table 1. Top 10 journals with the highest number of articles on diabetic retinopathy (n=41,996)

Journal	n	%
Investigative Ophthalmology and Visual Science	1,311	3.1
Ophthalmology	797	1.9
Diabetes Care	785	1.8
Retina	703	1.7
American Journal of Ophthalmology	682	1.6
British Journal of Ophthalmology	673	1.6
Diabetic Medicine	565	1.3
Diabetes Research and Clinical Practice	536	1.2
Diabetologia	509	1.2
Diabetes	508	1.2

Table 2. Top 10 institutions with the highest number of articles published (n=41,996)

Institution	n	%
Harvard Medical School	602	1.4
University of Melbourne	442	1.1
Wilmer Eye Institute	408	1
Sydney University	399	1
Moorfields Eye Hospital	385	0.9
University of Wisconsin-Madison	368	0.8
Singapore Eye Research Institute	322	0.7
Australian Center for Eye Studies	316	0.7
Johns Hopkins School of Medicine	297	0.7
National University of Singapore	297	0.7

Financing institutions

Institutions that provide the most financial support for research articles were; National Eye Institute (n=2,337, 5.6%), National Institutes of Health (n=1,405, 3.3%), National Natural Science Foundation of China (n=867, 2.1%).

Distribution of the articles according to the institutions in which they were published

The three leading institutions with the most articles on DR were; Harvard Medical School (1.4%), University of Melbourne (1.1%), and Wilmer Eye Institute (1%) (Table 2).

Ronald E. Klein from the United States was the author who published the most articles on DR (Figure 4).

Citation analysis

Forty-four of these articles were cited at least 1,000 times, 122 of the 500 times, and 1,937 at least 100 times. The most cited article was "The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus"[6] published in 1993 by the Diabetes Control and Complications Trial Research Group. This article was cited 20,708 times. 2,000 of the articles that could be accessed were never cited. However, the

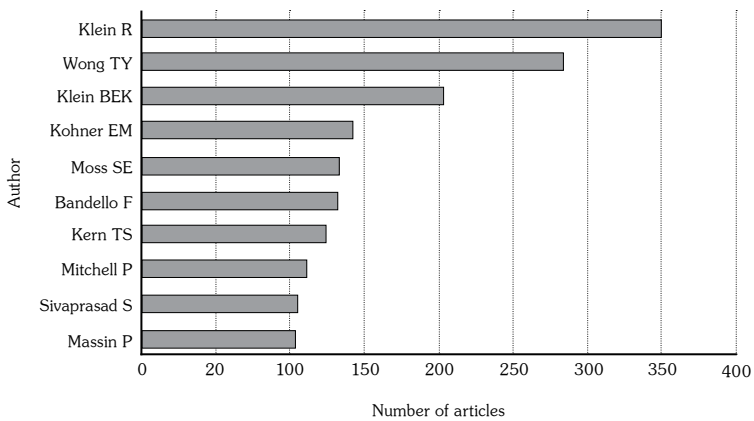

Figure 4. Authors who published the most on diabetic retinopathy.

Table 3. Analysis of the 10 most cited articles[6-15]

Author	Journal	Number of cites
Diabetes Control and Complications Trial Research Group, 1993[6]	New England Journal of Medicine	20,708
UK Prospective Diabetes Study (UKPDS) Group, 1998[7]	Lancet	17,161
Stratton et al.[8]	British Medical Journal	6,307
UK Prospective Diabetes Study Group, 1998[9]	British Medical Journal	6,294
ADVANCE Collaborative Group, 2008[10]	New England Journal of Medicine	5,406
Gæde et al.[11]	New England Journal of Medicine	3,615
Aiello et al.[12]	New England Journal of Medicine	3,200
The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 2003[13]	Diabetes Care	2,970
Resnikoff et al.[14]	Bulletin of the World Health Organization	2,948
Ohkubo et al.[15]	Diabetes Research and Clinical Practice	2,713

