DOI:10.34084/bshr.1115592 e-ISSN 2587-1641

Journal of Biotechnology and Strategic Health Research

Araştırma Makalesi /Research Article

http://dergipark.org.tr/tr/pub/bshr

Global Trends On Rotavirus Vaccine's Studies

Rotavirüs Aşısı Çalışmalarında Küresel Trendler

Cemile Uyar[1], Serpil Oğuz Mızrakçı[2]

[1] Kütahya Evliya Çelebi Training and Research Hospital, Department of Infectious Diseases and Clinical Microbiology, Kütahya, Turkey.

[2] Liv Hospital, Infectious Diseases and Clinical Microbiology Gaziantep, Turkey

ORCID ID: Cemile Uyar https://orcid.org/0000-0003-2052-1359, Serpil Oğuz Mızrakçı https://orcid.org/0000-0002-7331-5877

***Sorumlu Yazar / Corresponding Author:** Cemile Uyar, **e-posta / e-mail:** cemileuyar@hotmail.com

Geliş Tarihi / Received : 11-05-2022 **Kabul Tarihi / Accepted:** 23-07-2022 **Yayın Tarihi / Online Published:** 31-08-2022

Uyar C, Mızrakçı SO. Global Trends On Rotavirus Vaccine's Studies, J Biotechnol and Strategic Health Res. 2022;6(2):146-153

Abstract

Aim The aim of the current study was to investigate global research trends and collaborations on the Rotavirus vaccines.

Material and Method We conducted bibliometric research in this study on the Web of Science database with the keywords related to the rotavirus vaccine. And also visualization techniques were used for mapping the collaborations. We only included the research articles and review articles.

Results We reached 5093 publications according to our search, and 52.916% were published as open access. The most preferred publication languages were English (96.682%). Most of the articles (13.627%) on the rotavirus vaccine were published in the Vaccine journal. The publications were from 164 countries globally. Most of the publications were from the United States of America (USA) (42.981%), England (9.641%), India (6.892%), Australia (6.146%), and Belgium (5.910%). The Centers For Disease Control Prevention, League of European Research Universities Leru, and World Health Organization (WHO) were the leading affiliations on rotavirus vaccine studies. The Hirsch (H) indexes of the publications from the USA were higher (H index: 127), but the Belgian publications' average number of citations per publication was the highest.

Conclusion The quantity of papers on the rotavirus vaccine has increased over time. The Centers for Disease Control and Prevention, the League of European Research Universities Leru, and the WHO were the most active institutions, and the USA was the most productive country. The number of publications from countries where the disease is common was below the desired level.

Keywords Rotavirus vaccine, bibliometric analysis, research trends.

Özet

Amaç *Mevcut çalışmanın amacı, Rotavirüs aşıları üzerindeki küresel araştırma eğilimlerini ve iş birliklerini araştırmaktı.*

Gereç ve Yöntem *Bu çalışmada, Rotavirüs aşısı ile ilgili anahtar kelimeler ile Web of Science veri tabanında bibliyometrik araştırma yapıldı. Ayrıca iş birliklerinin haritalandırılması için görselleştirme teknikleri kullanıldı. Sadece araştırma makaleleri ve derleme makaleleri dahil edildi.*

Bulgular *Araştırmamıza göre 5093 yayına ulaşıldı ve %52,916'sı açık erişim olarak yayınlanmıştı. En çok tercih edilen yayın dili İngilizce (%96,682) idi. Rotavirüs aşısı ile ilgili makalelerin çoğu (%13,627) Vaccine dergisinde yayınlanmıştı. Yayınlar dünya çapında 164 ülkeden idi. Yayınların çoğu Amerika Birleşik Devletleri (ABD) (%42,981), İngiltere (%9,641), Hindistan (%6,892), Avustralya (%6,146) ve Belçika'dan (%5,91) idi. Hastalık Kontrol Önleme Merkezleri, Avrupa Araştırma Üniversiteleri Birliği Leru ve Dünya Sağlık Örgütü (DSÖ) rotavirüs aşı çalışmalarında önde gelen kuruluşlardı. ABD kaynaklı yayınların Hirsch (H) indeksleri daha yüksekti (H indeksi: 127), ancak Belçika yayınlarının yayın başına ortalama atıf sayısı en yüksekti.*

