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Bibliometric Analysis of Scientific Studies on Covid-19 in Turkey

Türkiye'de Covid-19 Üzerine Yapılan Bilimsel Çalışmaların Bibliyometrik Analizi

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Abstract: With the coronavirus epidemic (COVID-19) that emerged in 2019, many studies have been conducted around the world. It is very important to review these studies. The purpose of this research is to evaluate COVID-19 studies produced in Turkey. To conduct a descriptive bibliometric study to determine the trends in research. In this regard, publications in Web of Science database were used. Frequency analysis and bibliometric analysis of the published articles were performed. Worldwide publication trends were compared with Turkish results. Worldwide, 3.6% of the articles on COVID-19 originate from Turkey. Turkey is among the 10 countries that produce the most articles in the world. Within the international cooperation, most of the joint work has been done with the USA (5.47%). Contrary to the world, the categories of pediatrics, psychiatry, pharmacology, pharmacy and nursing have come to the fore in COVID-19 studies in Turkey. The most common keywords in the studies are as follows: "covid-19", "sars-cov 2", "pandemic", "anxiety", "coronavirus", "mortality", "turkey", "depression", "children", "pneumonia". "pneumonia". It has been observed that research on COVID-19 has started to decrease worldwide. Although Turkey is one of the countries that publishes the most articles on the subject in the world, it is very important to study the long-term effects of the epidemic both worldwide and in the country. It is believed that the research results will help to determine the problems to be solved in the future, research priorities and collaborations regarding the long-term effects of COVID-19.

Keywords: Bibliometrics, Covid-19, Pandemic, Medical information, Public health, Epidemiology.

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Özet: 2019 yılında ortaya çıkan koronavirüs salgını (COVID-19) ile birlikte dünya genelinde birçok çalışma yapılmıştır. Bu çalışmaları incelemek oldukça önemlidir. Bu araştırmanın amacı Türkiye'de üretilen COVID-19 çalışmalarını değerlendirmek ve araştırmalardaki eğilimleri belirlemek için tanımlayıcı bir bibliyometrik çalışma yürütmektir. Bu bağlamda Web of Science veri tabanındaki yayınlar kullanılmıştır. Yayımlanan makalelerin frekans analizi ve bibliyometrik analizi yapılmıştır. Dünya genelindeki yayın eğilimleri Türkiye sonuçları ile karşılaştırılmıştır. Dünya genelinde COVID-19 üzerine yapılan makalelerin %3,6'sı Türkiye'den üretilmiştir. Türkiye dünyada en fazla makale üreten 10 ülke arasındadır. Uluslararası iş birliği kapsamında en fazla ortak çalışma ABD (%5,47) ile yapılmıştır. Dünya genelinden farklı olarak Türkiye'de COVID-19 çalışmalarında pediatri, psikiyatri, farmakoloji, eczacılık ve hemşirelik kategorileri ön plana çıkmıştır. Çalışmalarda en sık kullanılan anahtar kelimeler şunlardır: "covid-19", "sars-cov 2", "pandemi", "anksiyete", "koronavirüs", "mortalite", "türkiye", "depresyon", "çocuklar", "zatürre". COVID-19 ile ilgili araştırmaların dünya çapında azalmaya başladığı gözlemlenmiştir. Türkiye, dünyada konuyla ilgili en çok makale yayınlayan ülkelerden biri olmasına rağmen, salgının hem dünya çapında hem de ülke çapında uzun vadeli etkilerinin incelenmesi oldukça önemlidir. Araştırma sonuçlarının COVID-19'un uzun vadeli etkileriyle ilgili gelecekte çözülmesi gereken sorunları, araştırma önceliklerini ve iş birliklerini belirlemeye yardımcı olacağına inanılmaktadır.

Anahtar Kelimeler: Bibliyometri, Covid-19, Pandemi, Tıbbi bilgi, Halk sağlığı, Epidemiyoloji.

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1. Introduction

COVID-19 is a global pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The coronavirus (COVID-19) epidemic, which started in December 2019, spread rapidly in many countries around the world and caused the deaths of millions of people due to the lack of a definitive treatment (1). This outbreak was declared a pandemic by the World Health Organization (WHO) on March 11, 2020 (2). COVID-19 causes various upper respiratory tract symptoms such as fever, cough, shortness of breath, nasal congestion, sore throat, and impaired smell (3,4,5). It has been reported that it generally affects men in the middle-aged and elderly groups, and the highest mortality rate is seen in the group over 80 years of age (6). It has been stated that having common diseases such as high blood pressure, cardiovascular disease, obesity, and diabetes increases the effect of infection and mortality (3,4).

The transformation of Covid-19 into a worldwide pandemic has posed a major threat to the international community and raised public health concerns. The epidemic has created a serious challenge for countries to respond appropriately (7). Countries around the world have faced major economic and social burdens. This process has had a negative impact not only on health, but also on many areas and issues such as agriculture, food, travel, tourism, economy, environment, waste and energy (8).

That's why COVID-19 has emerged as a widely researched topic. Extensive research has been published to understand and mitigate the disease (9). Academia has begun to investigate the effects of COVID-19 on human life and various sectors of society (10). Interest in COVID-19 spread rapidly in the scientific literature and among researchers (11). It has been stated in previous studies on the subject that the huge increase in the number of articles makes it increasingly difficult to follow the findings (12). Systematically summarizing publications with bibliometric analysis is very important to provide a road map to researchers (13,14).

Bibliometrics is a visual method used to determine developments in research trends and future research priorities by analyzing research publications in a specific field (15,16,17). Researchers have conducted various bibliometric studies on COVID 19. Although positive progress has been made in COVID-19 research, it has been reported that scientific studies have not been systematically

summarized and classified (14). While some researchers made country-by-country evaluations, some researchers examined publications addressing the impact of COVID-19 on various scientific fields and carried out bibliometric studies. Some researchers have analyzed studies examining the impact of COVID-19 on sustainable development goals (18,19,20).