Table 4. Top 10 institutions in Turkey with the highest number of publications on diabetic retinopathy (n=905)

Institution	n	%
Istanbul University Faculty of Medicine	45	5
University of Health Sciences	42	4.6
Istanbul University	40	4.4
Ankara University	38	4.2
Hacettepe University	37	4.1
Ankara Numune Training and Research Hospital	25	2.7
Gazi University	23	2.5
Gülhane Training and Research Hospital	22	2.4
Ataturk Training and Research Hospital	21	2.3
Ondokuz Mayıs University	19	2.1

Scopus database only allowed the review of the least 2,000 articles for citation analysis (Table 3).

Evaluation of Turkey's research articles on diabetic retinopathy

Turkey was in 13th place in the publication ranking, 905 articles were published. There was a rapid increase in the number of publications after 2000, and the most publications were published in 2016 (80 articles) and 2020 (83 articles). The highest number of articles were published by Mehmet Çıtırık from Ankara Training and Research Hospital (Figure 5).

The institutions with the highest number of publications from Turkey were Istanbul University Faculty of Medicine (5%) and Health Sciences University (4.6%) (Table 4).

DISCUSSION

With the use of oral antidiabetic drugs and insulin treatments, the life expectancy of patients

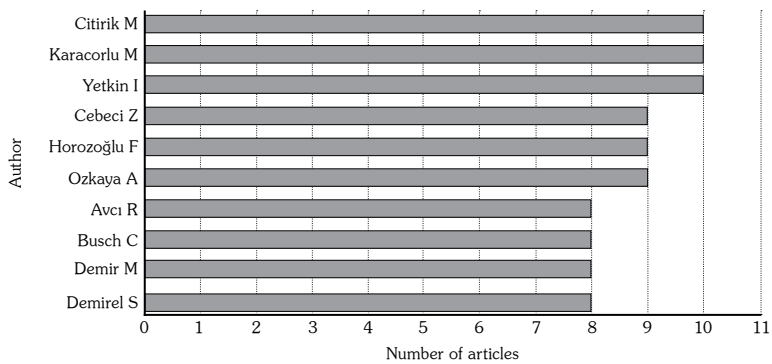

Figure 5. Authors who published the most on diabetic retinopathy from Turkey.

with diabetes has increased. The incidence of DR, one of the main complications of diabetes, has increased, too. Diabetic retinopathy is seen all over the world between the ages of 20-65 and is among the major causes of blindness in patients with diabetes. While the incidence of DR development within 10 years in patients diagnosed with diabetes before the age of 30 is 50%, this rate rises to 90% after 30 years. The longer the duration of diabetes, the higher the likelihood of DR findings. The risk of developing blindness in patients with diabetes is 25 times higher than in patients without diabetes.[16,17] For all these reasons, scientific products on DR are also carried out globally, and the globally increasing diabetic and aging population causes the studies on DR to continue without losing speed. In order to analyze the situation, we examined the research articles on DR based on the Scopus database, which is the largest database that provides bibliometric analysis. In our study, we found that the number of publications on DR is increasing both in our country and in the world. We believe that this situation will encourage the researchers to publish on DR.

With the bibliometric analysis method, holistic evaluations of scientific research can be made. By comparing previous studies, gaps in research areas can be identified and even comparisons can be made at the level of countries.[18-21] Internet databases are frequently used in the bibliometric analysis. While this method was frequently used in social field analyzes in previous years, it has also been used in medicine and eye diseases, which is our field, in recent years. In fact, different databases can be analyzed and mapped with visualization methods.[18-25]

Heng Wong et al.[24] in a bibliometric analysis study in which 100 groundbreaking articles in the field of eye were examined, it was reported that most of the publications were from the USA, as in our study. In this study, all types of articles were examined, 83% of the publications were original research articles and 15% of the publications were DR.[24] This shows that DR, which is the subject of our study, is one of the important issues in the field of eye diseases. In our study, only research articles were also evaluated. In this meta-analysis study, it was determined that most of the publications were published in the journals of Archives of Ophthalmology, the American Journal of Ophthalmology, and Ophthalmology. In our study, the first three journals in which the most articles were published; Journals were Investigative Ophthalmology and Visual Science (3.1%), Ophthalmology (1.9%), and Diabetes Care (1.8%).