Sonuç *Rotavirüs aşısı ile ilgili yayınların sayısı zamanla artmıştı. Hastalık Kontrol ve Önleme Merkezleri, Avrupa Araştırma Üniversiteleri Birliği Leru ve DSÖ en aktif kurumlardı ve Amerika Birleşik Devletleri en üretken ülkeydi. Hastalığın sık görüldüğü ülkelerden yayın sayıları istenen seviyenin altındaydı.*

Anahtar Kelimeler *Rotavirüs aşısı, bibliyometrik analiz, araştırma eğilimleri.*

INTRODUCTION

Rotavirus vaccination protects against rotavirus infections, which are the major cause of severe diarrhea in children under the age of five[1]. It was estimated that Rotavirus infection caused 440,000 fatalities, two million hospitalizations, and 25 million outpatient visits each year in children aged five years old over the world[2]. The transmission route is the fecal-oral route. It can cause severe diarrhea and even death. Even the nosocomial epidemics. Severe rotavirus gastroenteritis is seen in children who are usually immunosuppressed, unvaccinated, and aged between six months and two years of age[3].

Rotavirus vaccines have been introduced or will be introduced into national or subnational immunization programs in over 70% of nations and 90% of countries in the Global Alliance for Vaccines and Immunization[4]. It has been reported that rotavirus vaccines prevent 15-34% of severe diarrhea in developing countries and 37-96% of severe diarrhea in industrialized developed countries[5]. Animal rotavirus strains, human-animal rotavirus reassortants, attenuated human rotaviruses, subunits of rotavirus virions, and virus-like particles have all been used to develop rotavirus vaccines[6,7]. As most human rotaviruses grow too weak in cell culture to produce normal vaccine batches for large-scale immunization campaigns, reassortants are required for live virus-based vaccines. In humans, monovalent vaccinations made from animal rotaviruses have not proven effective. Human trials for rotavirus subunit vaccine candidates have begun[6-8].

In this study, bibliometric methods and advanced visualizing techniques were used for investigating the global Rotavirus vaccine research outputs.

MATERIAL and METHODS

The data was retrieved from the Thomson Reuters' Web of Science (WoS) Core Collection database. We selected in the topic (abstract, title, keywords) the search term "(rotavirus vaccine* OR "rotavirus vaccine* " OR " Rotarix *" OR RotaTeq*" OR, Rotavac*" OR, Rotavin-M1*" OR, Lanzhou lamb*" OR, Rotasiil*)" was used. The document type filter "article and review article" was used to limit the search to only research related "Rotavirus vaccine," while other document categories such as letters and conference abstracts were excluded. The search was limited to 1970 to December 31st, 2021, ensuring that only years completed by the time of the search were considered in the study. In this study, human rotavirus vaccines were selected within the sample pool.

The information was transferred to Microsoft Excel 2013 for Windows (Microsoft Corp., Redmond, WA, United States of America, USA). The WoS database was used to analyze the citations. The number of publications was considered as a metric of research quantity, and the Hirsch-Index (H-index) was used as an indicator of research output quality. For each publication, the total number of citations as well as the average number of citations per item were calculated (citation rate). The bibliometric data from the findings was saved in a separate database and shown in visualizations using tables.

Mapping

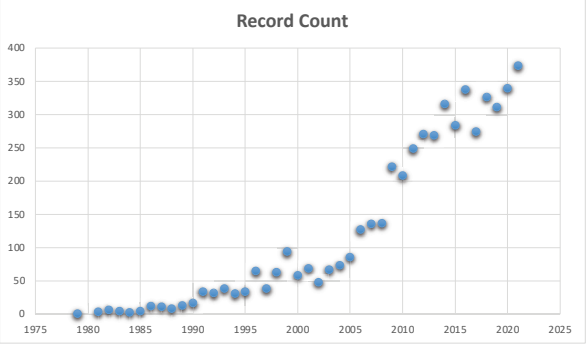
The VOSviewer software version 1.6.16 was utilized for visualization mapping (http://www.vosviewer.com).

