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Research Article /Araştırma

Organ bağışı alanındaki yayınların bibliyometrik analizi: 1980 – 2024

Bibliometric analysis of publications on organ donation: 1980 to 2024

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ABSTRACT

Aim: The insufficiency of organ donation (OD) drives researchers to conduct studies and develop solutions in this area. This study aimed to bibliometrically examine studies on organ donation indexed in the Web of Science (WoS) database.

Material and Methods: The bibliometric mapping technique, one of the bibliometric analysis methods, was employed in the study. The open-source "Bibliometrix" software based on R was used for bibliometric analysis.

Results: The analysis reviewed 2,578 articles published in 627 different journals between 1980 and 2023. The annual growth rate of publications was 12.46%, with an average of 16.69 citations per article and 8,713 total authors in the field. The most influential researchers were Susan E. Morgan and Laura A. Siminoff from the United States and Rafael Matesanz from Spain. The most influential researchers of Turkish origin were Nevzat Bilgin and Mehmet Haberal from Başkent University, and Ali Ozer from İnönü University. The journals "American Journal of Transplantation," "Transplantation Proceedings," and "Transplantation" were identified as the top three in terms of publications and citations. The most cited study was "The impact of presumed consent legislation on cadaveric organ donation: a cross-country study" by Alberto Abadie and Sebastien Gay, published in J Health Econ in 2006. The key themes identified were transplantation, tissue and organ procurement, qualitative research, attitude, knowledge, awareness, brain death, ethics, donation after cardiac death, consent, informed consent, and autonomy. These are expected to be the focus of future research.

Conclusion: This study provided a bibliometric analysis of articles on organ donation in the WoS database, offering valuable insights for researchers in the field.

ÖZ

Amaç: Organ bağışının yetersizliği, araştırmacıları bu alanda çalışmalar yapmaya ve çözüm önerileri geliştirmeye yönlendirmektedir. Bu çalışmanın amacı, Web of Science (WoS) veri tabanında dizinlenen organ bağışı konulu çalışmaları bibliyometrik olarak incelemektir.

Gereç ve Yöntem: Çalışmada bibliyometrik analiz yöntemlerinden biri olan bibliyometrik haritalama tekniği kullanılmıştır. Bibliyometrik analiz için R tabanlı açık kaynak "Bibliometrix" yazılımı kullanılmıştır.

Bulgular: Analizde, 1980–2023 yılları arasında 627 farklı dergide yayımlanmış toplam 2.578 makale incelenmiştir. Yayınların yıllık artış oranı %12,46 olarak belirlenmiş olup, makale başına ortalama 16,69 atıf alınmış ve alanda toplam 8.713 farklı yazar yer almıştır. En etkili araştırmacılar Amerika Birleşik Devletleri'nden Susan E. Morgan ve Laura A. Siminoff ile İspanya'dan Rafael Matesanz olarak öne çıkmıştır. Türkiye kökenli en etkili araştırmacılar ise Başkent Üniversitesi'nden Nevzat Bilgin ve Mehmet Haberal ile İnönü Üniversitesi'nden Ali Özer olmuştur. En fazla yayın ve atıf alan üç dergi "American Journal of Transplantation", "Transplantation Proceedings" ve "Transplantation" olarak belirlenmiştir. En çok atıf alan çalışma, Alberto Abadie ve Sebastien Gay tarafından 2006 yılında J Health Econ dergisinde yayımlanan "The impact of presumed consent legislation on cadaveric organ donation: a cross-country study" başlıklı çalışmadır. Öne çıkan ana temalar arasında transplantasyon, doku ve organ temini, nitel araştırmalar, tutum, bilgi, farkındalık, beyin ölümü, etik, kardiyak ölüm sonrası bağış, onam, bilgilendirilmiş onam ve özerklik yer almaktadır. Bu temaların gelecekteki araştırmaların da odağında olması beklenmektedir.

Sonuç: Bu çalışma, WoS veri tabanındaki organ bağışı konulu makaleleri bibliyometrik açıdan analiz ederek, alandaki araştırmacılar için önemli bilgiler sunmuştur.

ARTICLE INFO/MAKALE BİLGİSİ

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INTRODUCTION

Bibliometrics involves applying mathematical and statistical methods to analyze studies conducted in a specific field, generating visual insights into the qualitative and quantitative aspects of these publications (1). Bibliometric studies allow us to better understand the flow of information in scientific fields by analyzing the impact and development trends of academic research. This method provides researchers with opportunities to evaluate sources more effectively and discover new research areas (2). One critical topic for bibliometric analysis is organ donation (OD), a globally significant health issue.

OD refers to the act of allowing one's organs to be used for individuals in need, serving as the foundation for organ transplantation. Organ transplantation (OT) is the most effective and cost-efficient treatment method for patients suffering from organ failure (3,4). However, global OD rates are strikingly inadequate compared to the number of patients awaiting transplants (5). This discrepancy results in the loss of approximately 20% of patients on waiting lists each year (6,7).

Globally, the first successful kidney transplant was performed by Murray in 1954, the first liver transplant by Starzl in 1967, and the first heart transplant by Barnard in 1967 (8). In Türkiye, the first successful kidney transplant from a living donor occurred in 1975, from a cadaver in 1978, the first cadaveric liver transplant in 1988, and the first living donor liver transplant in 1990, all conducted by Haberal and his team (9). The increasing success, knowledge, and technology in OT have led to a 70% increase in demand for organ transplants from patients (10).

According to the latest data from the Global Observatory on Donation and Transplantation, 157,494 solid OT were performed worldwide in 2022, representing a 9.1% increase compared to 2021. Among these, 102,090 transplants involved deceased donors (62.49%) and living donors (39.28%), with kidney transplants accounting for the highest numbers (11). In Türkiye, 5,084 solid OT were performed in 2023, including 3,399 kidney, 1,630 liver, 15 lung, 39 heart, and one small intestine transplant (12). Contrary to European countries, approximately 75% of liver and kidney transplants in Türkiye are from living donors (9).

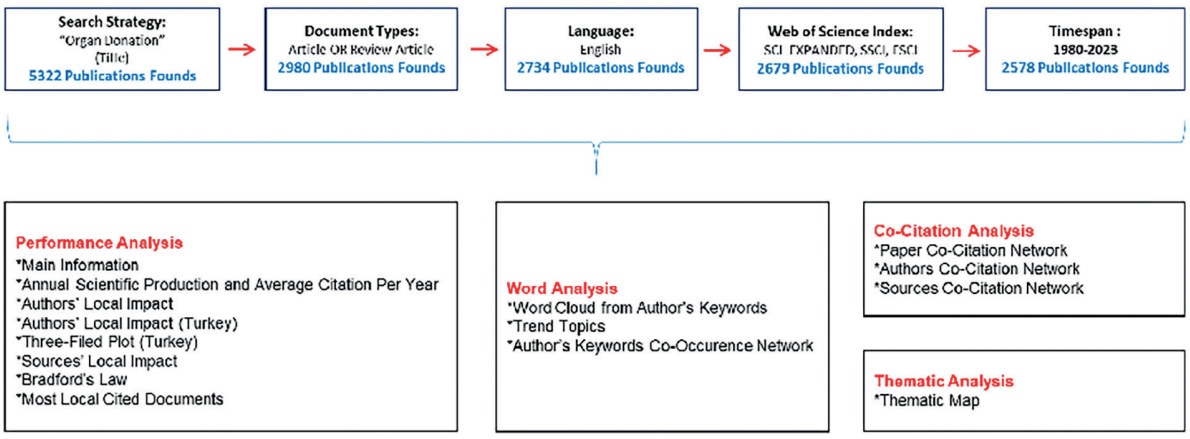

Figure 1. Workflow of Science Mapping

This study aimed to perform a bibliometric analysis of studies on OD in the Web of Science (WoS) database.

MATERIALS AND METHODS

The framework and workflow for the analysis of "OD" were outlined in Figure 1. The study design and data collection processes were conducted in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (13).