When we examine the studies in the literature, Wang et al. (2022) focused on ear-nose-throat research related to COVID-19 and conducted a bibliometric analysis of these articles (5). Wu et al. (2023) discussed studies investigating the impact of COVID-19 on pregnancy (8). Zeng et al. (2023) evaluated studies on vaccine development (1), while Wen et al. (2023) evaluated the studies on medical imaging in the process (15). Cortez et al. (2023) physical exercise studies (21), Wang et al. (2023) environmental pollution research (22), Benita (2021) transportation and human mobility behaviors (23), Jacimovic et al. (2021) dental research (24), Roychowdhury et al. (2022) examined publications in the field of social sciences (10) and Zyoud (2024) examined randomized clinical studies in the context of COVID-19 (9). In addition, there are studies in the literature that evaluate the research trends of India, Iran, Morocco, Canada, Cuba, South Asian countries and Latin American countries regarding COVID-19. It has been observed that the scientific contributions of these countries to COVID-19 have been evaluated from a bibliometric perspective (4,7,25-29).

However, as the impact of the pandemic decreased in terms of lethal spread, a decrease was observed in the number of relevant research and publications over the years. Although it is thought that the deadly effect of COVID-19 has passed, there is no doubt that its long-term effects still continue. An example of the long-term impact of COVID-19 is the increase in deaths due to heart attacks at young ages. It is reported that COVID-19 continues with different variants (8). In addition, the COVID-19 pandemic and new variants of the virus have revealed the urgency of implementing the sustainable development 2030 agenda (20,30). It has been stated that fundamentally sound social and economic data are lacking in some developing regions. Although studies have been and are being carried out on the relevant subject, it has been stated that more research is needed, pointing out the inadequacy in number (20,31). In this context, it is very important

to continue to investigate the long-term effects of the COVID-19 epidemic.

Like all countries in the world, Turkey has been negatively affected by the pandemic process. Giannos et al. (2022) stated that countries with low population density, such as Switzerland, Indonesia and Turkey, exhibited higher research efficiency for COVID-19 (31). There are studies in the literature evaluating the publications of various countries on their contributions to COVID 19. As far as we know, there is no research on bibliometric analysis of studies on COVID-19 conducted in Turkey in recent years.

The aim of this research is to carry out a descriptive bibliometric study to determine trends in COVID-19 research produced in Turkey. In the study, COVID-19 research outputs will be evaluated in determining the country's scientific road map. It is thought that the results may help determine future problems and research priorities regarding the long-term impact of COVID-19.

2. Materials and Methods

Publications related to COVID 19 were obtained through the Web of Science database. The scan was carried out on February 12, 2024. The scanning process was done by writing "covid 19" in the "All Field" section. Only "original article" was taken as the document type. There is no index limitation in the scanning process. Articles from 2019 to the present were selected as the year. 329747 articles were reached in the search strategy. Among these articles, studies conducted in Turkey were scanned. Evaluations were made on 11872 publications from Turkey. All broadcast information was compared with broadcast information made in Turkey. The analyze results menu in the Web of Science database and VOSviewer v1.6.20 software were used to analyze the publications. VOSviewer is a free software that can draw bibliometric networks at different levels of countries, organizations, journals, researchers or individual publications using bibliographic data. It can present association networks visually. The screening strategy and other steps of the study are shown in Figure 1.

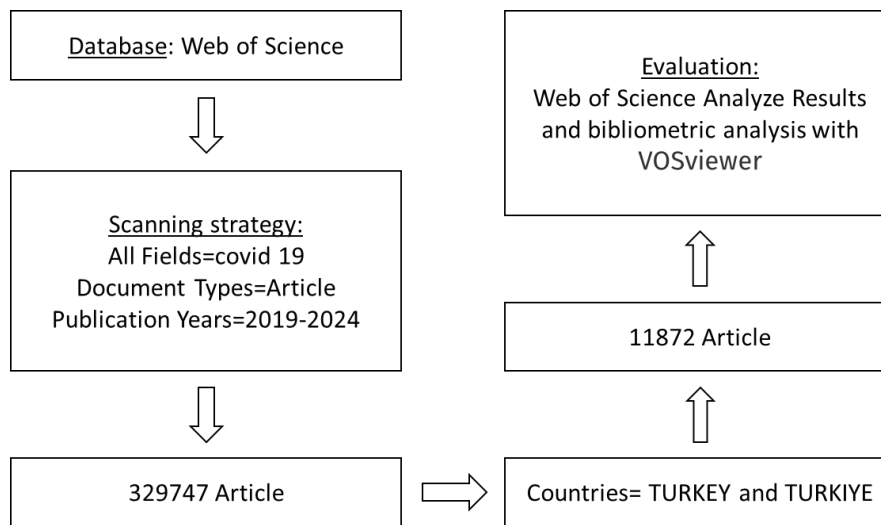


Figure 1. Scanning strategy and steps

3. Results

In this section, the frequency analysis of articles about COVID 19 according to some categories is summarized in tables. In the tables, the distribution of articles published all over the world (329747 articles) and articles published in Turkey (11872 articles) according to fields is shown and presented comparatively. The areas covered in frequency analysis are: Web of Science Categories, Authors, Publication Years, Citation Topics Meso, Citation

Topics Micro, Web of Science Index, Affiliations, Affiliation with Department, Publication Titles, Languages, Countries/Regions, Research Areas, Funding Agencies, Sustainable Development Goals. Following the frequency analysis, bibliometric analysis results were shared.

First, the 10 most published categories according to Web of Science categories were examined (Table 1).

According to the evaluation, 10.99% of the publications regarding COVID 19 since 2019 have fallen into the "Public Environmental Occupational Health" field. Most publications were made in this field. 5.37% of the publications made in Turkey fell into the field of "Public Environmental Occupational Health". The most publications about COVID 19 in Turkey were made in the "Medicine General Internal" category (15.10%). Worldwide, the publication rate in the "Medicine General Internal" category is 8.67%. While the "Pediatrics" category emerged as the third field with the most articles in Turkey, it was not among the top 10 categories worldwide. Likewise, the "Nursing" category can be given as an example. While "Psychiatry" is the 4th

category with the most articles in Turkey, it is ranked 10th in the world. While 4.89% of all articles fall into the field of "Environmental Sciences", this rate is 2.83% in Turkey. In addition, while the fields of "Immunology", "Health Care Sciences Services", "Medicine Research Experimental" were among the 10 most published categories, these categories were not in the top 10 in Turkey. The "Education Educational Research" category constitutes approximately 3% of the total publications both in the world and in Turkey. But it seems to be a higher priority in Turkey. While the "Economics" category constituted 2.8% of the publications in Turkey, it was not among the top 10 categories worldwide.

