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Brain drain in health professionals: a bibliometric study

Sağlık profesyonellerinde beyin göçü: bibliyometrik bir çalışma

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Abstract

Aim: The research was carried out to identify, visualize and reveal the trends in the studies conducted between 1988-2023 in the field of health workers and brain drain.

Materials and Methods: Performance analysis, scientific mapping and bibliometric analysis were performed with VOSViewer (1.6.15) software program. When the findings were limited to publication language, WoS category, countries, institutions, authors, publication type, indexes and publication year 1988-2023, the sample was found to be 2.247.

Results: As a result of the analysis, the most used keywords in the WoS category were "health professional", "mental health", "brain drain", "education", the most published in the USA as a country, the number of publications in "University of London" as the institution with the highest number of publications.

Conclusion: According to the results of this analysis, the most broadcasts were made in 2022 and the most broadcasts were made in the USA.

Keywords: Brain drain; Health workers; Health professional.

Öz

Amaç: Araştırma, 1988-2023 yılları arasında sağlık çalışanları ve beyin göçü alanında yapılan çalışmalardaki eğilimleri belirlemek, görselleştirmek ve ortaya koymak amacıyla gerçekleştirilmiştir.

Gereç ve Yöntem: VOSViewer (1.6.15) yazılım programı ile performans analizi, bilimsel haritalama ve bibliyometrik analiz yapılmıştır. Elde edilen bulgular yayın dili, WoS kategorisi, ülkeler, kurumlar, yazarlar, yayın türü taranan indeksler ve yayın yılı 1988-2023 ile sınırlandırıldığında örneklem 2.247 olarak bulunmuştur.

Bulgular: Analiz sonucunda WoS kategorisinde en çok kullanılan anahtar kelimeler "health professional", "mental health", "brain drain", "education", ülke olarak en çok yayın ABD'de, yayın sayısı olarak en çok yayın yapılan kurum "University of London" olmuştur.

Sonuç: Bu analiz sonuçlarına göre en çok yayının 2022 yılında yapıldığı ve yayınların en çok ABD'de olduğu belirlendi.

Anahtar Kelimeler: Beyin göçü; Sağlık çalışanları; Sağlık profesyonelleri.

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Introduction

Brain drain is caused by unfavorable economic conditions, especially the lack of scientific and academic opportunities in the country of residence. In addition, high scientific and technological conditions in the destination country are also among the attractive factors.[1-3] Today, advances in information, transportation and communication enable people to move faster, more practically and cheaper in terms of employment, education, career opportunities and quality of life. In the face of all these attractive opportunities, as well as adversities such as conflict, unemployment, poverty and inequality in their home countries, individuals seek a better future for themselves and their families.[1]

In recent years, not only academics but also businessmen, entrepreneurs and highly educated people have turned to brain drain due to high unemployment rates, low budget jobs and high living standards abroad. Countries such as Germany, the USA and the UK have been preferred for education and investment purposes, and visa applications have increased. Statistics provided by organizations such as the Dutch Immigration and Naturalization Agency (IND), the Council for At-Risk Academics and New World Wealth confirm the increase in brain drain abroad. The most common occupational group experiencing brain drain is health personnel.[2,4]

In countries with brain drain, loss of qualified manpower can lead to increased workload of other employees, limitations in access to quality health services and inequalities in access to health services. According to the UNESCO Institute of Statistics (UIS) (2023), there are 51,146 Turks abroad in terms of education.[5] It is seen that qualified health workers are needed all over the world, brain drain is increasing, and it is an issue that needs to be carefully considered considering the problems experienced by brain drain countries.[6] The factors that cause the migration of health workers are divided into two as repulsive and attractive factors. While the driving factors are characterized as internal factors that force migration, attractive factors can be defined as external factors that make migration attractive. Internal factors (driving or repulsive factors); low wages, unfavorable working conditions, limited career opportunities, political difficulties, violence, and torment, etc. External factors (attractive or attracting factors); higher income, better working conditions, political stability, career opportunities and a better future, etc.[7] Although the programs and projects carried out by TUBITAK for scientists in Turkey in order to ensure a reverse brain drain are successful,[8] no work is being done for healthcare personnel.

The worldwide shortage and under distribution of healthcare workers are at a critical stage and threatens the sustainability of health systems.[9,10] The World Health Organization (WHO) estimated that there was a global shortage of 7.2 million health care providers in 2013[11] with some sources predicting that this number could reach 15 million by 2030.[12] The insufficient number of health workers in the global framework for effective service delivery is a growing concern for states and policymakers working to achieve the United Nations Development Goals, which prioritize meeting the universal and sustained nature of health services and the equitable delivery of health services to the whole society by 2030. At the core of achieving these goals and improving health outcomes is a threshold for the number of physicians, nurses, midwives, and all other healthcare professionals to support an effective health care delivery system.[10,13]

Bibliometric analysis is a type of analysis that uses statistical methods to analyze articles, scientific studies and other publications. Bibliometric analysis uses statistical analysis to identify, evaluate and monitor the published literature in relation to bibliometric data, including information on authors, publications, institutions, journals and countries. Studies using bibliometric methods in the field of health are increasing day by day.[14]

Çelikkaya and Atila[15] analyzed 1586 studies in the Web of Science database between 1980-2019 in their study on the relationship between migration and development. According to the results of the analysis, it was observed that the number of

studies started to increase after 2006. In a study that considers international migration literature more generally, Arslan[16] analyzed the bibliometric analysis of studies on migration in international field indexes between 1975 and 2020 with the help of Orange program. Although brain drain among health workers is a common global condition, there is no bibliometric analysis of studies in this field. Based on this direction and rationale, the research was carried out in order to identify, visualize and reveal the trends in the studies conducted between 1988-2023 in the field of health workers and brain drain.