In this study, WoS database, one of the most widely used and respected bibliometric databases in academia, was utilized for bibliometric analyses and literature reviews. WoS provides access to a comprehensive collection of scientific literature, enabling researchers to analyze articles, citations, and impacts across various disciplines. It is widely used to evaluate research performance, identify trends in a field, pinpoint effective collaborative networks, and discover highly impactful publications (14).

The data search was conducted in the WoS database on August 10, 2024. Subsequently, the data were cleaned and filtered. Searching for publications with the title "Organ Donation" yielded 5,322 articles. When the document types "Article OR Review Article" were selected, the count decreased to 2,980. When the publication language was limited to "English," the total reduced to 2,734 articles. Selecting the WoS indices "SCI_EXPANDED, SSCI, ESCI" further narrowed it to 2,679 articles. Excluding 2024 publications due to ongoing database updates, a total of 2,578 articles were obtained for analysis.

The Bibliometrix software, an open-source R-based program, was used for analyzing the data. Bibliometrix is one of the most recent open-source tools for performing science mapping (15).

Our review analyzed 2,578 articles in four sections. The first section focuses on the performance analysis of articles in the field

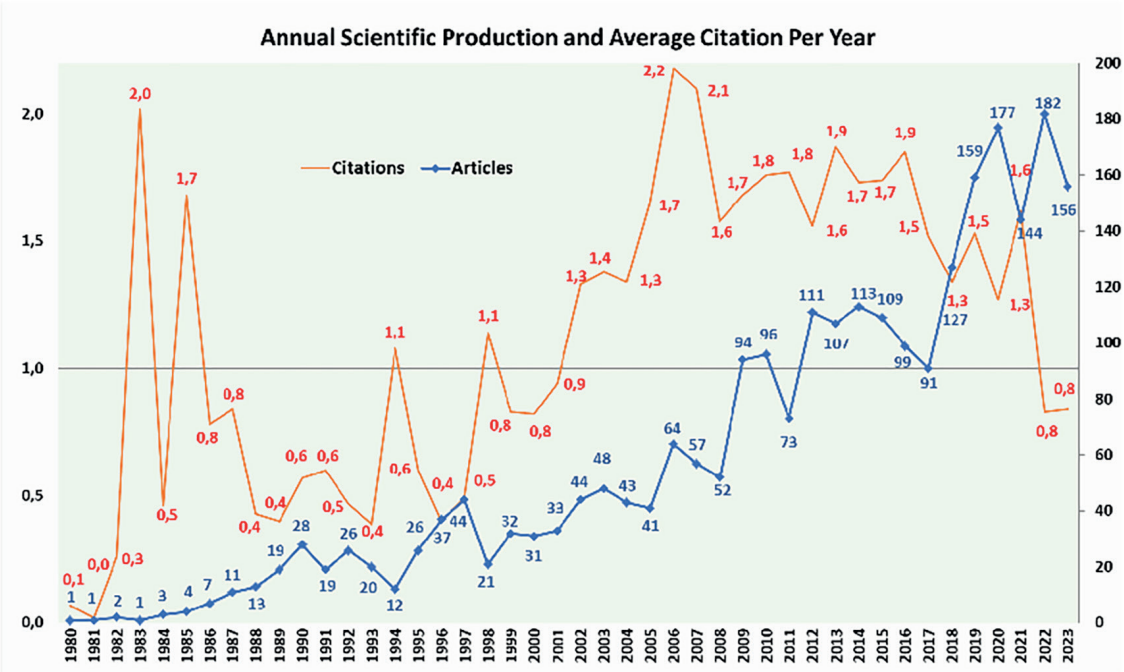

Figure 2. Annual scientific production and average citation per year

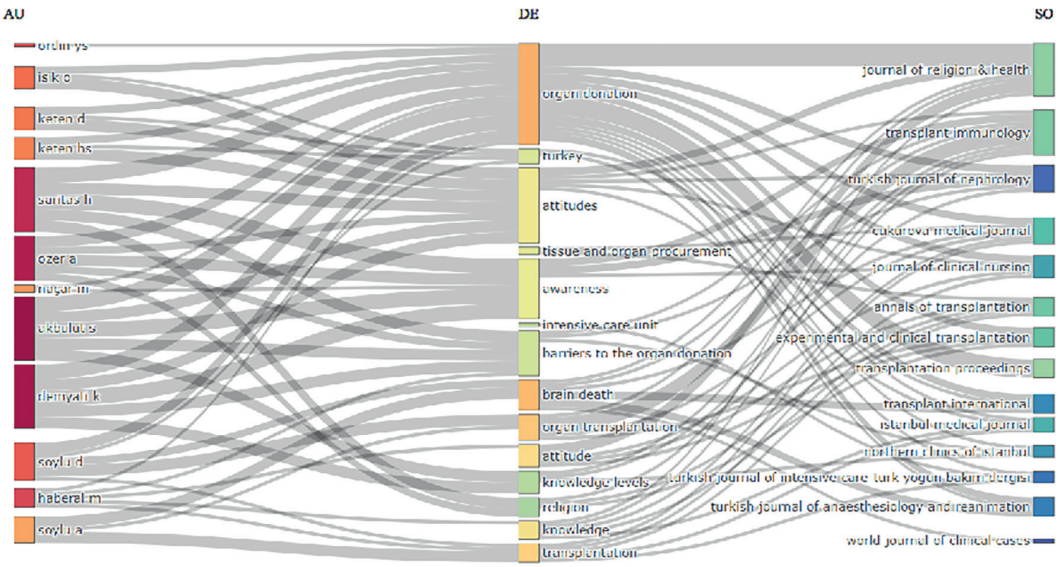

Figure 3. Three-Field Plot (Turkey)

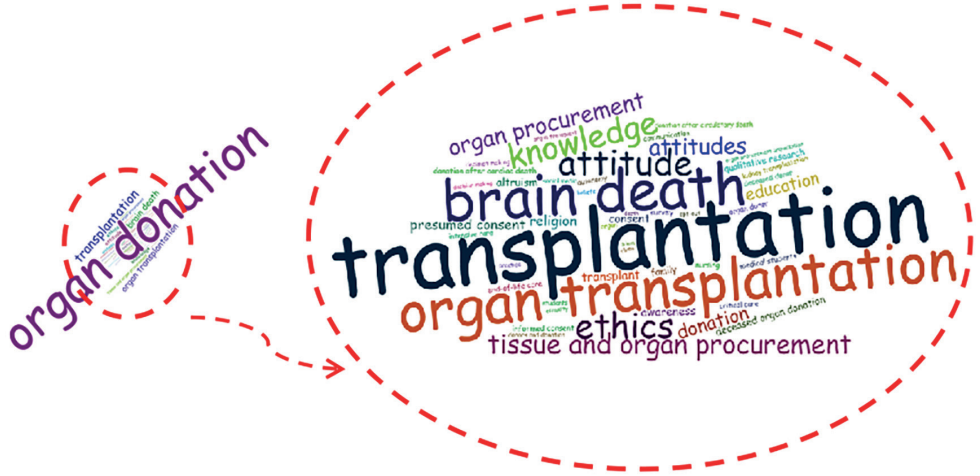

Figure 4. Word Cloud from Author's Keywords

of OD, while the second section examines word analysis. The third section delves into co-citation analysis, and the fourth section conducts thematic analysis. During the analysis, no word merging was performed to ensure the visibility of all terms in the results.