Co-authorships, co-occurrences, countries, author keywords, and co-citations of the cited sources were analyzed with visualization mapping techniques. Which collaborations were used were defined under the map figures explanations. To show the collaborations between countries or institutions, we used linking lines to illustrate our findings.

RESULTS

We reached 5093 publications according to our search, and 52.916% were published as open access. The most preferred publication languages were English (96.682%), French (0.864%), Spanish (0.844%), German (0.471%) and Portuguese (0.353%).

The first report was published in the year 19799. 2021 (n=381) was the year with the highest number of publications (Graphic 1).



Graphic 1. The number of publications by the years.

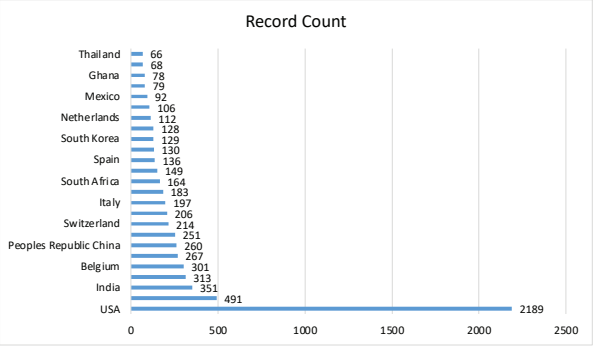
Most of the publications were published in Science Citation Index Expanded (SCI-Expanded) journals (n = 4737, 93.01%) indexed journals (Graphic 2).

Most of the articles (13.627%) on the rotavirus vaccine were published in the Vaccine journal (Table 1).

Table 1: The list of mostly published journals on rotavirus vaccine

Journals	Record Count	% of 5.093
Vaccine	694	13.627
Pediatric Infectious Disease Journal	250	4.909
Journal of Infectious Diseases	212	4.163
Human Vaccines Immunotherapeutics	180	3.534
Journal of Medical Virology	140	2.749
Plos One	113	2.219
Infection Genetics and Evolution	94	1.846
Clinical Infectious Diseases	91	1.787
Pediatrics	87	1.708
Journal of Virology	84	1.649
Journal of Clinical Microbiology	71	1.394
Archives of Virology	65	1.276
Expert Review of Vaccines	56	1.100
BMC Infectious Diseases	47	0.923
Journal of Clinical Virology	47	0.923
Communicable Diseases Intelligence	40	0.785
Vırology	38	0.746
Viruses Basel	36	0.707
Lancet	33	0.648
Epidemiology and Infection	32	0.628
Scıentıfic Reports	31	0.609
Emergıng Infectious Diseases	30	0.589
Journal of Virological Methods	29	0.569
BMC Public Health	28	0.550
Journal of General Virology	28	0.550
*Showing 25 out of 959 entries		

The publications were from 164 countries globally. Most of the publications were from the United States of America (USA) (42.981%), England (9.641%), India (6.892%), Australia (6.146%), and Belgium (5.910%). Figure 1 depicts trends in the number of papers with authors from each of the two major regions (the USA and the European Union) (Graphic 2).



Graphic 2. The most publishing countries on rotavirus vaccine.

The Rotanet-Italy Study Group (n=14, 0.274%), Australian Rotavirus Surveillance (n=10, 0.196%) and Vacsurv Consortium (n=10, 0.196%) were the main study groups on rotavirus vaccine studies. Umesh D.Parashar from the Centers for Disease Control & Prevention (CDC) – USA was the most published author on rotavirus vaccine studies.

The USA Department of Health and Human Services funded most of the publications (14.137%) (Table 2).

Table 2: The list of the leading funding agencies		
Funding Agencies	Record Count	% of 5.093
The USA Department of Health Human Services	720	14.137
National Institutes of Health USA	574	11.270
National Institute of Allergy Infectious Diseases	374	7.343
Glaxosmithkline	307	6.028
Bill Melinda Gates Foundation	258	5.066
Centers For Disease Control Prevention USA	150	2.945
European Commission	147	2.886
Merck Company	143	2.808
World Health Organization	106	2.081
Wellcome Trust	91	1.787

Showing 10 out of 2.556 entries;2.172 record(s) (42.647%) do not contain data in the field being analyzed.