Materials and Methods

Design

The research was carried out in order to identify, visualize and reveal the trends in the studies conducted between 1988-2023 in the field of health workers and brain drain. For this purpose, answers were sought to the following questions.

- How are relevant publications distributed by year?
- Who are the authors who publish and contribute the most in the field?
- Which institutions, funding organizations and journals contribute the most to the field?
- Which countries produce the most publications?
- What are the most used keywords in publications?
- What are the most cited publications?
- What are the publications that stand out in the network map of the data set in the citation analysis?

The aim of the research is to examine and reveal the current status of research published in the field of healthcare workers and brain drain in the "Web of Science Core Collection (WoS) database from a bibliometric perspective.

Nowadays, there are multiple databases from which the data set can be obtained in bibliometric analysis.

There are currently more than one database for bibliometric analysis. PubMed, Embase, Scopus, SpringerLink, Google Scholar, ScienceDirect are among the most frequently used databases. Databases used in bibliometric analyzes have different features. [19]

WoS database was the database used to obtain the data set in the research.[16]

Setting

The study data were collected on November 27, 2023, from publications in the WoS database spanning the years 1988-2023.

At the end of the search using the keywords "brain drain" and "health workers" or "health professional" to create the data set, 13.865 publications were reached.

The database is limited to Science Citation Index Expanded, Social Sciences Citation Index, Emerging Sources Citation Index.

Criteria for inclusion in the database were limited to Publications between the years 1988-2023, WoS category, publishing institutions, countries, journals, authors, publication language English, publication type article.

The research dataset consisted of 2.247 articles retrieved from the WoS database. The publication selection flow diagram is given in Figure 1.

Data analysis

In this research, VOSViewer (1.6.15) software program was used to visualize and map the bibliometric analysis method.

Using VOSViewer, data-based maps can be created and visualizations are made.[17] The VOSViewer program is one of the most preferred programs in bibliometric analysis due to its features. Bibliometric analysis is a powerful statistical analysis method used in the numerical and content examination of articles.[20]

In the bibliometric analysis, the language of publication, distribution of publications by years, prominent countries, journals, co-authors, partner institutions, country collaborations, leading researchers and most used keywords were analyzed.