While the Web of Science (WoS) database included in Thomson Reuters' publications was the only database for bibliometric studies until 2004, the number of bibliometric databases increased with the establishment of Scopus and Google Scholar in 2004.[26,27] Google Scholar was not evaluated in this study due to the difficulty in evaluating publication and citation data. In our study, SCOPUS, the largest database, was preferred for bibliometric analyzes.[26] PubMed, on the other hand, was evaluated in terms of comparison.

In the examination made with the same keywords in the PubMed database; It was determined that there were 38,245 publications, 36,274 research articles in total, and the maximum number of publications was in 2020.

In recent years, medical journals have switched to the OA publication model so that publications reach more people. In the OA model, the journal acts as a service provider by evaluating the article/product for the scientist (peer review) and providing the most widespread distribution. Before OA, some medical journals charged subscription fees from libraries as well as submission, color figure, or page fees from authors, while article processing/publication fee (APC) has become one of the main income items in the financing of journals with the OA model.[28] Lansingh and Carter[25] in their meta-analysis study, in which they examined publications in the field of ophthalmology, found that the articles published in the Scopus database did not show a significant difference between open and closed access articles in terms of the number of citations. In our study, 29.7% of the publications were in the form of OA. The citation numbers of these journals were not significantly different from other publications. Forty-four of the articles in our study were cited at least 1,000 times, 122 were cited 500 times, and 1,937 were cited at least 100 times. This shows that publications on DR have a very high citation potential.

As a result, the increase in scientific research on both treatment and prevention of DR causes an increase in the number of publications. The ranking of our country should be raised to higher levels in this regard.

The limitations of the study were that only research articles were evaluated and a single database was searched. Content analysis was not performed, only the characteristics of the publications were examined.

In conclusion, apart from developed countries, developing countries should also be encouraged to conduct research on this subject.