Table 1. Evaluation according to Web of Science categories

World			Turkey		
Web of Science Categories	N	%	Web of Science Categories	N	%
Public Environmental Occupational Health	36239	10.99	Medicine General Internal	1793	15.10
Medicine General Internal	28581	8.67	Public Environmental Occupational Health	638	5.37
Environmental Sciences	16132	4.89	Pediatrics	461	3.88
Multidisciplinary Sciences	15774	4.78	Psychiatry	450	3.79
Infectious Diseases	13838	4.20	Pharmacology Pharmacy	443	3.73
Immunology	13638	4.14	Education Educational Research	392	3.30
Health Care Sciences Services	11786	3.57	Nursing	389	3.28
Education Educational Research	10979	3.33	Infectious Diseases	347	2.92
Medicine Research Experimental	10446	3.17	Environmental Sciences	336	2.83
Psychiatry	9276	2.81	Economics	332	2.80
Total	166689	50.55	Total	5581	47.01

The Research Areas distribution of the articles is shown in Table 2. Although there are some differences, similar results were obtained from the evaluation made according to Web of Science

categories. When evaluated in terms of all articles, the most published field was "Public Environmental Occupational Health" and constituted 10.99% of all articles. In Turkey, the research field with the most articles is "General Internal Medicine" with 16%.

Table 2. Evaluation in terms of Research Areas

World			Turkey		
Research Areas	N	%	Research Areas	N	%
Public Health	36239	10.99	General Internal Medicine	1900	16.00
Environmental Occupational Health	31928	9.68	Public Environmental Occupational Health	638	5.37
General Internal Medicine	22218	6.74	Business Economics	636	5.36
Science Technology Other Topics	19737	5.99	Psychology	478	4.03
Business Economics	1851	0.56	Pharmacology Pharmacy	463	3.90
Environmental Sciences Ecology	15654	4.75	Engineering	461	3.88
Psychology	14155	4.29	Pediatrics	461	3.88
Education Educational Research	14134	4.29	Education Educational Research	451	3.80
Health Care Sciences Services	13838	4.20	Psychiatry	450	3.79
Infectious Diseases	13638	4.14	Environmental Sciences Ecology	422	3.55
Immunology	183392	55.62	Total	6360	53.57

The research areas of the articles on COVID 19 were evaluated at the meso and micro level by considering them more specifically. The 10 most published study topics were highlighted. Frequency distributions for the analysis are shown in Tables 3 and 4. In the Topics meso dimension, "Virology – General" and "Education & Educational Research" are the categories with the most articles, respectively. 26.49% of all articles and 33.34% of articles published in Turkey include the "Virology - General" category. In Turkey, the most publication areas in terms of topics meso are the same as the rest of the world. When we examine the differences in terms of topics meso, the topics "Statistical Methods" and "Healthcare Policy" were not among the top 10 categories with the most articles in Turkey. The topics "Numerical Methods" and "Psychiatry" were not among the 10 categories with the most articles worldwide. Although proportional

differences are observed, when looking at the first 10 fields, it can be said that similar subjects are being studied as in other countries.

More specifically, when we examine the topics in micro size, the "Coronavirus" category stands out. This is natural, since the articles examined in our research are related to COVID 19. 24.83% of all articles, 31.80% of articles in Turkey are in the "Coronavirus" category and come first. When we focus on the top 10 study areas in terms of Topics micro in COVID 19 articles, there is differentiation in some areas in the world and in Turkey. Unlike the rest of the world, the categories "Deep Learning", "Fractional Calculus", "Health Literacy" and "Fuzzy Sets" were in the top 10 in Turkey. Unlike Turkey, the categories "Telemedicine", "Technology Acceptance Model", "Unemployment" and "Medical Education" were in the top 10 in the world.

Table 3. Comparison by Citation Topics Meso

World			Turkey		
Citation Topics Meso	N	%	Citation Topics Meso	N	%
1.104 Virology - General	87336	26.49	1.104 Virology - General	3958	33.34
6.11 Education & Educational Research	9463	2.87	6.11 Education & Educational Research	288	2.43
6.3 Management	8545	2.59	6.10 Economics	279	2.35
1.14 Nursing	8528	2.59	6.73 Social Psychology	234	1.97
6.10 Economics	6673	2.02	6.3 Management	230	1.94
1.273 Health Literacy & Telemedicine	6665	2.02	1.44 Nutrition & Dietetics	192	1.62
6.73 Social Psychology	6060	1.84	1.14 Nursing	184	1.55
1.44 Nutrition & Dietetics	5888	1.79	9.162 Numerical Methods	179	1.51
9.92 Statistical Methods	5597	1.70	1.21 Psychiatry	175	1.47
1.156 Healthcare Policy	5543	1.68	1.273 Health Literacy & Telemedicine	147	1.24
Total	150298	45.58	Total	5866	49.41

Table 4. Comparison by Citation Topics Micro

World			Turkey		
Citation Topics Micro	N	%	Citation Topics Micro	N	%
1.104.1353 Coronavirus	81891	24.83	1.104.1353 Coronavirus	3775	31.80
1.273.1447 Telemedicine	4283	1.30	6.10.80 Option Pricing	160	1.35
9.92.1271 Competing Risks	3439	1.04	1.217.2317 Erysipelothrix Rhusiopathiae	138	1.16
1.217.2317 Erysipelothrix Rhusiopathiae	2900	0.88	9.162.448 Fractional Calculus	120	1.01
1.104.568 Measles	2604	0.79	4.17.128 Deep Learning	111	0.93
6.10.80 Option Pricing	2572	0.78	1.273.870 Health Literacy	98	0.83
6.223.247 Tourism	2143	0.65	6.223.247 Tourism	92	0.77
6.3.368 Technology Acceptance Model	1909	0.58	1.104.568 Measles	85	0.72
1.156.2068 Unemployment	1891	0.57	9.92.1271 Competing Risks	82	0.69
6.11.1094 Medical Education	1854	0.56	4.61.56 Fuzzy Sets	81	0.68
Total	105486	31.99	Total	4742	39.94

The change of articles about COVID 19 by years is given in Table 5. With the outbreak of the pandemic, the number of articles increased both worldwide and in Turkey until 2022. It has been observed that this number has decreased in 2023, and it is a matter of curiosity how much it will be by the end of 2024. While there was a 29.27% decrease in the number of articles worldwide in 2023 compared to the previous year, a 36.6% decrease was observed in Turkey. 32.01% of all articles published from 2019 to 12.02.2024 and 34.57% of articles published in Turkey were published in 2022. There is no publication addressing Turkey registered in the Web of Science database in 2019. The publication distribution for other years is similar to the general distribution. Among the publications made from 2020 to 2024 (12.02.2024), the rate of publications addressed to Turkey was 2.75%, 3.80%, 3.89%,

3.49%, 2.42%, respectively. 3.6% of the total articles published worldwide are publications addressed to Turkey.