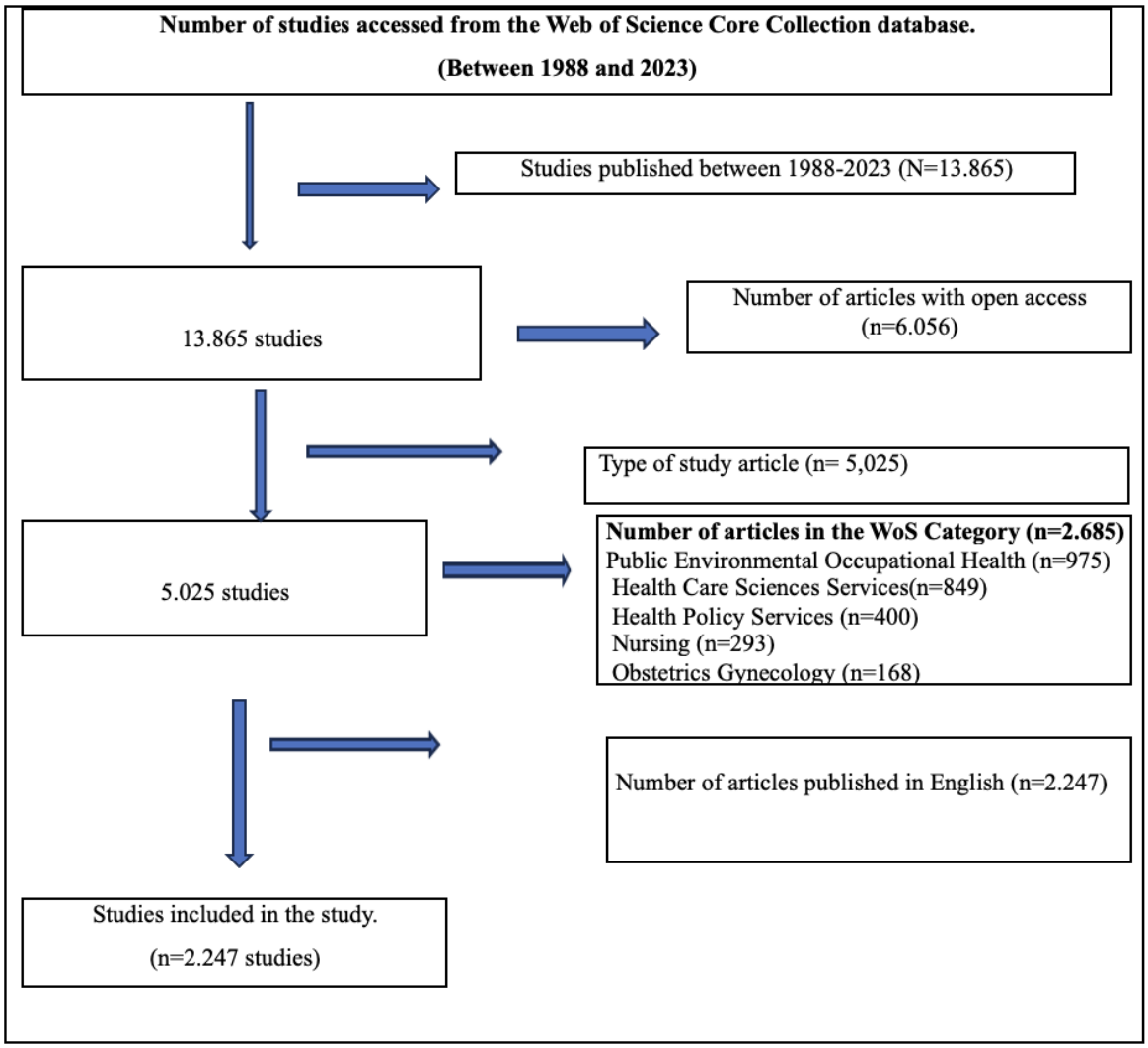


Figure 1. Publication selection flow diagram.

In the bibliometric analysis method of this study, VOSViewer (1.6.15) package program was used for visualization.

The data was shown graphically to better understand the results.[19] Analysis and graphical interpretation are invaluable for researchers to understand issues in this field.

One of the software that analyzes bibliographic data in different databases such as WoS, Scopus and PubMed is VOSViewer.[21] The VOSViewer provides density and visualization and network maps of data based on a variety of techniques, including citation analysis, bibliographic matching, co-authorship, and keyword usage.[22]

Network analysis is a visualization method used to examine the relationships of individuals, institutions or objects, and changes in relationships over time, from a social and structural perspective.[23,24] For network analysis, clusters, which are the units of analysis and constitute the total sample, and the relationships of the edges connecting the clusters are visualized and modeled.[24,25]

This method was chosen because it effectively presents the holistic and temporal dimension that is difficult to grasp due to the continuous and cumulative nature of the literature.

For this reason, bibliometric analysis has been preferred in many studies investigating new trends.[19,26] The frequency of use of concepts is determined in the first stage of analysis.

This is simply based on the principle of counting one unit of data set. The first basic data consists of the findings obtained as a result of frequency analysis. Data expressed as clusters in network analysis are also represented as circles on maps. The lines

connecting the clusters represent the connections, and their thickness and sum represent the strength of the connections.

The presence of each concept, person, or object in the literature is expressed by the number of clusters, the number of relations, and the total strength of the concept it represents.

In this research, concepts that were repeated at least twice and had terminological value were accepted as hypotheses for the unit of analysis.

The threshold value is determined by trial and error method to ensure that the maps created by the researchers for the purpose of the research can be read.[27,28]

When the concepts used at least once are included in the network analysis when determining the threshold value, independent concepts consisting of a single cluster without establishing a relationship with other concepts will be seen more on the map.

Therefore, the threshold value is limited to two. In the research, an attempt was made to determine the direction in which the discipline is moving and the frequently used concepts, rather than the concepts used in individual studies.

Results

The most publications were made in 2022 (n=256, 11.393%) and second in 2021 (n=243, 10.814%). It was determined that the first publications were made in 1988 (n=1) (Table 1).

Table 1. Distribution of publications by year (1988- 2023).

Publication Years	Record Count	% of 2.247
2023	123	5.474
2022	256	11.393
2021	243	10.814
2020	228	10.147
2019	184	8.189
2018	176	7.833
2017	168	7.477
2016	138	6.142
2015	123	5.474
2014	116	5.162
2013	93	4.139
2012	71	3.160
2011	56	2.492
2010	52	2.314
2009	43	1.914
2008	38	1.691
2007	28	1.246
2006	18	0.801
2005	15	0.668
2004	15	0.668
2003	13	0.579
2002	8	0.356
2001	9	0.401
2000	7	0.312
1999	10	0.445
1998	1	0.045
1997	3	0.134
1996	2	0.089
1995	2	0.089
1994	2	0.089
1993	2	0.089
1992	2	0.089
1991	1	0.045
1988	1	0.045

It was determined that the author who contributed the most to the field of health workers and brain drain was “Grimshaw JM” (n=14). It was determined that the institution providing the most funding support was the 'United States Department of Health Human Services' (n=163) and the most publications were published in the journal 'BMC Health Services Research' (n=129). The USA (n=594) was the country with the highest number of publications, and most publications were made in “University of London” (n=115) (Table 2).

Table 2. Top 10 authors with the most contributions to the field, countries, institutions, funding institutions, journal.