RESULTS

Performance Analysis

Statistical information on OD research is presented in Table 1. Between 1980 and 2023, a total of 2,578 documents were published across 627 different sources, reflecting an annual growth rate of 12.46%. The average

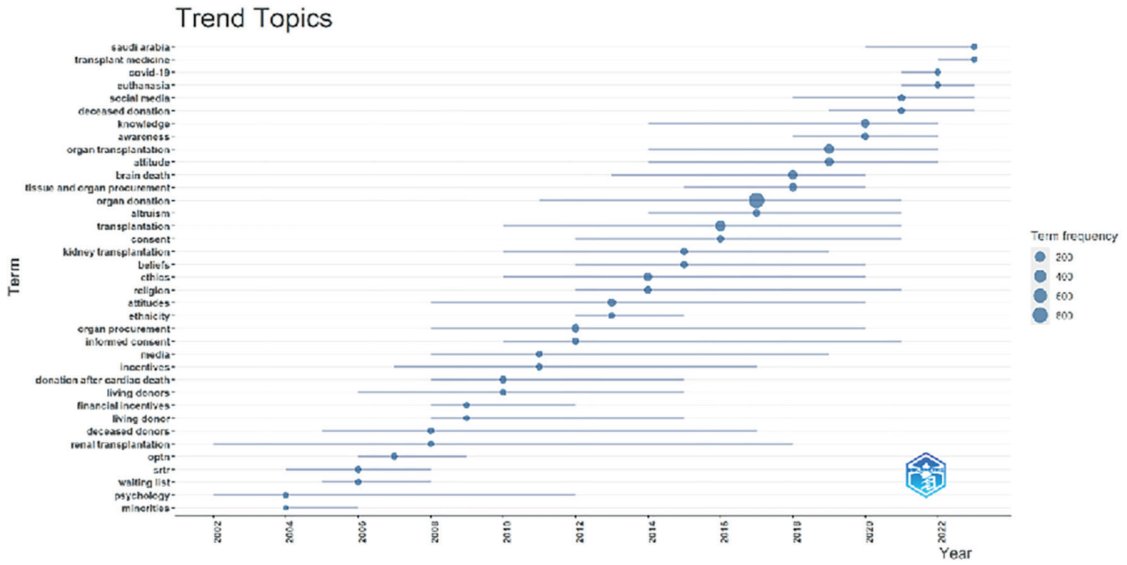

Figure 5. Trend Topics

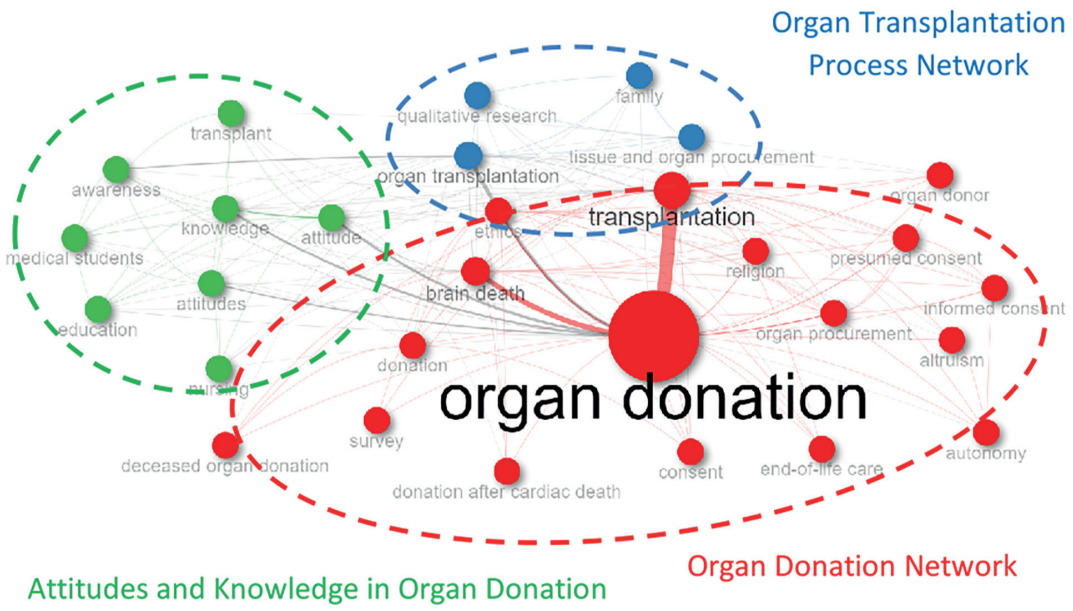

Figure 6. Authors' Keywords Co-Occurence Network

age of the articles was 12 years, with each document receiving an average of 16.69 citations. The total number of references cited in this field was 36,297, demonstrating the depth and scope of the scientific studies on OD.

A total of 8,713 authors contributed to the field, with 352 single-author documents.

Table 1. Main information

Description	Results	Description	Results
MAIN INFORMATION ABOUT DATA		AUTHORS	
Timespan	1980:2023	Authors	8713
Sources (Journals, Books, etc)	627	Authors of single-authored docs	287
Documents	2578	AUTHORS COLLABORATION	
Annual Growth Rate %	12.46	Single-authored docs	352
Document Average Age	12	Co-Authors per Doc	4.95
Average citations per doc	16.69	International co-authorships %	10.59
References	36297	DOCUMENT TYPES	
DOCUMENT CONTENTS		article	2004
Keywords Plus (ID)	1807	article; early access	6
Author's Keywords (DE)	2448	article; proceedings paper	396
		article; retracted publication	1
		review	171

Collaborative works were significantly high, with an average of 4.95 authors per document. Additionally, 10.59% of the articles involved international collaborations, underscoring the global interest and cooperation in the field of organ donation. When examining the types of documents, it is observed that articles dominate, although conference papers and reviews also hold a significant share.

These findings indicate that research in the field of organ donation is dynamic and continually evolving, characterized by strong international collaboration and an increasing impact of academic studies in this area over the years.

The annual scientific production and average citations per year from 1980 to 2023 were obtained using Bibliometrix and are shown in Figure 2. The data illustrate changing dynamics in production and citation rates over the years.

The annual production of studies on OD and their average citation counts highlight the growth and interest in this research area. While only one article was published in 1980, this number increased to 182 in 2022 and 156 in 2023, clearly demonstrating the rising trend over time.

In the 1980s, only a few articles were published annually, but a noticeable increase began in the 1990s. Particularly from the 2000s onward, research on organ donation experienced a significant surge, with the number of published articles rising rapidly after 2006. By 2020, the annual publication count reached 177 articles, peaking at 182 in 2022.

Table 2. Authors' local impact

Element	h_index	g_index	m_index	TC	NP	PY_start
MORGAN SE	18	25	0,783	1410	25	2002
SIMINOFF LA	16	26	0,552	1064	26	1996
MATESANZ R	15	21	0,517	831	21	1996
PARRILLA P	15	33	0,682	1198	67	2003
RAMÍREZ P	14	31	0,636	1071	73	2003
MERION RM	13	14	0,619	790	14	2004
RÍOS A	13	27	0,591	833	62	2003
DOMÍNGUEZ-GIL B	12	13	0,75	624	13	2009
FEELEY TH	12	18	0,632	617	18	2006
MARTÍNEZ-ALARCÓN L	11	20	0,611	470	39	2007
RANDHAWA G	11	17	0,407	307	23	1998
SALIM A	11	12	0,611	300	12	2007
SHEMIE SD	11	18	0,647	477	18	2008
DELMONICO FL	10	12	0,435	566	12	2002
DHANANI S	10	16	0,833	312	30	2013
BRIERLEY J	9	11	0,6	148	11	2010
HARRISON TR	9	10	0,45	334	10	2005
LÓPEZ-NAVAS A	9	15	0,6	248	22	2010
MIRANDA B	9	13	0,31	300	13	1996
QUICK BL	9	9	0,5	189	9	2007

NP = Number of publications, TC = Total citations, TC/NP = Citations per paper, PY_start = Publication year starting