Declaration of conflicting interests

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REFERENCES

1. Wang W, Lo ACY. Diabetic retinopathy: Pathophysiology and treatments. Int J Mol Sci 2018;19:1816.
2. Lechner J, O'Leary OE, Stitt AW. The pathology associated with diabetic retinopathy. Vision Res 2017;139:7-14.
3. Jones S, Edwards RT. Diabetic retinopathy screening: A systematic review of the economic evidence. Diabet Med 2010;27:249-56.
4. Vujosevic S, Aldington SJ, Silva P, Hernández C, Scanlon P, Peto T, et al. Screening for diabetic retinopathy: New perspectives and challenges. Lancet Diabetes Endocrinol 2020;8:337-47.
5. Arıca R, Çorbacı A. Müşterilerin ortak üreticilik rolünü konu edinen araştırmaların incelenmesi: Scopus veri tabanında taranan turizm ve otelcilik dergilerinin bibliyometrik açıdan değerlendirilmesi. Turizm Akademik Dergisi 2019;5:263-76.
6. Diabetes Control and Complications Trial Research Group, Nathan DM, Genuth S, Lachin J, Cleary P, Crofford O, Davis M, et al. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. N Engl J Med 1993;329:977-86.
7. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). UK Prospective Diabetes Study (UKPDS) Group. Lancet 1998;352:837-53.
8. Stratton IM, Adler AI, Neil HA, Matthews DR, Manley SE, Cull CA, et al. Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): Prospective observational study. BMJ 2000;321:405-12.
9. UK Prospective Diabetes Study Group. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. UK Prospective Diabetes Study Group. BMJ 1998;317:703-13.
10. ADVANCE Collaborative Group, Patel A, MacMahon S, Chalmers J, Neal B, Billot L, Woodward M, et al. Intensive blood glucose control and vascular outcomes in patients with type 2 diabetes. N Engl J Med 2008;358:2560-72.
11. Gaede P, Vedel P, Larsen N, Jensen GV, Parving HH, Pedersen O. Multifactorial intervention and cardiovascular disease in patients with type 2 diabetes. N Engl J Med 2003;348:383-93.
12. Aiello LP, Avery RL, Arrigg PG, Keyt BA, Jampel HD, Shah ST, et al. Vascular endothelial growth factor in ocular fluid of patients with diabetic retinopathy and other retinal disorders. N Engl J Med 1994;331:1480-7.
13. Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care 1997;20:1183-97.
14. Resnikoff S, Pascolini D, Etya'ale D, Kocur I, Pararajasegaram R, Pokharel GP, et al. Global data on visual impairment in the year 2002. Bull World Health Organ 2004;82:844-51.
15. Ohkubo Y, Kishikawa H, Araki E, Miyata T, Isami S, Motoyoshi S, et al. Intensive insulin therapy prevents the progression of diabetic microvascular complications in Japanese patients with non-insulin-dependent diabetes mellitus: A randomized prospective 6-year study. Diabetes Res Clin Pract 1995;28:103-17.
16. Karabuğa Yakar H. Yaşlılıkta diyabetin diğer bir yüzü: Diyabetik retinopati ve düşmeler. IDUHeS 2018;1:13-22.
17. Erden B, Bölükbaşı S, Erdenöz S, Elçioğlu M. Diabetes mellitus ve oftalmoloji. Okmeydanı Tıp Dergisi 2015;31(Ek sayı):12-6.
18. Alkan S, Dindar Demiray EK, Yıldız E, Özlü C. Analysis of scientific publications on Acinetobacter bacteremia. Infect Dis Clin Microbiol 2021;1:39-44.
19. Nichols JJ, Jones L, Morgan PB, Efron N. Bibliometric analysis of the orthokeratology literature. Cont Lens Anterior Eye 2021;44:101390.
20. Manoel Alves J, Handerson Gomes Teles R, do Valle Gomes Gatto C, Muñoz VR, Regina Cominetti M, Garcia de Oliveira Duarte AC. Mapping research in the obesity, adipose tissue, and microRNA field: A bibliometric analysis. Cells 2019;8:1581.
21. Beshyah WS, Beshyah SA. Bibliometric analysis of the literature on Ramadan fasting and diabetes in the past three decades (1989-2018). Diabetes Res Clin Pract 2019;151:313-22.

22. Iftikhar PM, Ali F, Faisaluddin M, Khayyat A, De Gouvia De Sa M, Rao T. A bibliometric analysis of the top 30 most-cited articles in gestational diabetes mellitus literature (1946-2019). Cureus 2019;11:e4131.
23. Cen Y, Li Y, Huang C, Wang W. Bibliometric and visualized analysis of global research on fungal keratitis from 1959 to 2019. Medicine (Baltimore) 2020;99:e20420.
24. Heng Wong MY, Tan NYQ, Sabanayagam C. Time trends, disease patterns and gender imbalance in the top 100 most cited articles in ophthalmology. Br J Ophthalmol 2019;103:18-25.
25. Lansingh VC, Carter MJ. Does open access in ophthalmology affect how articles are subsequently cited in research? Ophthalmology 2009;116:1425-31.
26. Kawuki J, Yu X, Musa TH. Bibliometric analysis of Ebola research indexed in Web of Science and Scopus (2010-2020). Biomed Res Int 2020;2020:5476567.
27. Karasözen B, Gökkurt Bayram Ö, Umut Zan B. WoS ve Scopus veri tabanlarının karşılaştırması. Türk Kütüphaneciliği 2011;25:238-60.
28. Guo S, Wang L, Xie Y, Luo X, Zhang S, Xiong L, et al. Bibliometric and visualized analysis of stem cells therapy for spinal cord injury based on Web of Science and CiteSpace in the last 20 years. World Neurosurg 2019;132:e246-e258.