Author	Number of articles	Country	Number of articles	Affiliation	Number of articles	Funding support institution	Number of articles	Journal	Number of articles
Grimshaw JM	14	USA	594	London University	115	United States Department of Health Human Services	163	BMC Health Services Research	129
Francis JJ	12	Australia	524	Sydney University	106	National Institutes of Health NIH USA	140	BMC Public Health	87
Johnston M	9	England	406	N8 Research Partnership	102	National Health and Medical Research Council Nhmrc of Australia	77	Journal of Medical Internet Research	80
Butow P	8	Canada	279	Monash University	87	Canadian Institutes of Health Research Cihr	62	International Journal of Environmental Research and Public Health	72
Eccles MP	8	Brazil	125	Melbourne University	76	National Institutes of Health Research Nihr	57	Human Resources for Health	54
Legare F	8	Scotland	90	Toronto University	66	Uk Research Innovation Ukri	51	Academic Medicine	46
Neusy AJ	8	Netherlands	81	Queensland University	58	Australian Government	38	Frontiers In Public Health	41
Wensing M	8	Spain	59	Harvard University	57	European Union Eu	37	Bmc Pregnancy and Childbirth	37
Brown A	7	New Zealand	57	White Rose University Consortium	56	Medical Research Council UK MRC	37	Implementation Science	32
Michie S	7	South Africa	55	California University	54	NIH National Cancer Institute NC	27	Healthcare	28

As a result of the analysis, the most cited first place was the publication titled "The PHQ-9- Validity of a brief depression severity measure", "Kroenke, K; Spitzer, RL; Williams, JBW" in 2001, published in the Journal of General Internal Medicine, with an average of 981.09 citations, a total of 22.565 citations, followed by "Effectiveness and efficiency of guideline dissemination and implementation strategies", "Grimshaw, JM; Thomas, RE; MacLennan, G; Fraser, C; Ramsay, CR ; Valet, L ; Whitty, P; Eccles, MP; Matowe, L; Shirran, L; Wensing, M; Dijkstra, R; Published by Donaldson, C in 2004 and published in the journal "Health Technology Assessment", it received an average of 96.5 citations, for a total of 1.930 citations (Table 3).

Table 3. Top 10 most cited publications (1988-2023).

	Publication	Author	Year	Journal	Average Citation	Total Citation
1	The PHQ-9- Validity of a brief depression severity measure	Kroenke K, Spitzer RL, Williams JBW	2001	Journal of General Internal Medicine	981.09	22.565
2	Effectiveness and efficiency of guideline dissemination and implementation strategies	Grimshaw JM, Thomas RE, MacLennan G, Fraser C, Ramsay CR, Vale L, Whitty P, Eccles MP, Matowe L, Shirran L, Wensing M, Dijkstra R, Donaldson C	2004	Health Technology Assessment	96.5	1.930
3	Factors Associated with Smoking Behavior among University Students in Syria	Al-Kubaisy W, Abdullah NN, Al-Nuaimy H, Kahn SM, Halawany G, Kurdy S	2012	Asia Pacific International Conference on Environment -Behavior Studies (Aıce-Bs)	83.08	997
4	Cognitive load theory in health professional education: design principles and strategies	van Merrienboer JJG and Sweller J	2010	Medical Education	48.07	673
5	Smartphones for Smarter Delivery of Mental Health Programs: A Systematic Review	Donker T, Petrie K, Proudfoot J, Clarke J, Birch MR, Christensen H	2013	Journal of Medical Internet Research	60.45	665
6	A checklist for identifying determinants of practice: A systematic review and synthesis of frameworks and taxonomies of factors that prevent or enable improvements in healthcare professional practice	Flottorp SA, Oxman AD, Krause J, Musila NR, Wensing M, Godycki-Cwirko M, Baker R, Eccles MP	2013	Implementation Science	48.09	529
7	Coproduction of healthcare service	Batalden M, Batalden P, Margolis P, Seid M, Armstrong G, Opipari-Arrigan L, Hartung H	2016	Bmj Quality & Safety	63.63	509
8	Do self-reported intentions predict clinicians' behavior: a systematic review	Eccles MP, Hrisos S, Francis J, Kaner EF, Dickinson HO, Beyer F, Johnston M	2006	Implementation Science	26.28	473
9	Determinants of innovation within health care organizations - Literature review and Delphi study	Fleuren M, Wiefferink K and Paulussen T	2004	International Journal for Quality in Health Care	21.45	429
10	Recommendations from the international evidence-based guideline for the assessment and management of polycystic ovary syndrome	Teede HJ, Misso ML, Costello MF, Dokras A, Laven J, Moran L, Piltonen T, Norman RJ	2018	Fertility and Sterility	68.33	410

When the co-author analysis was limited to a minimum of 2 publications and 2 citations per author, the total number of authors was found to be 10.963. Based on the minimum number of publications and minimum citations per author, the number of authors meeting the threshold values was found to be 813. The number of publications of "Univ Sydney" (n=95), the number of citations (n=2171), the total connection power was 219, the number of publications of "Univ Toronto" (n=57), the number of citations (n=1047), the total connection power was 152, the number of publications of "Univ British Columbia" was 152, the number of citations (n=977), the total connection power was 105. In the co-author country cooperation analysis, when the threshold value per country was limited to a minimum of 2 publications and 2 citations and analyzed, the number of countries doing joint work was found to be 130. The number of collaborating countries that met the threshold values was found to be 95 (Figure 2).