The number of articles of the countries that published the most articles about COVID 19 are as follows; USA 86220 (26.15%), CHINA 37424 (11.35%), ENGLAND 28963 (8.78%), ITALY 21217 (6.43%), INDIA 20056 (6.08%), GERMANY 15589 (4.73%), SPAIN 15475 (4.69%), CANADA It published 15409 (4.67%) articles, AUSTRALIA 13905 (4.22%) and BRAZIL 11392 (3.45%).

When the publication language of the articles is evaluated; 96.56% of all articles were published in English, 1.48% in Spanish, and 0.49% in Portuguese. 96.91% of the articles in Turkey were published in English and 3% in Turkish

Table 5. Change in the number of articles by years

World			Turkey		
Publication Years	N	%	Publication Years	N	%
2019	18	0.01	2019	-	-
2020	43918	13.32	2020	1208	10.18
2021	101814	30.88	2021	3865	32.56
2022	105567	32.01	2022	4104	34.57
2023	74667	22.64	2023	2604	21.93
2024	3763	1.14	2024	91	0.77
Total	329747	100	Total	11872	100

The institutions that publish the most about COVID 19 are shown in Table 6. The institution with the most publications in the world was UNIVERSITY OF LONDON (2.44%). The institution that published the most articles in Turkey was UNIVERSITY OF HEALTH SCIENCES TURKEY. 11.08% of the articles in Turkey were published by this institution. The second institution

with the most publications, HACETTEPE UNIVERSITY, made 4.84% of the publications. The 10 institutions that publish the most in the world contributed 15% of the total articles to the literature. The 10 institutions that produced the most articles in Turkey contributed 40.93% of the total articles to the literature.

Table 6. Evaluation in terms of Affiliation

World			Turkey		
Affiliations	N	%	Affiliations	N	%
UNIVERSITY OF LONDON	8045	2.44	UNIVERSITY OF HEALTH SCIENCES TURKEY	1315	11.08
UNIVERSITY OF CALIFORNIA SYSTEM	7493	2.27	HACETTEPE UNIVERSITY	575	4.84
HARVARD UNIVERSITY	7052	2.14	ISTANBUL UNIVERSITY	529	4.46
EGYPTIAN KNOWLEDGE BANK EKB	4440	1.35	ISTANBUL UNIVERSITY CERRAHPASA	434	3.66
HARVARD MEDICAL SCHOOL	3977	1.21	ANKARA UNIVERSITY	385	3.24
UNIVERSITY OF TORONTO	3885	1.18	CITY HOSPITAL ANKARA	369	3.11
UNIVERSITY OF TEXAS SYSTEM	3791	1.15	MARMARA UNIVERSITY	336	2.83
UNIVERSITY SYSTEM OF OHIO	3783	1.15	DOKUZ EYLUL UNIVERSITY	316	2.66
UNIVERSITY COLLEGE LONDON	3619	1.10	GAZI UNIVERSITY	316	2.66
JOHNS HOPKINS UNIVERSITY	3383	1.03	SAKARYA UNIVERSITY	284	2.39
Total	49468	15.00	Total	4859	40.93

The departments that published the most articles on COVID 19 are given in Table 7. The department that published the most articles in the world was "Huazhong University Of Science And Technology Tongji Medical College", and the department that published the most articles in Turkey was "Istanbul University Istanbul Faculty Of Medicine". 0.47% of the articles published in the world are addressed to

"Huazhong University Of Science And Technology Tongji Medical College". 1.71% of the articles published in Turkey are addressed to "Istanbul University Istanbul Faculty Of Medicine". "Koc University School Of Medicine" and "Sakarya University Faculty Of Medicine", which are among the top 10 departments in Table 7, produced 111 articles separately.

Table 7. Evaluation in terms of affiliation with department

World			Turkey		
Affiliation with Department	N	%	Affiliation with Department	N	%
Huazhong University Of Science And Technology Tongji Medical College	1540	0.47	Istanbul University Istanbul Faculty Of Medicine	203	1.71
Columbia Medical Center	1494	0.45	Istanbul University Cerrahpasa Cerrahpasa Faculty Of Medicine	174	1.47

Stanford Medicine	1389	0.42	Ankara University Faculty Of Medicine	160	1.35
Stanford University School Of Medicine	1380	0.42	Marmara University School Of Medicine	141	1.19
University College London School Of Life And Medical Sciences	1347	0.41	Gazi University Faculty Of Medicine	133	1.12
University Of Toronto Temerty Faculty Of Medicine	1282	0.39	Inonu University School Of Medicine	131	1.10
University Of Oxford Medical Sciences Division	1274	0.39	Dokuz Eylul University Faculty Of Medicine	130	1.10
Imperial College London Faculty Of Medicine	1229	0.37	Ege University Faculty Of Medicine	120	1.01
Harvard Medical School	1153	0.35	Ondokuz Mayıs University Faculty Of Medicine	114	0.96
Yale School Of Medicine	1148	0.35	Koc University School Of Medicine-Sakarya University Faculty Of Medicine	111	0.93
Total	13236	4.01	Total	1417	11.94

The 10 journals with the most articles in Turkey and in the world and the quarter in which they are placed are listed in Table 8. Researchers around the world have published mostly in the journal "INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH". Researchers in Turkey mostly published

articles in the journal "ANNALS OF CLINICAL AND ANALYTICAL MEDICINE". "SUSTAINABILITY" magazine is among the 10 most published magazines both in the world and in Turkey. Publications in the 10 most published journals in the world constitute 10.44% of the total publications.