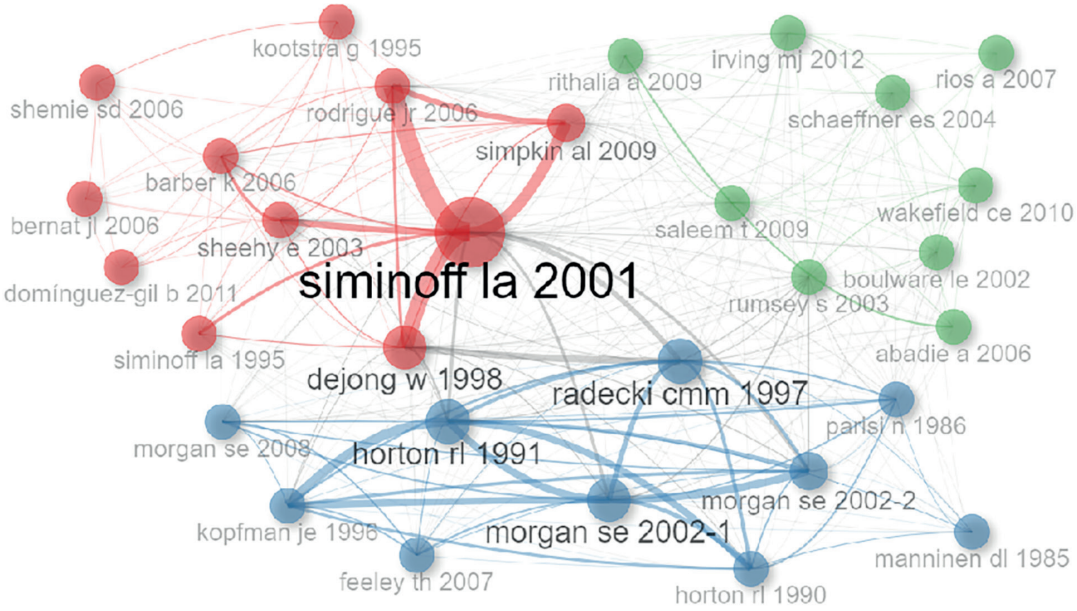

Figure 7. Papers Co-Citation Network

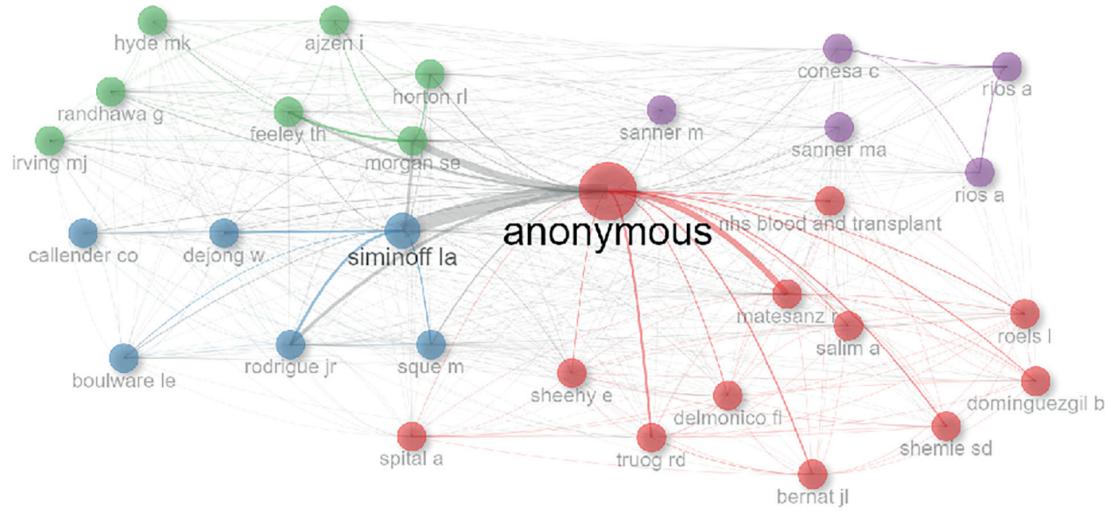

Figure 8. Authors Co-Citation Network

The citation trends showed fluctuations over the years. While initial citation numbers were low, they increased significantly in studies published after 2006. This indicates that research on OD has garnered greater attention and more references in the scientific community over time.

The data reveal that studies on organ donation have significantly increased over the years, with accelerated scientific output and a broad impact in the field. However, fluctuations in citation counts indicate that the topic has garnered varying levels of attention over time.

Table 3. Authors' local impact (Türkiye)

Element	h_index	g_index	m_index	TC	NP	PY_start
BILGIN N	4	4	0,154	91	4	1999
HABERAL M	4	4	0,154	96	4	1999
OZER A	4	5	0,267	67	5	2010
AKAYDIN M	3	3	0,115	96	3	1999
AKBULUT S	3	5	0,6	34	5	2020
DEMYATI K	3	5	0,6	34	5	2020
KEÇECIOGLU N	3	3	0,115	96	3	1999
NAÇAR M	3	3	0,188	99	3	2009
ORDIN YS	3	4	0,375	24	4	2017
SARITAS H	3	5	0,6	34	5	2020
TOKALAK I	3	3	0,13	118	3	2002
TUNCER M	3	3	0,115	96	3	1999
YAKUPOGLU G	3	3	0,115	96	3	1999
ÇETINKAYA F	3	3	0,188	99	3	2009
ALLAHVERDI TD	2	2	0,4	17	2	2020
AYAR G	2	2	0,182	15	2	2014
AYKAS A	2	2	0,2	27	2	2015
BAYKAN Z	2	2	0,125	59	2	2009
BILGEL H	2	2	0,059	92	2	1991
BILGEL N	2	2	0,059	92	2	1991

NP = Number of publications, TC = Total citations, TC/NP = Citations per paper, PY_start = Publication year starting

Table 4. Sources' local impact

Source	H-Index	G-Index	TC	NP	TC/ NP	PY_ start
AMERICAN JOURNAL OF TRANSPLANTATION	37	58	3473	70	49,6	2003
TRANSPLANTATION PROCEEDINGS	34	46	5799	549	10,6	1985
TRANSPLANTATION	26	41	1946	69	28,2	1987
CLINICAL TRANSPLANTATION	24	38	1669	70	23,8	1991
TRANSPLANT INTERNATIONAL	20	33	1154	53	21,8	1989
HEALTH COMMUNICATION	16	21	746	21	35,5	2002
PROGRESS IN TRANSPLANTATION	16	25	829	61	13,6	2008
CRITICAL CARE MEDICINE	15	18	908	18	50,4	1988
JOURNAL OF MEDICAL ETHICS	15	24	636	38	16,7	1998
SOCIAL SCIENCE & MEDICINE	14	18	805	18	44,7	1990
SAUDI JOURNAL OF KIDNEY DISEASES AND TRANSPLANTATION	13	22	540	36	15,0	2006
BMC MEDICAL ETHICS	11	19	455	19	23,9	2009
NEPHROLOGY DIALYSIS TRANSPLANTATION	11	16	541	16	33,8	1997
ANNALS OF TRANSPLANTATION	10	16	297	30	9,9	2007
BIOETHICS	10	17	307	21	14,6	1994
JOURNAL OF THE NATIONAL MEDICAL ASSOCIATION	10	13	442	13	34,0	1993
ANAESTHESIA	9	11	290	11	26,4	2005
BMJ-BRITISH MEDICAL JOURNAL	9	9	653	9	72,6	1989
BRITISH JOURNAL OF ANAESTHESIA	9	10	329	10	32,9	2003
INTENSIVE CARE MEDICINE	9	10	433	10	43,3	2004

NP = Number of publications, TC = Total citations, TC/NP = Citations per paper, PY_start = Publication year starting