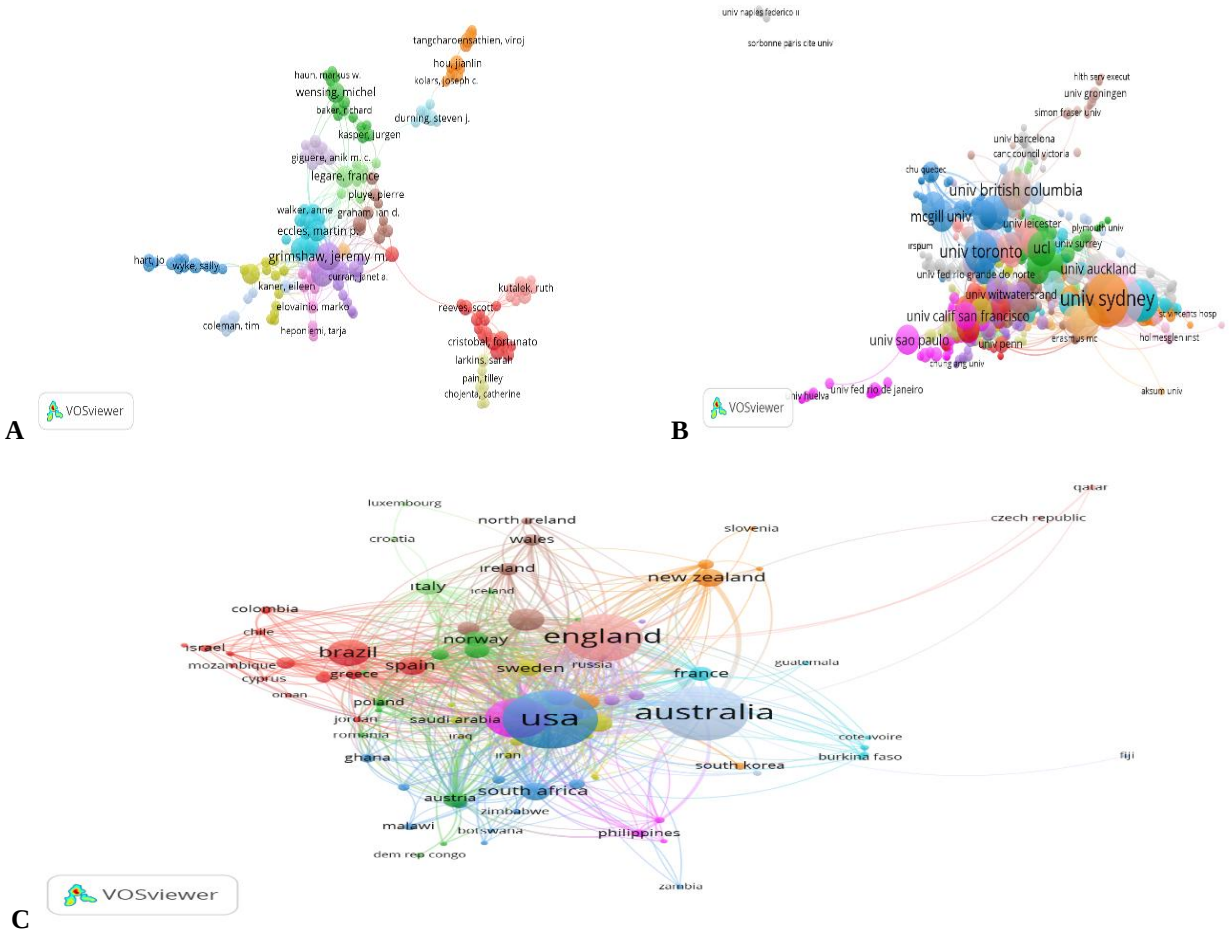


Figure 2. Co-author- author, institution, country analysis network map: A. Co-author-author collaboration network consists of 155 authors, 16 clusters, 537 links. The total connection strength is 905. B. In co-author-institution cooperation, the network consists of 755 institutions, 23 clusters, 4224 connections. The total connection strength is 5650. C. In co-author-country cooperation, the network consists of 95 countries, 12 clusters, 764 connections. The total connection strength is 2068

When the threshold value of the network was limited to 5, it was seen that it consisted of 341 keywords, 12 clusters, 3780 links that passed the threshold value, and the total connection strength was 4803. In the field of health workers and brain drain, the common keyword in the field of network map analysis is that the keyword "health professional" is 9 clusters, 122 formations, 148 links, 274 total connection strength, the keyword "mental health" is 7 clusters, 70 formations, 91 links, 147 aggregate link strength, the keyword "brain drain" is 3 clusters, 7 formations, 15 links, the total connection power is 19, the keyword "education" is 19, 2 clusters, 67 formations, 94 connections were found as a result of the analysis of 178 total connection strengths (Figure 3).