The CDC, League of European Research Universities Leru, and World Health Organization were the leading affiliations on rotavirus vaccine studies (Table 3).

Table 3: The leading affiliations on rotavirus vaccine		
Affiliations	Record Count	% of 5.094
Centers For Disease Control Prevention USA	695	13.644
League of European Research Universities Leru	262	5.143
World Health Organization	217	4.260
Glaxosmithkline	212	4.162
National Institutes of Health USA	202	3.965
Universiy of London	176	3.455
Johns Hopkins Universiy	171	3.357
Cincinnatı Children S Hospital Medıcal Center	144	2.827
Merck Company	139	2.729
PATH	139	2.729

Showing 10 out of 4.748 entries; 34 record(s) (0.667%) do not contain data in the field being analyzed.

The H indexes of the publications from the USA were higher (H index: 127), but the Belgian publications' average number of citations per publication was the highest (Table 4).

Table 4: The number of publications, citations and H indexes of top listed five countries				
Country	Number of publications	Number of citations	H indexes	Number of citations avarage per publication
USA	2,189	98618	127	45.05
England	491	22655	68	46.14
India	351	17767	49	50.62
Australia	313	14388	49	45.97
Belgium	301	22195	60	73.74*
Total	5,093	155050	143	30.44
*Showing the highest number				

Mapping

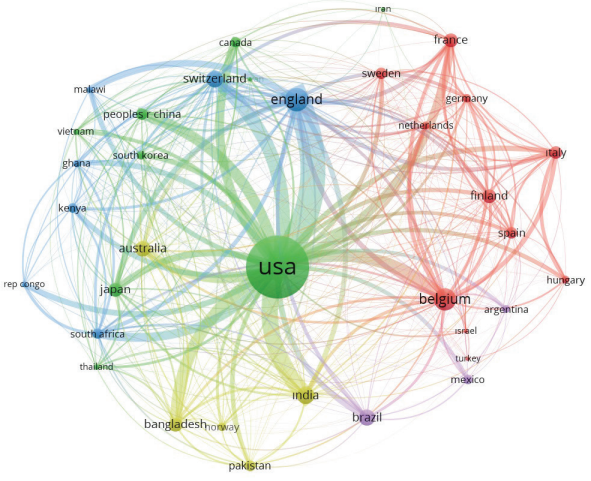


Figure 1. Mapping of countries in international collaboration with at least 50 publication and 50 citations.

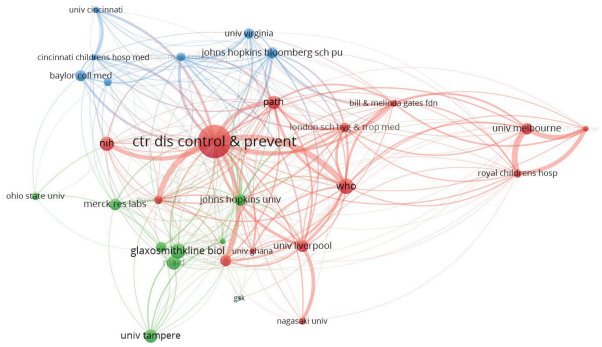


Figure 2. Mapping of organizations in international collaboration with at least 50 publication and 50 citations.

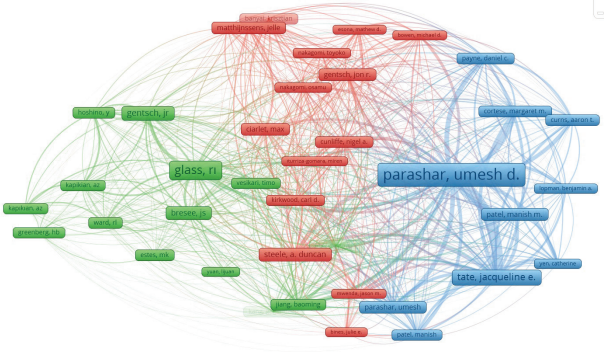


Figure 3. Citation visualization map among authors with at least 30 publication and 30 citations.

*The lines connecting the authors are indicative of citations. Relatively more cited authors represented by larger circle size or font size.