Table 8. Evaluation of the most published journals

World			Turkey		
Publication Titles	N	%	Publication Titles	N	%
INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH (Q1-Q2)	5875	1.78	ANNALS OF CLINICAL AND ANALYTICAL MEDICINE (ESCI)	144	1.21
PLOS ONE (Q2)	5598	1.70	INTERNATIONAL JOURNAL OF CLINICAL PRACTICE (Q3)	130	1.10
SUSTAINABILITY (Q2-Q3)	3654	1.11	EUROPEAN REVIEW FOR MEDICAL AND PHARMACOLOGICAL SCIENCES (Q2)	126	1.06
FRONTIERS IN PUBLIC HEALTH (Q1)	3589	1.09	CUREUS JOURNAL OF MEDICAL SCIENCE (ESCI)	106	0.89
CUREUS JOURNAL OF MEDICAL SCIENCE (ESCI)	3509	1.06	JOURNAL OF MEDICAL VIROLOGY (Q1)	104	0.88
SCIENTIFIC REPORTS (Q2)	3352	1.02	SUSTAINABILITY (Q2-Q3)	102	0.86

FRONTIERS IN PSYCHOLOGY (Q1)	2766	0.84	REVISTA DA ASSOCIACAO MEDICA BRASILEIRA (Q4)	87	0.73
VACCINES (Q1)	2546	0.77	FLORA INFEKSIYON HASTALIKLARI VE KLINIK MIKROBIYOLOJI DERGISI (ESCI)	86	0.72
BMJ OPEN (Q2)	1840	0.56	TURKISH JOURNAL OF MEDICAL SCIENCES (Q3)	86	0.72
JOURNAL OF CLINICAL MEDICINE (Q2)	1692	0.51	CURRENT PSYCHOLOGY (Q2)	73	0.61
Total	34421	10.44	Total	1044	8.79

The index comparison of the articles is shown in Table 9. 60.57% of the articles on COVID 19 worldwide and 58.73% of the articles in Turkey were published in SCI-Exp indexed journals. In Turkey, the ESCI index (30.01%) ranked second and the SSCI index (20.52%) ranked third, while worldwide the SSCI index (28.36%) ranked second and the ESCI index (24.69%) ranked third. 3.49% of the articles published in SCI-Exp index journals

worldwide are addressed to Turkey. 4.38% of the articles published in ESCI index journals worldwide are addressed to Turkey. 2.6% of the articles published in the world-wide SSCI index journals are addressed to Turkey. 2.28% of the articles published in the world-wide A&HCI index journals are addressed to Turkey.

Table 9. Web of Science Index comparison

World			Turkey		
Web of Science Index	N	%	Web of Science Index	N	%
Science Citation Index Expanded (SCI-EXPANDED)	199719	60.57	Science Citation Index Expanded (SCI-EXPANDED)	6972	58.73
Social Sciences Citation Index (SSCI)	93527	28.36	Emerging Sources Citation Index (ESCI)	3563	30.01
Emerging Sources Citation Index (ESCI)	81417	24.69	Social Sciences Citation Index (SSCI)	2436	20.52
Arts & Humanities Citation Index (A&HCI)	3459	1.05	Arts & Humanities Citation Index (A&HCI)	79	0.67

Table 10 lists the 10 organizations that provide the most funding to COVID 19 article studies in the world and in Turkey. TUBITAK took the first place in Turkey. Funding was provided for 168 articles on the subject. It has been observed that the most funding organization in the world is "UNITED STATES DEPARTMENT OF HEALTH HUMAN

SERVICES". "UNITED STATES DEPARTMENT OF HEALTH HUMAN SERVICES", which is the funder of 4.53% of the studies in the world, supported 63 articles in Turkey. When Table 10 is examined, it is seen that most of the top funding organizations in the world also support studies in Turkey.

Table 10. Top funding organizations for articles

World			Turkey		
Funding Agencies	N	%	Funding Agencies	N	%
UNITED STATES DEPARTMENT OF HEALTH HUMAN SERVICES	14946	4.53	TURKIYE BILIMSEL VE TEKNOLOJIK KURUMU TUBITAK	168	1.42
NATIONAL INSTITUTES OF HEALTH NIH USA	13628	4.13	UNITED STATES DEPARTMENT OF HEALTH HUMAN SERVICES	63	0.53
NATIONAL NATURAL SCIENCE FOUNDATION OF CHINA NSFC	11450	3.47	NATIONAL INSTITUTES OF HEALTH NIH USA	61	0.51
UK RESEARCH INNOVATION UKRI	4420	1.34	EUROPEAN UNION EU	45	0.38
EUROPEAN UNION EU	3958	1.20	SPANISH GOVERNMENT	39	0.33
NATIONAL SCIENCE FOUNDATION NSF	3294	1.00	UK RESEARCH INNOVATION UKRI	35	0.29
SPANISH GOVERNMENT	2832	0.86	NATIONAL NATURAL SCIENCE FOUNDATION OF CHINA NSFC	34	0.29
MEDICAL RESEARCH COUNCIL UK MRC	2318	0.70	NATIONAL SCIENCE FOUNDATION NSF	23	0.19
WELLCOME TRUST	2222	0.67	AGENCE NATIONALE DE LA RECHERCHE ANR	21	0.18
CONSELHO NACIONAL DE DESENVOLVIMENTO CIENTIFICO E TECNOLOGICO CNPQ	2148	0.65	ISTANBUL UNIVERSITY	21	0.18
Total	61216	18.56	Total	510	4.30

Table 11 expresses the distribution of COVID 19 studies in terms of sustainable development goals. 66.75% and 73.52% of the articles about COVID 19 in the world and Turkey, respectively, are aimed at the goal of "Good Health And Wellbeing". These results are natural since COVID 19 is primarily a health problem. The "Quality Education" target comes second. 4.57% of the articles addressed to Turkey are related to quality education. While

"Gender Equality" and "Decent Work And Economic Growth" are at the forefront in Turkey, "Sustainable Cities And Communities" and "No Poverty" targets are at the forefront worldwide. 92.94% of all articles on the subject and 92.57% of articles addressed in Turkey were found to be related to sustainable development goals.