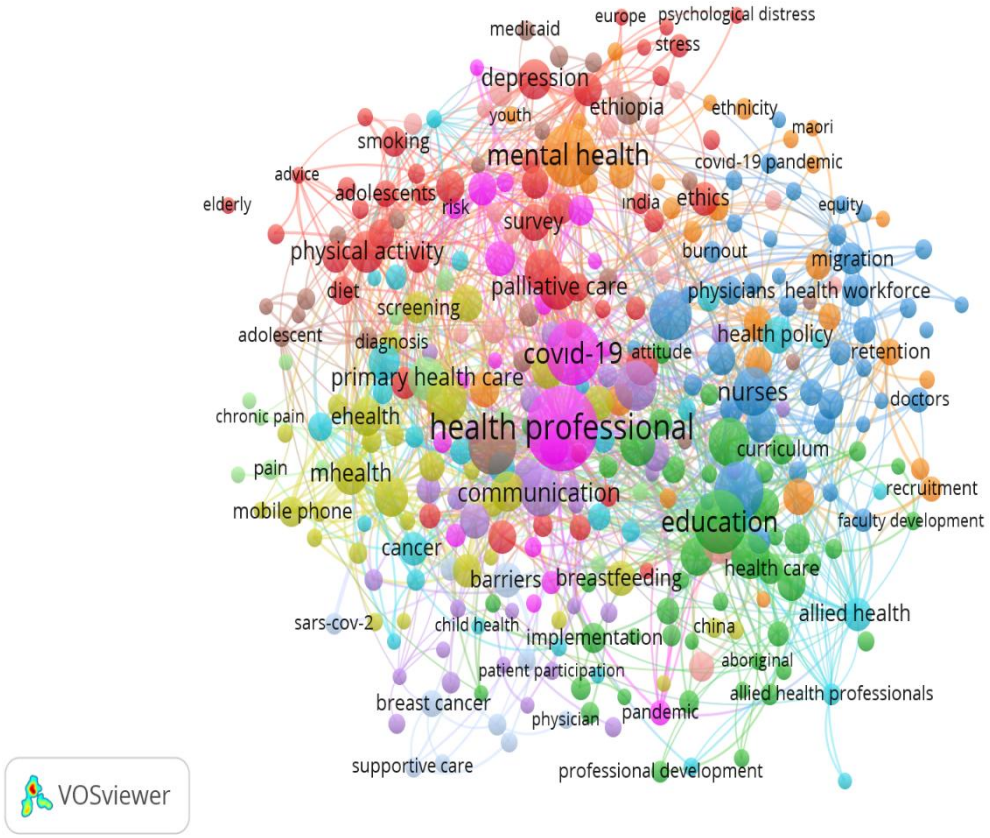


Figure 3. Common keyword analysis network map.

When the threshold value per article for citation analysis of articles was limited to a minimum of 10 citations and analyzed, the total number of publications was found to be 2247. Based on the minimum number of citations, the number of publications that met the threshold values was found to be 941 (Figure 4B).

When the number of articles related to the number of citations received by the institutions was limited to 2 and the citation threshold value was 2, it was seen that the total number of institutions was 3139 and the number of institutions meeting the threshold value was 789 (Figure 4C).

When the number of citations received by the countries was limited to the number of articles and the citation threshold value was 2, it was seen that the total number of countries was 130 and the number of countries meeting the threshold value was 96. According to the country citation analysis, USA received 36275 citations, Australia received 12208, England received 12268, Canada received 8311 citations (Figure 4D).

In the common citation analysis of the articles, when the number of citations per study was limited to a minimum of 10, it was seen that there were 74 articles in the data set that exceeded the threshold value and received a minimum of 10 citations per article. It was found that a total of 6 clusters were formed in the data set, there were 518 connections, the total connection strength was 983 (Figure 5A).

In the common citation analysis of journals, it was seen that when the number of citations per journal was limited to a minimum of 20, the minimum number of journals exceeding the threshold value was 595. The dataset showed a total of 7 clusters, 78678 links, 646609 total link strength (Figure 5B).

In the joint analysis of the authors, it was seen that when the number of citations per author was limited to a minimum of 20, the minimum number of journals exceeding the threshold value was 89. In the data set, it was seen that there was a total of 5 clusters, 1254 links, 5175 total connection strength (Figure 5C).