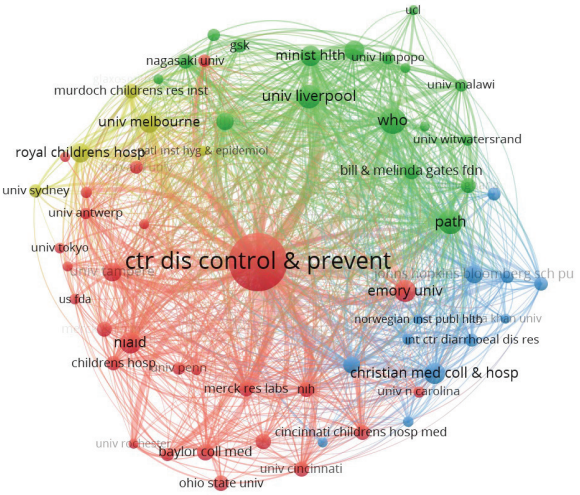


Figure 4. Citation visualization map among organization with at least 30 publication and 30 citations.

*The lines connecting the authors are indicative of citations. Relatively more cited authors represented by larger circle size or font size.

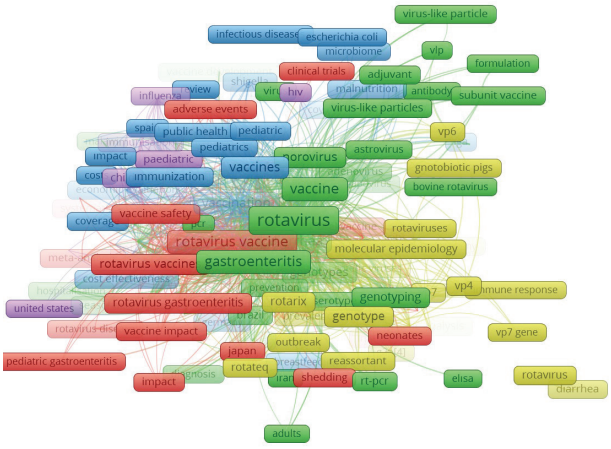


Figure 5. Keyword visualization map of publications that are mentioned at least 10 times.

*Converging lines are indicative of occurrence relationships in articles. Keywords represented by larger circle size or font size appeared relatively more in article.

DISCUSSION

Bibliometric analysis is an important technique for assessing and analyzing the output and trends of scientific research. Sharing extremely early information with the public, researchers, government organizations, institutes, and at national and international levels is of considerable interest. Safety measures and guidelines are implemented based on this type of information[11-20]. A few bibliometric studies have been performed on research relating to rotavirus[19,20], but no similar studies on rotavirus vaccine have been published yet.

Bibliometric analyses aid in revealing the state of a certain field of science as well as influencing next studies[11-20]. The rotavirus vaccine has been the subject of several excellent scientific investigations. It will be advantageous for scientists who wish to pursue this topic further to look at the studies of the specified researchers and to collaborate[11-20]. This bibliometric analysis of global research output in the field of the rotavirus vaccine reveals an increase in the number of publications during the last two decades. We conducted a preliminary search in the Wos database using keywords related to the rotavirus vaccine. We chose the WOS database for the extraction since it is a scientific database in the biomedical field with a precise and particular search engine. Also, we chose research articles and review articles. With this study, the bibliometric analysis of the rotavirus vaccine was conducted for the first time in the available literature.

Rotavirus infection has become extremely important all over the world1[4,5]. Vaccination studies on this disease, which affects the whole world, have also gained importance. Therefore, we wanted to address this topic in our study. As a result, the current study attempted to assess the overall global research output and visualize the rotavirus vaccination research area. The fact that the number of articles increased over the years (Graphic1) in our study reveals that this issue is a hot topic.