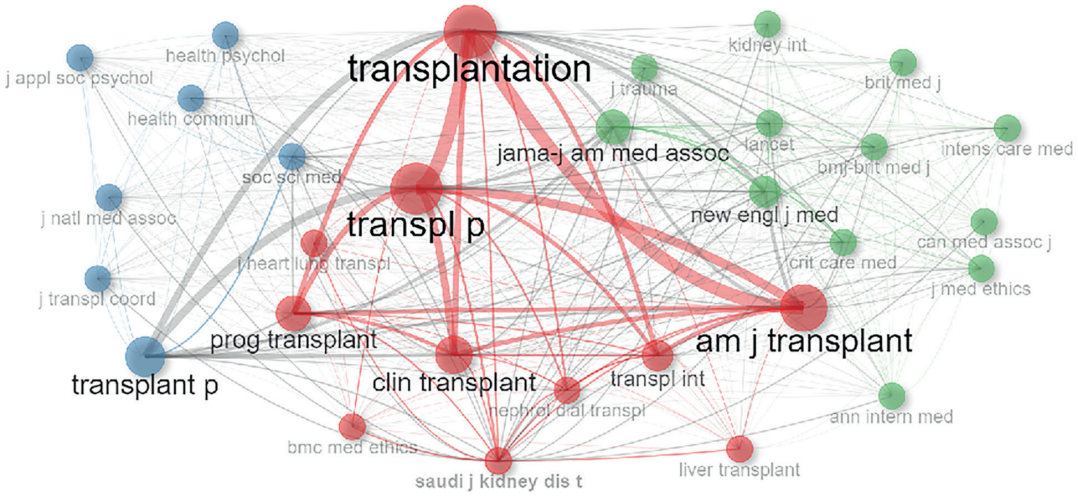

Figure 9. Sources Co-Citation Network

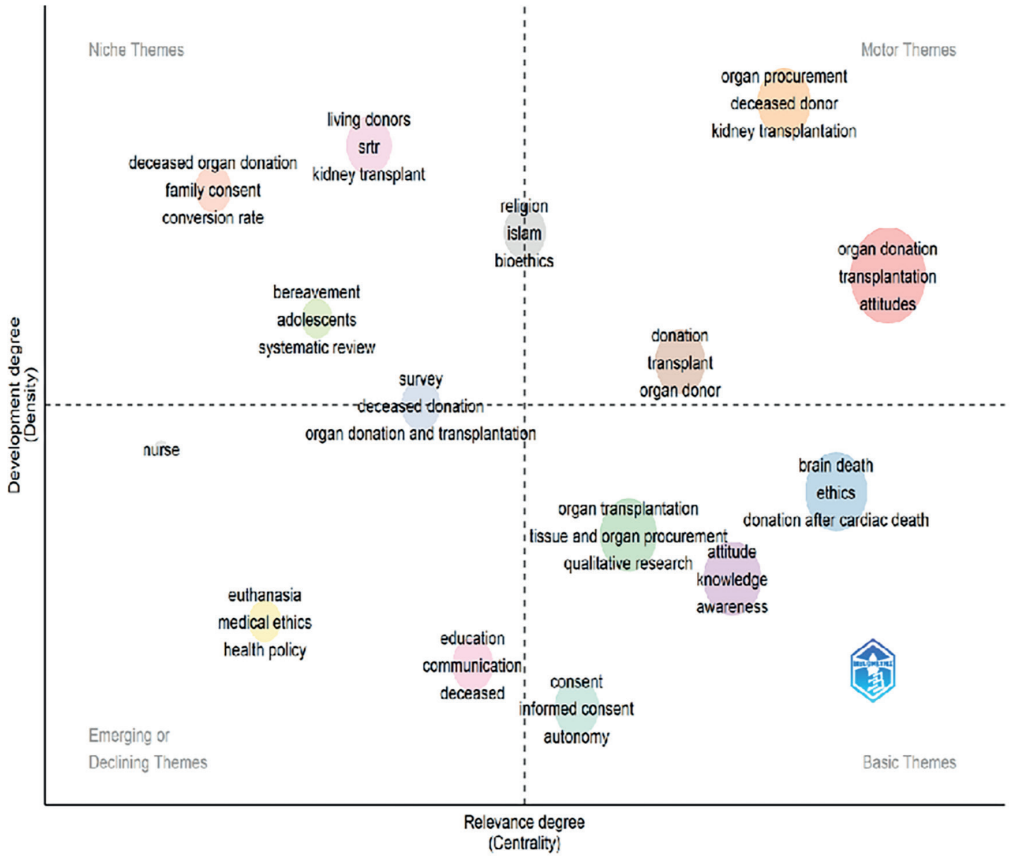

Figure 10. Thematic Map

Table 5. Most global cited documents

Paper	Total Citations	TC per Year
ABADIE A, 2006, J HEALTH ECON	302	15,89
PARK HS, 2007, HUM COMMUN RES	297	16,50
KLEIN AS, 2010, AM J TRANSPLANT	235	15,67
WOLFE RA, 2010, AM J TRANSPLANT	199	13,27
MANNINEN DL, 1985, JAMA-J AM MED ASSOC	196	4,90
SIMPKIN AL, 2009, BMJ-BRIT MED J	188	11,75
BERNAT JL, 2010, CRIT CARE MED	183	12,20
MAGLIOCCA JF, 2005, J TRAUMA	178	8,90
MORGAN SE, 2002, J APPL COMMUN RES	178	7,74
RADECKI CMM, 1997, HEALTH PSYCHOL	174	6,21
RODRIGUE JR, 2006, AM J TRANSPLANT	169	8,89
JOHNSON RJ, 2014, TRANSPLANTATION	159	14,45
KOPFMAN JE, 1998, J APPL COMMUN RES	158	5,85
MORGAN SE, 2002, HEALTH COMMUN	157	6,83
SHEPHERD L, 2014, BMC MED	156	14,18
REINHART AM, 2007, COMMUN MONOGR	155	8,61
RIOS A, 2007, AM J TRANSPLANT	143	7,94
SANNER M, 1994, JAMA-J AM MED ASSOC	142	4,58
OLIVER M, 2011, NEPHROL DIAL TRANSPL	140	10,00
HORTON RL, 1990, SOC SCI MED	139	3,97

TC = Total citations

Statistics for the top 20 most influential authors in OD research are presented in Table 2. These statistics are based on h-index rankings and evaluate the local impact of various authors using a range of bibliometric indicators. The analysis includes h-index, g-index, m-index, total citations (TC), total publications (NP), and the year the authors began their academic careers.

The h-index, first introduced by Jorge E. Hirsch, is a metric used to measure a researcher's scientific productivity and impact (16,17). The g-index, introduced by Leo Egghe in 2006, is designed to give more weight to highly cited articles, offering a refined approach to assessing scholarly influence (18). Meanwhile, the m-index, also developed by Hirsch, aims to compare researchers with academic careers of varying lengths. By dividing the h-index by the number of years the researcher has been actively working, this metric is considered a logical method for such comparisons (19).

Morgan SE and Siminoff LA hold the highest h-index and g-index values in this field. Morgan SE has an h-index of 18 and a g-index of 25, indicating a broad impact and a substantial number of highly cited publications. Similarly, Siminoff LA exhibits a comparable influence, with an h-index of 16 and a g-index of 26.

Authors such as Ramírez P and Parrilla P stand out with high publication counts, totaling 73 and 67 articles, respectively. These authors have published extensively, and their works have garnered significant citations. Notably, Ramírez P has achieved 1,071 total citations, reflecting a remarkable impact in the field.

Dhanani S (m-index: 0.833) and Morgan SE (m-index: 0.783) also distinguish themselves with high m-index values, demonstrating their productivity and influence throughout their careers. Dhanani S's high m-index suggests a relatively short but impactful career trajectory, characterized by substantial contributions to the field.

Siminoff LA and Matesanz R have been recognized for their contributions to OD research since 1996. Over the years, these authors have made significant and consistent contributions, building a strong foundation and impact in the field.

In contrast, authors like Dhanani S, Brierley J, and López-Navas A have entered the field more recently, particularly after 2010, and stand out with their high m-index values. This suggests that they are likely to make even greater contributions to the field in the future.

Statistical data highlighting the academic performance and local impact of Türkiye-based authors working on organ donation are presented in Table 3. Most authors have h-index and g-index values ranging between 2 and 4, indicating that while their work has a limited overall impact, they still contribute to the field. The highest g-index observed is 5, suggesting that some of their articles have received more citations compared to others, reflecting a degree of prominence for specific works.

Tokalak I stands out as the most cited author on the list, with a total of 118 citations. However, their relatively low h-index and g-index values suggest that these citations are concentrated on a limited number of publications.

Authors such as Bilgin N and Haberal M, who began their work in 1999, have each published four articles, receiving 91 and 96 citations, respectively. These authors are among the early contributors to the field and have made sustained contributions over many years.

Relatively newer contributors, such as Akbulut S, Demyati K, and Sarıtas H, started publishing in 2020 and exhibit high m-index values of 0.6. This indicates that they have made a notable impact in a short period and are likely to contribute significantly in the future.

Meanwhile, authors like Bilgel H and Bilgel N, who began their work in 1991, are among the earliest contributors in the field. However, their low h-index and g-index values suggest that the impact of their work has become more limited over time.

Authors such as Ozer A and Ordin YS have received a moderate number of citations, demonstrating a measurable impact through their h-index and g-index values. Notably, Ozer A's m-index of 0.267 indicates that they are at an early stage of their career but are already showing productivity and effectiveness in their contributions.