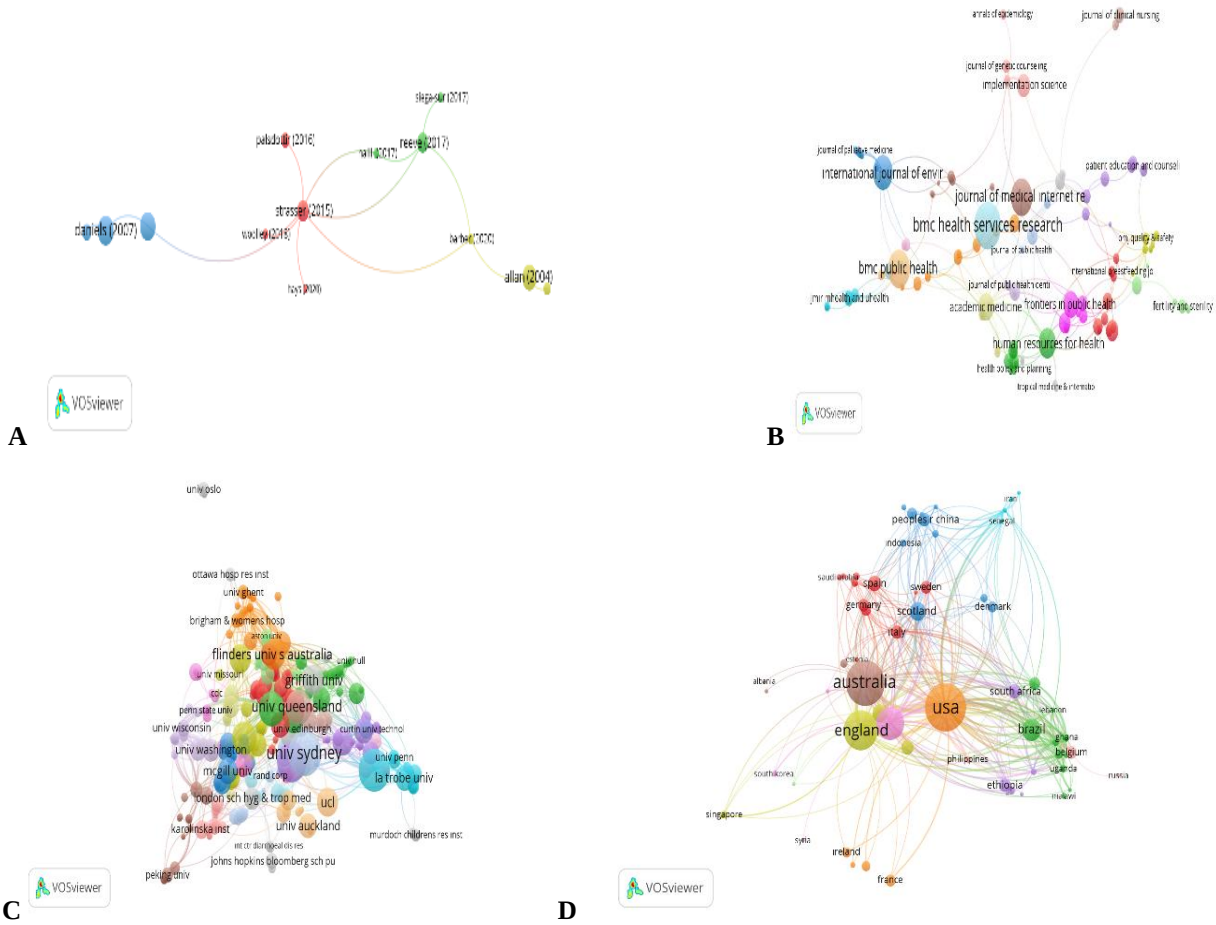
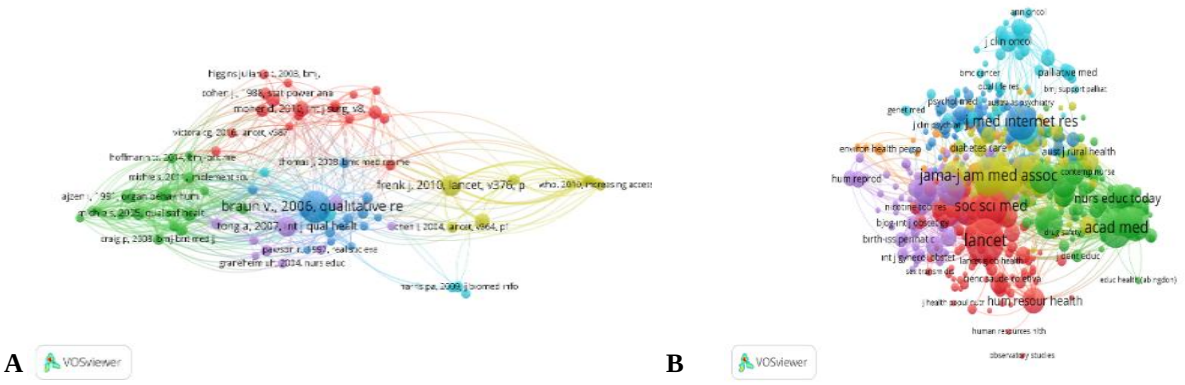


Figure 4. Article, journal, institution, country network map according to citation analysis