Table 11. Evaluation of publications within the scope of sustainable development goals

World			Turkey		
Sustainable Development Goals	N	%	Sustainable Development Goals	N	%
03 Good Health And Well Being	220101	66.75	03 Good Health And Well Being	8728	73.52

04 Quality Education	19273	5.84	04 Quality Education	542	4.57
11 Sustainable Cities And Communities	10763	3.26	05 Gender Equality	386	3.25
01 No Poverty	10034	3.04	08 Decent Work And Economic Growth	281	2.37
05 Gender Equality	9615	2.92	11 Sustainable Cities And Communities	276	2.32
08 Decent Work And Economic Growth	7979	2.42	01 No Poverty	177	1.49
13 Climate Action	6477	1.96	13 Climate Action	124	1.04
09 Industry Innovation And Infrastructure	4943	1.50	09 Industry Innovation And Infrastructure	111	0.93
10 Reduced Inequality	4643	1.41	10 Reduced Inequality	84	0.71
02 Zero Hunger	3201	0.97	02 Zero Hunger	72	0.61
16 Peace And Justice Strong Institutions	2582	0.78	12 Responsible Consumption And Production	53	0.45
12 Responsible Consumption And Production	1924	0.58	06 Clean Water And Sanitation	41	0.35
06 Clean Water And Sanitation	1490	0.45	16 Peace And Justice Strong Institutions	41	0.35
15 Life On Land	1470	0.45	07 Affordable And Clean Energy	30	0.25
07 Affordable And Clean Energy	1008	0.31	15 Life On Land	26	0.22
14 Life Below Water	968	0.29	14 Life Below Water	18	0.15
Total	306471	92.94	Total	10990	92.57

3.1. Bibliometric Analysis Results

Bibliometric analysis of articles related to COVID-19 in Turkey was analyzed with the Vosviewer program and the association networks created are shown in figures. The size of the nodes obtained as a result of bibliometric network analysis indicates the frequency of occurrence. Curves between nodes represent co-occurrences. The shorter the distance between two nodes, the higher the number of times the two phenomena (things evaluated) coexist.

In the bibliometric analysis, co-authorship was first analyzed. The network was created through 1493 authors with the highest connection strength among 34911 authors. Researchers with at least five publications were included in the network analysis. The created network visual is given in Figure 2. The researcher who produced the most articles and received the most citations was "Yildirim, Murat". Its node is the largest. The author with the most links was "sahin,dilek" with 288 links.

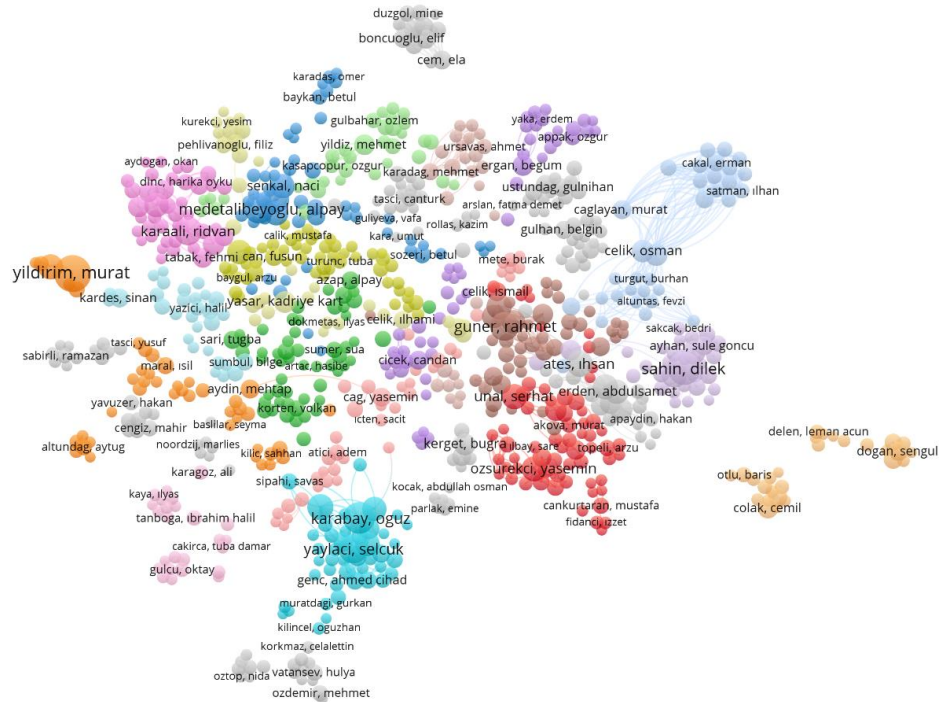


Figure 2. Co-author reviews of COVID-19 publications

In the institution-based bibliometric analysis, evaluations were made on 847 strongly connected institutions. In the evaluation made in terms of inter-institutional collaborations, the University of Health Sciences produced the most articles. The university with the most citations was Hacettepe University. The university with the most connections in terms of

joint work was determined as the University of Health Sciences. The network visual of the analysis is shown in Figure 3. As seen in the figure, the largest node belongs to the University of Health Sciences. Institutions close to each other published more together.