Rotarix (GlaxoSmithKline Biologicals SA, Rixensart, Belgium) and RotaTeq (Merck & Co., Inc., West Point, PA, USA) were both licensed and rapidly integrated into national immunization programs in many countries in 2006. WHO recommends primarily rotavirus vaccines. Inclusion in national immunization programs around the world in 2009 live attenuated oral vaccines has been found to be effective in developing countries in Africa and Asia[21]. By the end of 2018, 92 countries had integrated the rotavirus vaccine into their national immunization programs, with another 6 countries implementing the vaccine in stages or regions[4]. Only four countries account for roughly half of all rotavirus-related deaths (India, Nigeria, Pakistan, and the Democratic Republic of the Congo)[22]. But our results showed that there are limited studies from underdeveloped countries such as Nigeria, Pakistan, and the Democratic Republic of the Congo where the diseases is endemic. In our study, it was determined that, in addition to global organizations such as CDC and WHO, industrial organizations such as GlaxoSmithKline both provide funds for these scientific outputs and produce scientific articles. Also, the countries (Belgium and the USA) where the two important vaccines were produced had the biggest number of publication numbers (Graphic 2).

Bibliometric analyses can be carried out using pre-existing databases of publications on a subject or, depending on the preferences of the researchers, using datasets that they have produced themselves. Mapping techniques can be used23-25. In this study we analysed the keywords, international collabrations, coauthorship analyses by using Vos Viewer programme (Figure 1-5).

In our study, a total of 5093 publications on the rotavirus vaccine were analyzed. We found that the number of publications published has increased significantly in the last 20 years. In this study, the most frequent keyword and author co-occurrence keywords were given in Figure 5. The H indexes of the publications from the USA were higher (H index: 127), but the Belgian publications' average num-

ber of citations per publication was the highest. The most productive country was the USA. According to the previous bibliometric analysis in the rotavirus search[15,19], the leading country was the USA. This once again showed the importance given to scientific studies and the fact that the USA has many scientific institutions[17-19].

CONCLUSION

This is the first bibliometric study to provide comprehensive data on the rotavirus vaccine's published literature. The quantity of papers on the rotavirus vaccine has increased over time. The CDC, the League of European Research Universities Leru, and the WHO were the most active institutions, and the USA was the most productive country. The number of publications from countries where the disease is common was below the desired level. Rotavirus was the most common co-occurrence author keyword. This study's conclusions may be useful to researchers, policymakers, and educational goals. Funding agencies can use it to assess current research and potential research trends in rotavirus vaccines. Future research paths are still focused on developing effective vaccines and treatment therapies.
Limitations: This study only covers one database's results with the preferred keywords. Additionally, since the keywords were exclusively in English, it's possible that publications written in other languages were left out. This research did not use content analysis. Future comparison studies may be planned to be more thorough.

Ethics Approval

As there is no human or animal involvement in most bibliometric investigations, no ethical approval was necessary.

Conflict of Interests

The authors declare that they have no conflicts of interest.

Institutional and Financial Support

The authors declared that they had received no financial support for this study

Author Contributions

SOM, CU: Contributed to the conception of the work, conducted the study, revised the data, approved the final version of the manuscript, and agreed to all aspects of the work. SOM, CU: Contributed to the collecting data of the work. SOM, CU: Contributed to the conception of the work, revising the data, approved the final version of the manuscript, and agreed to all aspects of the work.