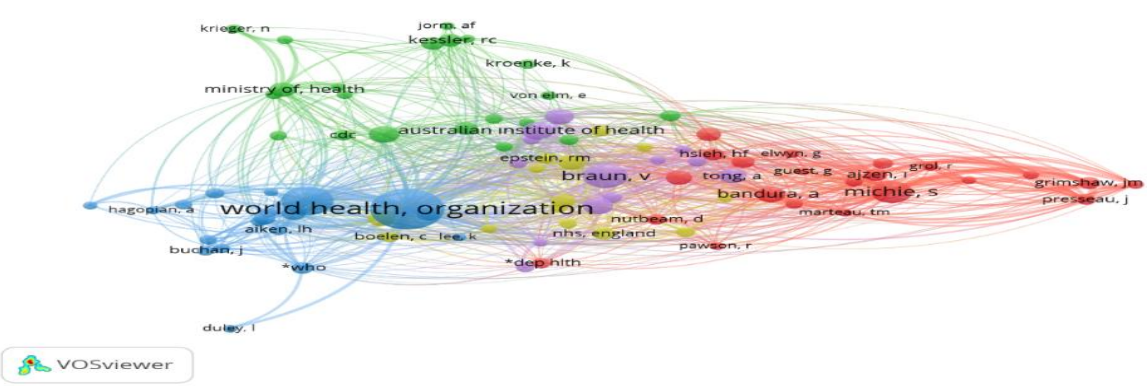


Figure 5. Common-citation article, journal, author analysis network map

Discussion

This research is the first bibliometric analysis carried out in order to identify and visualize the studies in the field of health workers and brain drain, to reveal the trends, to point out the gaps in the literature and to provide researchers with a literature-based perspective. According to the results of this analysis, the most broadcasts were made in 2022 and the most broadcasts were made in the USA.

According to the results of the analysis, the studies on employees and brain drain have gradually increased since 2013 and reached the highest number in 2022. As a result of the analysis, it was found that the most used keywords were "health professional", "mental health", "brain drain", and that the USA published the most as a country. This may be due to the fact that the US, as a general human resources policy, has policies to offer various opportunities to qualified healthcare professionals worldwide in terms of working life, and the number of publishers and the number of journals may have determined the results of the research in this direction. In addition, it may be due to the fact that the publications are published in English. In the review of 17 studies conducted in West Africa, which gives a lot of brain drain, it was reported that physicians especially preferred the USA.[14] In Nigeria, a sub-Saharan African country, it is reported that 44.5% of those with a medical degree emigrate to the United States.[31] Between 2005 and 2015, there was an increase of over 70% in the number of African-trained physicians entering the U.S. workforce.[30] In 2016, non-U.S.-born medical graduates accounted for about one-fifth of general practitioners in the United States, and that number is projected to continue to grow.[29] The findings of the analysis overlap with the literature, and especially the USA and high-income countries receive brain drain from health personnel. It may be recommended to develop policies to address this issue in order to eliminate global inequality.

The need for more staff trained in evidence-based medicine is increasing by the day, and it is reported that it fails to meet the basic minimum threshold for the employment of 23 trained health professionals per 10.000 people in 83 countries globally. This condition is particularly severe in low- and middle-income countries.[12,13,32] The picture is exacerbated by the migration of large numbers of trained health workers from low- and middle-income countries, whose current numbers are already insufficient, to high-income countries.[12,13,32,33] Similarly, studies have found that the need for financial security, especially in doctors, is the main driver of doctor migration, and in addition, factors related to self-actualization, such as educational opportunities and the desire for professional development through research, are also among the reasons for major migration.[31] In a study on migration and development, 1586 studies in the Web of Science database were examined and it was reported that the number of studies started to increase after 2006.[15] Due to the health policies implemented in line with the results of this analysis, the lack of health workers in developed countries due to the rapid aging of the world population and the variable picture in the global economy, it is clear that the mobility of brain drain in health workers will increase from developing countries to developed countries and this will be reflected in the number of publications in the literature. The findings of the analysis and the literature are similar, and the brain drain of health workers is a global problem, and the gap between unequal distribution continues to grow rapidly.

Since the results of this analysis are evaluated based on quantitative data, the findings in the field of health workers and brain drain are important in terms of giving an overview in terms of contributing to the literature. In order to reveal the causes of brain drain of health workers and the reasons for mobility in this field, the planning of qualitative research in the field can be recommended to researchers interested in the field. Since these research results were limited to quantitative data from the WoS database, publications in other databases could not be evaluated. In the future, the research in which the data to be obtained from other databases are studied together will be important as it reveals the general picture.

It is thought that the brain drains of health personnel to developed countries will increase rapidly day by day and it is recommended to create and adopt policies on the subject. When the literature in the field of health workers and brain drain is examined, it is seen that more studies are needed in this area. It is thought that the results obtained from this study will contribute to new research and literature in providing a more general perspective to researchers.

Conclusion

According to the results of this analysis, it was found that the most publications were made in 2022 and the publications were mostly in the USA, the population density in the countries receiving brain drain was low, the population density was less in the developed countries, there was more health personnel brain drain in developed countries, and employment and economic reasons were the triggering force in terms of brain drain in health personnel. It is known that the sector that experiences the highest brain drain is health professionals. Migration from countries with poor conditions to countries with more advantageous conditions continues to increase day by day. This situation needs to be addressed in terms of country policies.

Ethics Committee Approval

There was no data obtained from animal or human experiments for this article.

Informed Consent

The consents were obtained from all of the authors for this article.

Author Contributions

All of the authors contributed at every stage of the study.

Acknowledgments

None

Conflict of Interest

The authors declare that they have no conflict of interest.

Financial Disclosure

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Statements

These data have not been presented or published anywhere previously.

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