Three area charts related to OD are presented in Figure 3. This visualization highlights the names of authors on the left, key terms associated with the research in the center,

and sources on the right. A total of 12 authors, 14 keywords, and 14 journals were analyzed. The figure illustrates the focus areas of various productive authors, the key terms they emphasize, and the journals where they publish their work.

In the field of Organ Donation and Attitudes, the *Journal of Religions & Health* stands out, while *Transplant Immunology* and the *Turkish Journal of Nephrology* are prominent for studies on Awareness. Research on Barriers to OD is primarily published in the *Turkish Journal of Nephrology* and *Northern Clinics of Istanbul*.

Among the influential authors, Sarıtaş H has predominantly focused on Organ Donation and Religion, publishing their work in the *Journal of Religions & Health* and *Transplantation Proceedings*. Similarly, Akbulut S and Demyati K have explored topics such as Organ Donation, Attitudes, Awareness, Barriers to OD, and Knowledge Levels, publishing their findings in journals including the *Journal of Religions & Health*, *Transplant Immunology*, and the *Turkish Journal of Nephrology*.

Table 4 presents the top 20 journals publishing on OD, ranked by their h-index (Source Local Impact). These 20 journals account for 46.58% (1,201 out of 2,578) of the total articles published. The table includes key bibliometric indicators, such as h-index, g-index, total citations (TC), total publications (NP), citation-per-publication ratio (TC/NP), and the year they began publication (PY_start). These metrics provide insights into the local impact of various academic sources within the field.

The *American Journal of Transplantation* and *Transplantation Proceedings* stand out as the most influential journals in terms of h-index and g-index. Notably, the *American Journal of Transplantation* has an h-index of 37 and a g-index of 58, reflecting its extensive academic impact and the high number of citations received by its articles. In contrast, *Transplantation Proceedings* has published more articles (549), yet its citation-per-publication ratio (10.6) is comparatively lower.

Journals such as *BMJ-British Medical Journal*, *Critical Care Medicine*, and the *American Journal of Transplantation* feature the highest citation-per-publication ratios. Among these, *BMJ-British Medical Journal* stands out with an impressive average of 72.6 citations per article, making it the most impactful journal in this regard.

The journal *Critical Care Medicine* ranks second with a citation-per-publication ratio of 50.4, highlighting the high academic value of articles published in this journal.

Journals such as *Transplantation Proceedings* (1985), *Transplantation* (1987), and *Clinical Transplantation* (1991) are noteworthy for their long-standing presence in the field and extensive article archives. Their longevity underscores their pioneering roles in advancing research on OD.

Relatively newer journals, such as *BMC Medical Ethics* (2009) and *Annals of Transplantation* (2007), have proven to be highly impactful in terms of citation-per-publication ratios. These journals, with their focus on ethics and medical ethics, have made significant contributions to the discourse on organ donation.

Although journals like *Annals of Transplantation* and *Bioethics* have lower h-index and g-index values and their articles receive fewer citations on average, they remain important contributors to the field. These journals specialize in publishing focused and significant research in organ donation and transplantation, making meaningful contributions despite their more niche impact.

A citation analysis was conducted to identify the most-cited articles in the field of organ donation and to explore the connections between these articles. Citation analysis is commonly used to investigate the intellectual structure and developmental dynamics underlying a field of study.

The top 20 most-cited publications in the OD field are presented in Table 5, ranked in descending order based on their global citation (GC) counts. The table provides a comprehensive overview of these publications, sorted by their total global citation numbers.

The most globally cited article is Abadie A (2006), with a total of 302 citations (TC=302), achieving an annual average of 15.89 global citations. Other notable works include Park HS (2007) with 207 citations (TC=207), Klein AS (2010) with 235 citations (TC=235), Wolfe RA (2010) with 199 citations (TC=199), and Manninen DL (1985) with 196 citations (TC=196).

The article with the highest annual average global citation count is Park HS (2007), with a value of 16.50. This is closely followed by Abadie A (2006), which has an annual average of 15.89 citations.

Word Analysis

Authors select specific keywords to describe their articles, which are believed to reflect the content of the paper. Given that these keywords provide insight into the focus and themes of the research, they are crucial for conducting analyses and identifying the current topics and trends within a field of study (20).

A word cloud makes it easier to identify overlapping areas and analyze the popular keywords within those areas over time (21). In a word cloud, the larger a keyword appears, the more frequently it has been used in the dataset. The top 50 keywords chosen by authors of articles on organ donation are presented in Figure 4 as a word cloud.

Terms such as OD, Transplantation, and Brain Death are among the most frequently used keywords, indicating that research in this field predominantly focuses on these core concepts.

Other frequently used terms include OT and Tissue and Organ Procurement, highlighting the importance of research into the OT and procurement processes in the field of OD.

The frequent use of terms such as Attitude, Ethics, and Knowledge highlights that social attitudes, ethical issues, and levels of awareness are key focal points in research on OD and OT. These topics are examined as factors influencing individuals' decisions regarding organ donation.

Terms like Presumed Consent and Opt-Out point to research on the legal and political frameworks surrounding OD. These concepts are frequently used in studies addressing the various methods implemented in different countries' organ donation systems and the impacts of these methods.

The high frequency of medical terms such as Intensive Care, Critical Care, and End-of-Life Care indicates that the medical aspects of OD and transplantation are a significant area of research. These terms often appear in studies examining the role of healthcare services in the OD process.

The use of terms like Religion, Ethnicity, and Islam indicates that demographic and cultural factors play a significant role in research on OD. These factors are examined as important influences on individuals' attitudes and decisions regarding OD.

The frequent appearance of terms such as Education and Awareness reflects studies focused on educating the public and healthcare professionals, as well as raising awareness about OD. These studies examine the impact of educational programs aimed at increasing OD rates.

Figure 5 illustrates the popular keywords selected by authors and when they gained prominence over the years. Two keywords that were used at least five times per year are visualized for each year. Between 2002 and 2008, keywords such as Minorities, Psychology, Waiting List, Scientific Registry of Transplant Recipients (SRTR), Organ Procurement and Transplantation Network (OPTN), Renal Transplantation, and Deceased Donor were more frequently used. However, more recent years have seen an increased usage of keywords such as Saudi Arabia, Transplant Medicine, Covid-19, Euthanasia, Social Media, Deceased Donation, Knowledge, and Awareness.

This change over time illustrates how the focus of research on OD has evolved in terms of societal, medical, ethical, and regional dimensions. In the early years, topics such as minorities, psychological factors, and waiting lists were more prominent. However, in more recent years, Covid-19, social media, regional studies, and ethical debates have become central to the research agenda.

This shift shows how research in the field of OD has expanded over time, encompassing a broader range of topics, and adapting to global events and emerging issues.

In Figure 6, the co-occurrence network of author-generated keywords representing articles on OD is presented. The co-occurrence network of the top 29 keywords was analyzed. To clearly visualize the keyword co-occurrence networks, no word merging was performed.

The keywords are clustered into three groups, represented by red, green, and blue colors. The red cluster contains 17 keywords, the blue cluster contains 8 keywords, and the green cluster contains 4 keywords. The red cluster is represented by the keyword OD. When examining the co-occurrence networks, the thickness of the lines between keywords indicates the strongest co-occurrences, with the pairs OD – Transplantation, OD – Brain Death, and OD – OT showing the highest levels of co-occurrence.

The red cluster appears to represent concepts related to OD. This cluster could be named the OD Network, as all these concepts are closely linked to research on organ donation. Keywords such as OD, Transplantation, and Brain Death emerge as both central and significant terms in the network. These terms have strong connections with all other concepts and play a crucial role within the network.

The grouping of all these concepts into a single cluster highlights the interconnected and holistic nature of the terms used in organ donation research. This integrated structure underscores the collaborative and multidisciplinary approach adopted in this field.