References

1. World Health Organization (2013). Rotavirus vaccines: WHO position paper—January 2013. Weekly Epidemiological Record. 88(5): 49–64.
2. Parashar UD, Hummelman EG, Bresee JS, et al. Global illness and deaths caused by rotavirus disease in children. Emerg Infect Dis. 2003; 9:565.
3. Alkan S, Dindar Demiray EK, Akça A, et al. Nozokomiyal Rotavirüs Enfeksiyonları. Black Sea Journal of Health Science. 2022; 5(1): 138-142.
4. International Vaccine Access Center. Available at: http://view-hub.org (Accessed on March 14, 2022).
5. Soares-Weiser K, Bergman H, Henschke N, et al. Vaccines for preventing rotavirus diarrhoea: vaccines in use. Cochrane Database Syst Rev. 2019;3(3):CD008521. doi:10.1002/14651858.CD008521.pub4
6. Changotra H, Vij A. Rotavirus virus-like particles (RV-VLPs) vaccines: An update. Rev Med Virol. 2017;27(6):10.1002/rmv.1954. doi:10.1002/rmv.1954
7. Bhandari N, Rongsen-Chandola T, Bavdekar A, et al. Efficacy of a monovalent human-bovine (116E) rotavirus vaccine in Indian infants: a randomised, double-blind, placebo-controlled trial. Lancet. 2014;383(9935):2136-2143. doi:10.1016/S0140-6736(13)62630-6
8. Cunliffe NA, Bresee JS, Hart CA. Rotavirus vaccines: development, current issues and future prospects. J Infect. 2002; 45:1.
9. Lecce JG, King MW. The calf reo-like virus (rotavirus) vaccine: an ineffective immunization agent for rotaviral diarrhea of piglets. Can J Comp Med. 1979;43(1):90-93.
10. Küçük U, Alkan S, Uyar C. Bibliometric analysis of infective endocarditis. Iberoam J Med. 2021;3(4):350-355.
11. Özlü C. Bibliometric Evaluation Based On Scopus Database: A Global Analysis of Publications on Myelodysplastic Syndrome and Evaluation of Publications From Turkey. Biotech Strateg Health Res. 2021;5(2):125-131.
12. Dindar Demiray EK, Oğuz Mızrakçı S, Alkan S. Analysis of publications on Acinetobacter: A Scopus database search study. J Clin Med Kaz. 2021;18(5):44-48. doi.org/10.23950/jcmk/11226.
13. Alkan-Çeviker S, Öntürk H, Alıravcı ID, Sıddıkoğlu D. Trends of COVID 19 vaccines: International collaboration and visualized analysis. Infect Dis Clin Microbiol. 2021; 3(3): 129-136.
14. Özlü A. Miyofisal Ağrı Sendromu Konulu Yayınların Analizi. International Anatolia Academic Online Journal Health Sciences.2021;7(3):65-78.
15. Ekici A, Alkan S, Aydemir S, Gürbüz E, Unlu AH. Trends in Naegleria fowleri global research: A bibliometric analysis study. Acta Tropica. 2022. Preprint. doi: https://doi.org/10.1016/j.actatropica.2022.106603
16. Mızrakçı S, Dindar Demiray EK, Öntürk Akyüz H. Bruselloz Konulu Yayınların Global Analizi ve Türkiye'den Yapılan Yayınlarla Karşılaştırılması. J Biotechinol & Strategic Health Res. 2021;5(3):229-235.
17. Köylüoğlu AN, Aydın B, Özlü C. Bibliometric evaluation based on scopus database: Global analysis of publications on diabetic retinopathy and comparison with publications from Turkey. D J Med Sci. 2021;7(3):268-275.
18. Gürler M, Alkan S, Özlü C, Aydın B. Collaborative Network Analysis and Bibliometric Analysis of Publications on Diabetic Foot Infection. J Biotechinol & Strategic Health Res. 2021;5(3):194-199.
19. Mızrakçı S. Rotavirus Konulu Yayınlara Global Bakış. Black Sea Journal of Health Science. 2022;5(2):239-244.
20. Banchi P, Rota A, Bertero A, et al. Trends in Small Animal Reproduction: A Bibliometric Analysis of the Literature. Animals (Basel). 2022;12(3):336. doi:10.3390/ani12030336
21. Rotavirus vaccines WHO position paper: January 2013- Recommendations. Vaccine. 2013;31(52):6170-6171. doi:10.1016/j.vaccine.2013.05.037
22. Tate JE, Burton AH, Boschi-Pinto C, et al. World Health Organization-Coordinated Global Rotavirus Surveillance Network. Global, regional, and national estimates of rotavirus mortality in children <5 years of age, 2000-2013. Clin Infect Dis. 2016; 62 (Suppl 2):S96–S105.
23. Gökçe ON, Alkan S. Contribution of Turkey in Liver Transplant Research: A Scopus Database Search [published online ahead of print, 2022 May 23]. Exp Clin Transplant. 2022;10.6002/ect.2021.0491. doi:10.6002/ect.2021.0491
24. Cinpolat HY. A bibliometric analysis of global research trends on biomarker studies in Alzheimer's disease. D J Med Sci. 2022;8(1):5-10.
25. Şahin S. Vasküler Cerrahiye Genel Bakış. Black Sea Journal of Health Science. 2022; 3-4. doi:10.19127/bshealthscience.1076552