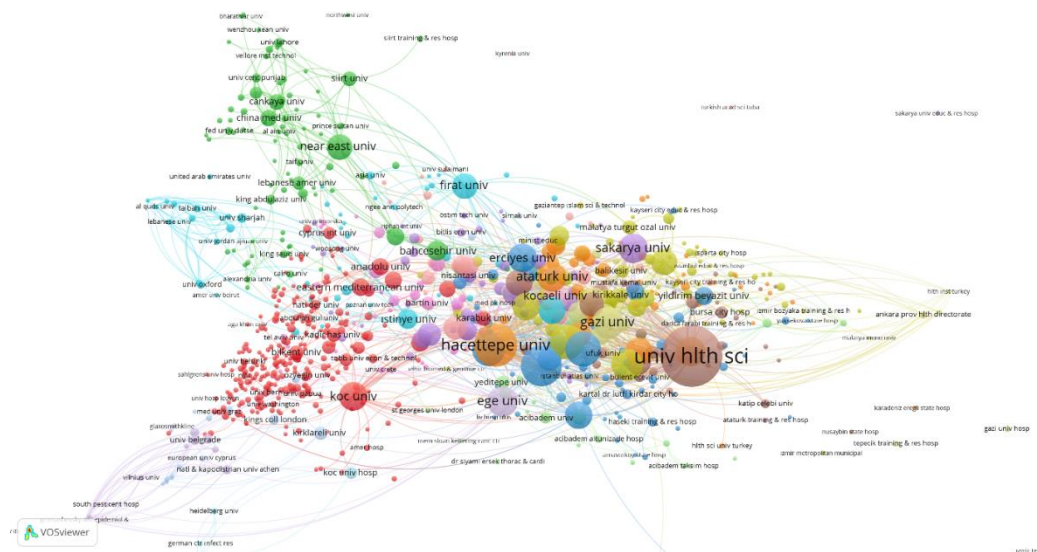


Figure 3. Collaborative network of institutions for COVID-19 articles

In the next step, the countries with the most co-publications regarding COVID-19 were evaluated. Among the 148 countries with at least five collaborative studies, co-authorship was evaluated with the 108 countries with the strongest connections. Within the scope of international cooperation, the most common

collaboration is with the USA (5.47%), followed by the UK (4.6%), Italy (3.3%), Spain (2.64%) and Germany (2.5%). The result of the network analysis, where joint studies are evaluated on a country basis, is shown in Figure 4. When Figure 4 is examined, it can be seen that the closest and largest node to Turkey is the USA node.

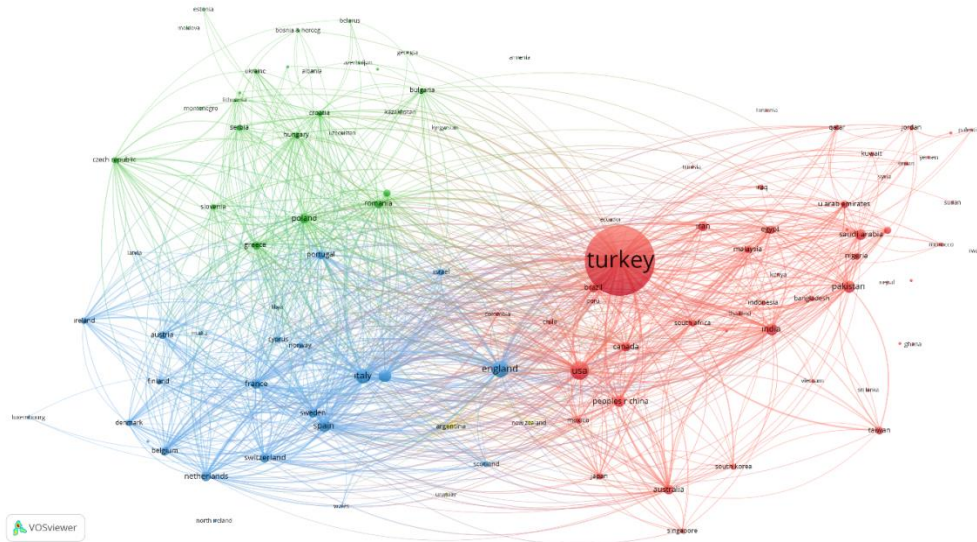


Figure 4. Bibliometric analysis of articles on country partnership

The keywords of COVID-19 articles were evaluated and it was seen that the most frequently used keyword was "covid-19". The most frequently occurring keywords can be listed as "sars-cov 2", "pandemic", "anxiety", "coronavirus", "mortality", "turkey", "depression",

"children". Network analysis was conducted on 1326 keywords with the strongest links among 20150 words. The bibliometric analysis result for keywords is given in Figure 5. Those with large node sizes represent the most frequently encountered words.

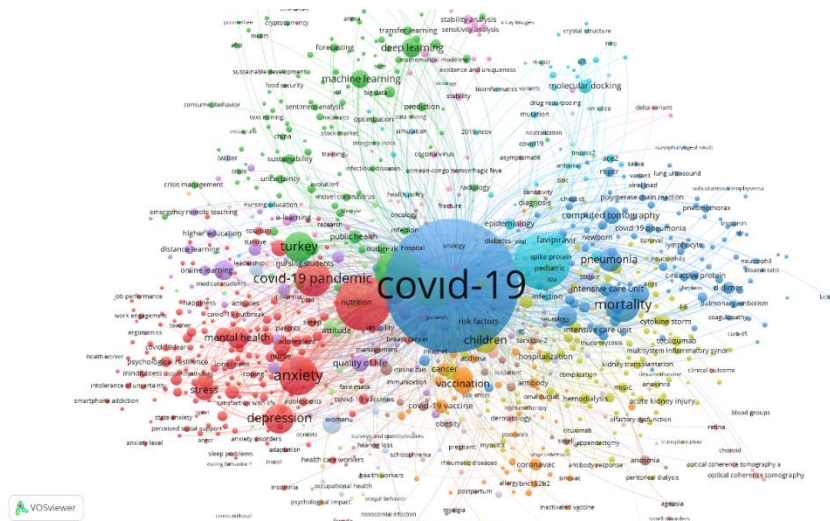


Figure 5. Bibliometric analysis of keywords

4. Discussion and Conclusion

In this research, articles published on COVID-19 both in the world and in Turkey were evaluated. For national-level studies, network visualization was made with bibliometric analysis and the collaboration levels of the studies were shown. 329747 articles registered in the Web of Science database were evaluated, and among them, 11872 articles were addressed to Turkey. Bibliometric analysis was carried out on 11872 articles. Frequency analysis focused on the 10 most published rankings. Publications addressed to Turkey constitute 3.6% of the publications in the whole world. Turkey has taken its place among the 10 countries that produce the most articles, such as USA, China, England, Italy and Germany. Here we can see the importance Turkey attaches to the epidemic and its level of scientific contribution to the literature.

According to Web of Science categories, unlike the rest of the world, pediatrics, Psychiatry, Pharmacology Pharmacy and Nursing categories have come to the fore in studies on COVID-19 in Turkey. Compared to Turkey, Environmental Sciences and Immunology categories are given more priority worldwide. While the most important area regarding COVID-19 in Turkey was General Internal Medicine, worldwide it was Public Environmental Occupational Health. This situation shows that the health aspect is prioritized in Turkey. Worldwide, the impact of the pandemic on the public and the environment has been prioritized.