The green cluster is associated with attitudes, knowledge levels, and education concerning OD. Terms like Attitude, Knowledge, and Education stand out as critical themes for understanding individual and societal approaches to OD. Therefore, the cluster could be named Attitudes and Knowledge in OD. This cluster highlights the strong connections between key themes such as attitudes, knowledge levels, and awareness. The keywords Attitude and Knowledge lie at the center of this cluster, closely linked to other concepts within the network. Their centrality underscores their importance in shaping the

discourse on education and awareness in OD.

The blue cluster is centered around OT and shows strong connections with other terms related to this process. Keywords such as Tissue and Organ Procurement, Family, and Qualitative Research are linked to significant themes and procedures in the organ transplantation process. Hence, the cluster name Organ Transplantation Process Network seems appropriate. This cluster illustrates the robust interconnection between key terms associated with the transplantation process. The term OT serves as the core of this cluster, maintaining close ties with other concepts. Meanwhile, other terms represent crucial but more specific aspects of OT process within the network.

Co-Citation Analysis

A Document Co-Citation Network analysis was conducted to examine shared citations among the papers in the "OD" literature. Using the Louvain algorithm, the first 30 articles were analyzed. As shown in Figure 7, the co-citation network consists of three clusters represented by red, blue, and green circles. Each circle in the clusters represents a paper. The presence of a line between circles indicates a relationship between the articles, with thicker lines signifying stronger relationships.

The red cluster contains 11 articles, the blue cluster 10, and the green cluster 9. The most co-cited articles were from the red cluster, led by Siminoff LA (2001), while the blue cluster was led by Radecki CMM (1997).

When examining the size of the circles, the articles that share the highest number of co-citations with another article are Siminoff LA 2001, Radecki CMM 1997, Morgan SE 2002-1, Horton RL 1991, Dejong W 1998, Simpkin AL 2009, and Morgan SE 2002-2.

Analyzing the thickness of the connecting lines, the most frequently co-cited article pairs by subsequent studies are:

- Siminoff LA 2001 – Rodrique JR 2006,
- Siminoff LA 2001 – Dejong W 1998,
- Siminoff LA 2001 – Simpkin AL 2009,
- Horton RL 1991 – Kopfman JE 1996.

These connections highlight the pivotal role these articles play in shaping subsequent research within the field.

An Author Co-citation Network analysis was conducted to examine the co-citations of authors in OD articles. As shown in Figure 8, the co-citation network is divided into four node clusters represented by circles.

The red cluster is the largest, consisting of 12 authors, while the green cluster has 7 authors, the blue cluster 6 authors, and the purple cluster 5 authors. In the red cluster, the central node represents Anonymous, which accounts for the most-cited works with no identifiable authors. Examination of the WOS database indicates that such works are attributed to "Anonymous" when the cited references lack author details.

The blue cluster is represented by Siminoff LA, who is also the most co-cited author in the network. The green and purple clusters do not have dominant authors with frequent co-citations. When examining the thickness of the connecting lines, the following pairs represent the strongest co-citation relationships:

- Anonymous – Siminoff LA,
- Anonymous – Matezans R,
- Anonymous – Morgan SE,
- Anonymous – Feeley TH,
- Siminoff LA – Dejong W.

These findings underscore the influential contributions of Siminoff LA and Anonymous sources in shaping subsequent research within the domain.

The Source Co-citation Network analysis was conducted to examine the co-citations of sources referenced in OD articles. As shown in Figure 9, the co-citation network is divided into three clusters, each represented by circles. Each circle signifies a single source.

The red cluster represents the central cluster with high centrality, containing 11 journals. *The Transplantation* journal is at the center of this cluster, with co-citation links both within its own cluster and with other clusters. The other journals in the red cluster with the most co-citations are *Transpl P, AM J Transplant, Prog Transplant, and Clin Transplant*.

The green cluster includes 12 journals, with *New Engl J Med* and *Jama-L AM Med Assoc* being the most co-cited journals in this group. The blue cluster contains 7 journals, with *Transplant P* being the most co-cited journal in this cluster.

The highest co-citations are between the following journal pairs, as indicated by the thickness of the lines: *Transplantation - Transpl P, Transplantation - AM J Transplant, Transpl P - AM J Transplant, Transpl P – Transplant P, and Transplantation - Transplant P.*

Thematic Analysis

Figure 10 presents a thematic map of OD research across different periods, created using Bibliometrix. This map is based on the first 2000 author keywords that were repeated at least twice. The most frequently used keywords are grouped into thematic clusters, with each cluster represented by the top three most recurring terms. The clustering process was carried out using the Louvain clustering algorithm, and word merging was performed. The size of the circles is adjusted according to the frequency of usage of the keywords they represent.

Thematic analysis is a research method that examines a text, document, or dataset around specific themes, topics, or motivational elements. This approach aims to identify patterns and meanings within texts and is generally categorized as a qualitative research method. Researchers use this method to develop a deeper understanding of particular subjects.

Thematic mapping is used to visualize how research themes have evolved and their dynamics over time (22).Strategic diagrams, on the other hand, are tools that reflect the interactions of factors within a specific research topic over time and define the network structure of the field in a static manner (23).

Strategic diagrams divide themes into four quadrants, each interpreted using specific parameters. In these diagrams, the y-axis represents intensity (density), while the x-axis represents centrality, depicting the thematic map. A theme is considered more important the more central it is, and more developed the more intense it is (24).

The themes in the first quadrant, located in the top right corner of the thematic map, are Motor Themes; they show high intensity and high centrality, are advanced, and are vital to the research field. The themes in the second quadrant, located in the top left corner, are Niche Themes; they show high intensity but low centrality, are well-developed but remain isolated. The themes in the third quadrant, located in the bottom left corner, are Emerging or Declining Themes, showing low intensity and low centrality; these themes represent newly emerging or declining topics. The themes in the fourth quadrant, located

in the bottom right corner, are Basic Themes; they show low intensity but high centrality, indicating that while not extensively studied, they have well-developed internal connections (25).

Motor themes, the first quadrant themes, consist of three clusters. The first cluster is represented by the keywords OD, Transplantation, Attitudes; the second cluster by Organ Procurement, Deceased Donor, Kidney Transplantation; and the third cluster by Donation, Transplant, Organ Donor. These motor themes are central and well-developed, representing the focal points and emphasis of the research field. They have been systematically and extensively addressed by researchers over a long period of time.

OD, Transplantation, Attitudes: These keywords emphasize the core dynamics of organ donation, people's attitudes toward the topic, and the importance of donation processes. Organ Procurement, Deceased Donor, Kidney Transplantation: These keywords focus on critical processes such as organ procurement, deceased donors, and kidney transplantation. Donation, Transplant, Organ Donor: These keywords highlight the central role of donation processes and organ donors, emphasizing their importance among motor themes. These themes represent the core focus of research in organ donation and transplantation. Studies have been concentrated and systematically developed in these areas.

Niche themes, the second quadrant themes, consist of three clusters. The first cluster is represented by the keywords Living Donors, Srtr, Kidney Transplant; the second cluster by Deceased Organ Donation, Family Consent, Conversion Rate; and the third cluster by Bereavement, Adolescents, Systematic Review. These themes are peripheral and advanced, with well-developed internal connections but weak external connections, indicating that they have only marginal importance.

Living Donors, Srtr, Kidney Transplant: These keywords focus on living donors and the kidney transplantation process. Deceased Organ Donation, Family Consent, Conversion Rate: These keywords cover specific topics related to family consent and organ procurement from deceased donors. Bereavement, Adolescents, Systematic Review: These keywords focus on topics such as the bereavement process, adolescent donors, and systematic reviews. These themes represent specific and in-depth research areas within organ donation, yet they are generally more isolated from mainstream research. They hold importance but are less central to the primary focus of the field.

Emerging or Declining themes, the third quadrant themes, consist of three clusters. The first cluster is represented by the keywords Education, Communication, Deceased; the second cluster by Euthanasia, Medical Ethics, Health Policy; and the third cluster by Nurse. These themes are peripheral and underdeveloped, with weak internal and external connections, indicating that they represent emerging or fading topics.

Education, Communication, Deceased: Research on education, communication, and deceased donors is central to this theme. Euthanasia, Medical Ethics, Health Policy: This cluster covers topics related to medical ethics, euthanasia, and health policies, all of which approach the donation process from an ethical perspective. Nurse, Studies focusing on the role of nurses are represented in this theme. These themes may represent newly emerging or declining topics within organ donation. The research indicates that these themes are either still in the developmental stage or are starting to fade from the research agenda.

Basic themes, the fourth quadrant themes, consist of four clusters. The first cluster is represented by the keywords Organ Transplantation, Tissue and Organ Procurement, Qualitative Research; the second cluster by Attitude, Knowledge, Awareness; the third cluster by Brain Death, Ethics, Donation After Cardiac Death; and the fourth cluster by Consent, Informed Consent, Autonomy. These themes are emerging active research topics and are maturing.

Organ Transplantation, Tissue and Organ Procurement, Qualitative Research: These are fundamental studies related to organ transplantation and procurement processes.

Attitude, Knowledge, Awareness: This cluster focuses on core issues such as attitudes, knowledge, and awareness. Brain Death, Ethics, Donation After Cardiac Death: This group addresses topics on brain death, ethics, and donation after cardiac death. Consent, Informed Consent, Autonomy: This cluster examines issues surrounding consent, informed consent, and autonomy. These themes represent the core research areas within organ donation and are in the process of maturing. In the future, these topics may become the focus of further research.

A cluster represented by Religion, Islam, Bioethics is situated between the Motor themes and Niche themes, while a cluster represented by Survey, Deceased Donation, Organ Donation and Transplantation lies between the Niche themes and Emerging or Declining themes.

DISCUSSION

Bibliometric analyses have been widely applied in the medical field since their development in 1987 (26). However, a review of the literature revealed a lack of bibliometric studies on organ donation. This study aimed to fill this gap.

The first publication in the field of "Organ Donation" indexed in the WoS database dates back to 1980. A total of 2,578 articles across 627 journals were published on this topic up to 2024. The annual growth rate of articles was 12.46%, with an average of 16.69 citations per article. The annual number of articles produced increased significantly, peaking at 182 in 2022. This reflects the growing interest in OD among both the general public and the healthcare community.

The most influential researchers, based on publication counts and citations, were Professor Susan E. Morgan from Miami University School of Communication, Professor Laura A. Siminoff from Temple University's College of Public Health in the United States, and nephrologist Professor Rafael Matesanz from Spain's National Transplant Organization (ONT).

Among Turkish researchers, the most impactful were Professor Nevzat Bilgin from Başkent University Faculty of Medicine, Department of General Surgery – Transplant Division, followed by Professor Mehmet Haberal from the same institution. Haberal pioneered organ transplants in Türkiye and served as the founding president of The Middle East Society for Organ Transplantation (MESOT). He is also the Editor-in-Chief of the journal *Experimental and Clinical Transplantation*. Professor Ali Ozer from İnönü University Faculty of Medicine, Department of Public Health, was the third most influential Turkish researcher.

The *American Journal of Transplantation*, the official journal of the American Society of Transplant Surgeons and the American Society of Transplantation, has been indexed in the WoS database since 2003 and accounted

for 2.71% of the publications. This journal was identified as the most impactful in the field. *Transplantation Proceedings*, indexed since 1985, published 21.3% of all articles on this topic and emerged as the second most influential journal. It also serves as the official publication for organizations such as the Asian Transplantation Society and the Turkish Transplantation Centers Coordinators Association. *Transplantation*, the third most impactful journal, has been indexed since 1987 and is the official publication of The Transplantation Society, publishing 2.67% of the articles.

In terms of citations, the most impactful study was conducted by Alberto Abadie from the Massachusetts Institute of Technology and Sebastien Gay from Georgetown University. Their 2006 article, "The impact of presumed consent legislation on cadaveric organ donation: a cross-country study," published in *J Health Econ*, examined the effect of presumed consent legislation on donation rates and found it significantly positive (27).

The second most influential article, published in *Hum Commun Res* in 2007, is authored by Professor Hee Sun Park and Professor Sandi W. Smith from the Department of Communication at Michigan State University. The study, titled "*Distinctiveness and influence of subjective norms, personal descriptive and injunctive norms, and societal descriptive and injunctive norms on behavioral intent: a case of two behaviors critical to organ donation*", concludes that societal norms play a significant role in influencing organ donation behavior (28).

The third most influential article, published in *Am J Transplant* in 2010 by transplant surgeon Andrew S. Klein and colleagues from Cedars-Sinai Medical Center, USA, is titled "*Organ donation and utilization in the United States, 1999-2008*". This study examines organ donation and transplantation numbers in the USA between 2004 and 2008 and addresses the decline in organ donation rates (29).

The results of the keyword analysis show that terms such as brain death, OT, attitudes, ethics, and knowledge have emerged as key concepts, which are indeed fundamental elements of the OD process. The detection of brain death and the effective management of the OD process involve significant roles played by the intensive care team and the organ transplantation coordinator (9). Several factors, such as individuals' knowledge level, religious beliefs, social structures, and awareness, influence the decision to donate organs (4). After 2019, however, terms like Covid-19, euthanasia, and social media have been more frequently used. For instance, Bollen et al. engage in ethical debates surrounding organ donation euthanasia, addressing how surgical procedures leading to death might also improve the quality of other donated organs and respect the patient's autonomy (30). Ibrahim et al. have commented on how infection transmission to recipients and healthcare personnel could be prevented during the Covid-19 pandemic, how transplantation activities were significantly reduced, and how the likelihood of patient death on the waiting list increased (31). This reflects how OD research has evolved over time, encompassing various dimensions and adapting to global events.

When analyzing the Co-Citation results, the most frequently co-cited author is Professor Laura A. Siminoff from the College of Public Health, Temple University in the USA, with her article titled *"Factors influencing families' consent for donation of solid organs for transplantation"*. This study found that the sociodemographic characteristics of the family and the patient (ethnicity, patient's age, and cause of death), as well as prior

knowledge of the patient's wishes, were significantly related to the willingness to donate. The importance of educating the public to increase organ donation rates was emphasized (32). Along with this article, another highly cited study is by Professor James R. Rodrique, a transplant surgeon from Harvard Medical School, titled *"Organ donation decision: comparison of donor and non-donor families"*. This study found that the likelihood of organ donation was higher when the donor and their close relatives were young, had received information about OD, the transplant coordinator explained the process in detail, and the donor had previously expressed their willingness to donate. Similar to Siminoff's study, this research also recommended increasing community education (33).

The thematic analysis of OD research highlights key themes such as transplantation, tissue and organ procurement, qualitative research, attitude, knowledge, awareness, brain death, ethics, donation after cardiac death, consent, informed consent, and autonomy. The themes of *OT, Tissue and Organ Procurement, and Qualitative Research* may prompt further research on topics such as the optimization of organ and tissue procurement processes, integration of new technologies like artificial intelligence and biotechnology, and the psychosocial impacts of donor-recipient experiences. The themes of *Attitude, Knowledge, and Awareness* could lay the groundwork for more studies in areas such as the effectiveness of public awareness campaigns, the role of educational programs in enhancing knowledge, and changes in societal attitudes toward OD. Themes such as *Brain Death, Ethics, and Donation After Cardiac Death* may offer potential for research focused on updating the definition of brain death, the medical and ethical aspects of donation after cardiac death, and how ethical conflicts related to OD are addressed in different cultures. The themes of *Consent, Informed Consent, and Autonomy* could serve as focal points for future research on topics like the impact of digital health data and artificial intelligence on informed consent processes, preserving and expanding donor autonomy, and comparing global legal and ethical standards regarding OD. These themes form the foundation of current OD research and present significant areas of inquiry for future studies. Topics such as artificial organs, digital consent processes, and global awareness strategies are among the potential research areas that should be deeply explored.

In conclusion, articles related to OD were bibliometrically analyzed in the WoS database, and insights that are believed to be beneficial to researchers in this field have been revealed. The originality of this study lies in the fact that it is the first comprehensive bibliometric research on organ donation. A limitation of this study is that it focused solely on articles indexed in a single database, with only those categorized as journal articles being included in the analysis. It is recommended that similar studies be conducted in other databases such as PubMed and Scopus, and that the study be repeated in the future with updated data.

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