An evaluation was made in terms of topic micro categories, where research areas are examined in a more specific dimension. According to this review, Telemedicine, Unemployment, Technology Acceptance Model, Medical Education issues are among the priorities of academicians in the world, unlike in Turkey. On the other hand, researchers in Turkey have prioritized the field of Deep Learning in their studies on COVID-19. According to this result, it can be said that Turkish researchers attach more importance to artificial intelligence in COVID-19 studies.

When we look at the institution-based evaluation, the 10 institutions that publish the most in Turkey constitute approximately 41% of all publications (Table 6). The institution that publishes the most and cooperates most with other institutions is the University of Health Sciences. The institution with the most citations is Hacettepe University. There are more than 200 universities in Turkey. It is thought that these institutions should take more

responsibility in terms of contributing to the literature. Other institutions' cooperation with the most publishing institutions can increase research on the subject and contribute to obtaining stronger collaborative results on the long-term effects of COVID-19.

When examined as a faculty, it was seen that the faculty that produced the most articles was Istanbul University Faculty of Medicine. Newly established medical faculties or departments with inadequate technical infrastructure can collaborate with the faculties that produce the most articles, so that their post-pandemic effects can be investigated and current new findings can be brought to the literature.

COVID-19 articles were evaluated according to the journals in which they were published. The most published journal in Turkey is the ESCI indexed ANNALS OF CLINICAL AND ANALYTICAL MEDICINE journal. There is one Q1 category journal among the 10 journals with the most articles published. The fact that open access fees in journals cannot be easily covered by Turkish academics and that there is not enough funding for studies restricts the open access publication of articles in indexed journals. Although research is funded by various organizations, it is very limited. The most funding organization in Turkey was TUBITAK, but it supported only 1.42% of the studies. It is seen that some researchers in Turkey, one of the largest funders in the world, have benefited from studies on COVID-19. But this is true for a relatively small number of studies. It is thought that researchers can improve their work in terms of quality and quantity by increasing cooperation with funders. Table 10 shows the organizations that provide the most funding. Most articles have been published in SCI-Exp indexed journals in the world and in Turkey. While the ESCI index ranked second in Turkey (30.01%), it ranked third worldwide (24.69%).

Within the scope of international cooperation, the most joint publications were made with the USA, England, Italy, Spain and Germany, respectively. 5.47% of the articles about COVID-19 produced in Turkey were made jointly with the USA, 4.6% with the UK, and 3.3% with Italy. Since this pandemic is an epidemic that has occurred on an international scale, it is very important to increase international cooperation in the future and to include studies in the literature. Table 6 lists the departments that publish the most on the subject in the world. By closely monitoring the work of these units, collaborations can be developed on common issues.

The most cited joint articles within the scope of international cooperation were the articles carried out with the UK, USA, Germany and Brazil, respectively.

The study also examined publications regarding COVID-19 in terms of sustainable development goals. Healthy individuals and quality education have been the two primary goals both in the world and in Turkey. 73.52% of the articles in Turkey and 66.75% of the studies in the world are related to the development goal of "Good Health And Wellbeing". In the following primary objectives; While gender equality and economic growth are more of a priority for developing Turkey, sustainable cities and poverty goals are more important around the world. It has been stated that the COVID-19 pandemic and new variants of the virus reveal the urgency of implementing the 2030 agenda (20,30). The pandemic has posed more significant challenges to developing countries than to developed countries in terms of sustainable development. In this process, while developed countries are determined to work on the sustainability of education, developing countries have shown more interest in economic sustainability (20). When COVID-19 studies are examined, it is seen that Turkey prioritizes quality education like developed countries (Table 11). It has been stated in the literature that data analysis is not at an ideal level around the world, especially in developing countries, and that the data are irregular, incomplete and not systematically examined.²⁰ This study revealed the basic structure and development trends of studies on COVID-19 in Turkey through a systematic review. It provides summary information for future research.

When the articles are examined in terms of keywords; "covid-19", "sars-cov 2", "pandemic", "anxiety", "coronavirus", "mortality", "turkey", "depression", "children", "pneumonia" are among the most frequently mentioned words. has taken place. When these keywords are examined, it is seen that they are mostly related to the field of health. It is known to everyone that the epidemic affects many areas. In this context, it has been reported that it is very important to continue investigating the long-term effects of the COVID-19 epidemic (20,31). Giannos et al. (2022) states that Turkey exhibits high research productivity on COVID-19, it is clear that Turkish academics need to examine the impact of COVID-19 on different fields in detail (31).

As a result of the evaluation, it was seen that the number of articles, which increased with the onset of

COVID-19, decreased both in Turkey and in the world as of 2022 (Table 5). It is a matter of curiosity how many articles there will be on the subject by the end of 2024. It is thought that this decrease is related to the lethal effect of COVID-19 and the decrease in the size of the epidemic. As a result of this situation, it seems that the long-term effects of the COVID-19 epidemic have not been adequately investigated or ignored. It is known that this epidemic affects many areas from health to economy, and there is no doubt that its effects still continue (8).

For example, it has been reported both in the literature and in the international press that heart attacks, heart diseases, strokes, blood clots and neurological complications have increased with the vaccines administered after COVID-19. It is also stated here that the effect of the vaccine should also be questioned. It has been stated that the probability of death due to heart attack, especially among young people, increases after COVID-19. Relevant findings belong to studies investigated after COVID-19. It has even been stated that some symptoms, even if they are not seen at the moment, may cause complaints in people in the future (32-38).

As a result, in this study, COVID-19 articles published in Turkey to date were examined and collaborations, trending topics, national and international joint networks were evaluated. This research was conducted with reference to the studies carried out by other countries on the COVID-19 broadcast network in the literature. In these studies, researchers examined the contribution level and trends of their own countries' COVID-19 research to the field (4,7,25-29). When other studies and existing Web of Science documents are examined, it is seen that Turkey is among the countries that publish the most on the subject. The results show the level of contribution of Turkish academics to the literature. However, there is still a need to investigate long-term effects. The current research results will be a useful resource for future research topics and collaborations as they provide academics with extensive literature information.

4.1. Limitations of the study

The limitation of this research is that only publications from the Web Of Science database were considered. However, the Web of Science database emerges as the most internationally known and prestigious database in terms of publication. Therefore, Web of Science database publications were discussed in the study.

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