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The Evolution of Retinopathy of Prematurity Publications: A Holistic Investigation of Global Outputs with Bibliometric Analysis

Prematüre Retinopatisi Yayınlarının Değerlendirmesi: Bibliyometrik Analiz ile Küresel Çıktıların Bütünsel Bir İncelemesi

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ABSTRACT

Objective: Although retinopathy of prematurity (ROP) affects preterm newborns at a significant rate worldwide, no comprehensive bibliometric research has been conducted as yet. This study aimed to use bibliometric methods to present a summary of articles published on ROP between 1980 and 2019, to identify the articles most cited in the field, most active journals, and subjects of trends. Using the bibliometric analysis, readers were introduced to the articles published on ROP as a whole. The results of the study will be of guidance to researchers in terms of which subjects require more research and what subjects of new research could be.

Method: Articles published on ROP between 1980 and 2019 were downloaded from the Web of Science database and analyzed with bibliometric methods. The literature scan was made using the following keywords: "retinopathy of prematurity," "retrolental fibroplasia," and "ROP" in the title section. The correlations between the number of publications in a country and gross domestic product (GDP) and GDP per capita values were analyzed using Spearman's correlation coefficient. The number of articles to be published in the future was estimated with linear regression analysis.

Results: 4,575 publications on ROP were identified, of which 2,345 were articles. A continuing increasing trend for publication was seen. The five countries producing the most articles on ROP were as follows: USA (978), UK (187), Turkey (156), India (140), and China (121). A statistically significant positive correlation was determined between the number of ROP articles produced and the GDP and GDP per capita values of countries ($r = 0.688$, $p < 0.001$; $r = 0.664$, $p < 0.001$). Journals publishing the most articles were the Journal of American Association for Pediatric Ophthalmology and Strabismus, Ophthalmology, and British Journal of Ophthalmology, respectively. The most cited area was the international classification of premature retinopathy.

Conclusion: In parallel with the increasing importance of ROP, this comprehensive study, evaluating articles in this field as a whole, will be of guidance to clinicians, academicians, and students interested in this subject.

Keywords: Retinopathy of prematurity, ROP, retrolental fibroplasia, bibliometrics, scientometrics

ÖZ

Amaç: Prematüre retinopatisi (ROP) dünya genelinde önemli miktarda preterm yenidoğanı etkileyen önemli bir konu olmasına rağmen bu konuda henüz kapsamlı bir bibliyometrik araştırma yapılmamıştır. Bu çalışmanın amacı bibliyometrik yöntemlerle ROP konusunda 1980-2019 yılları arasında yayınlanan makalelerin bütünsel bir özeti sunmak, alandaki en çok atıf yapılan makaleleri belirlemek, en aktif dergileri ve trend konularını belirlemektir. Yaptığımız bibliyometrik analiz ile ROP konusundaki yayınları bir bütün olarak okuyuculara göstermeyi amaçladık. Bu çalışmanın sonuçları ayrıca hangi konuların daha fazla çalışılmaya ihtiyaç duyduğu ve hangi yeni araştırma konularının olabileceği konusunda araştırmacılara fikir sağlayacaktır.

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Yöntem: ROP konusunda 1980 ve 2019 yılları arasında yayınlanan makaleler Web of Science veritabanından indirildi ve bibliyometrik yöntemler kullanılarak analiz edildi. Literatür taraması makalelerin "title" bölümünde "retinopathy of prematurity", "retrolental fibroplasia" "ROP" anahtar kelimeleri kullanılarak gerçekleştirildi. Ülkelerin yayın sayısı ile Gayri Safi Yurtiçi Hasıla (GSYH) ile kişi başına GSHY değerleri arasındaki korelasyonlar Spearman'ın korelasyon katsayısı kullanılarak analiz edildi. Gelecekte yayınlanacak makale sayısı doğrusal regresyon analizi ile tahmin edildi.

Bulgular: ROP konusunda toplam 4.575 yayın bulundu. Bu yayınların 2.345'i makale idi. ROP konusunda her geçen gün artan bir yayın trendi olduğu görüldü. ROP konusunda en fazla makale üreten ilk 5 ülke sırasıyla USA (978), UK (187), Turkey (156), India (140), ve China (121) idi. Dünya ülkelerinin GSYH ve GSHY göstergeleri ile ROP yayın üretkenlikleri arasında istatistiksel olarak anlamlı pozitif bir korelasyon bulundu ($r = 0,688, p < 0,001$; $r = 0,664, p < 0,001$). En fazla yayın üreten dergiler sırasıyla Journal of AAPOS, Ophthalmology, ve British Journal of Ophthalmology idi. Makale başına atıfta en etkili dergiler Pediatrics, Archives of Ophthalmology, ve Ophthalmology idi. Prematüre retinopatisinin uluslararası sınıflandırması en fazla atıf alan konu idi.

Sonuç: ROP'nin artan önemine paralel olarak, bu alandaki makalelerin bütüncül bir değerlendirmesini yapan bu kapsamlı çalışma, bu konuya ilgi duyan doktor, akademisyen ve öğrencilere yön gösterecektir.

Anahtar kelimeler: Retinopathy of prematurity, ROP, retrolental fibroplasia, bibliometrics, scientometrics

INTRODUCTION

Retinopathy of prematurity (ROP) is an important eye disease that occurs in premature infants and affects vision at a significant rate⁽¹⁻³⁾. Retinopathy is one of the leading preventable causes of blindness⁽⁴⁾.

The incidence of ROP shows variability according to the level of development of countries and characteristics of neonatal intensive care units (NICU). In a retrospective study by Sancak et al.⁽⁵⁾, ROP frequency at the end of a four-year period (2011-2014) was 43% in 888 preterm newborns [gestational age (GA) ≤ 32 weeks and birth weight ≤ 1500 g], followed up in NICU. In a multicenter prevalence study by Bas et al.⁽⁶⁾ (2018), 27% ROP and 6.7% severe ROP were determined at any stage in 6115 infants [4964 (81%) with GA ≤ 32 weeks and 1151 (19%) with GA > 32 weeks] in 69 NICU. Eriş et al.⁽⁷⁾ (2018) reported ROP at a rate of 41.7% in infants with a birth weight less than 1500 g and 27% in infants of GA less than 34 weeks. A prospective study in Sweden reported ROP (at any stage) at a rate of 73% (368/506) and severe retinopathy at a rate of 35% (175/506) in infants with GA less than 27 weeks⁽⁸⁾. Another study in Austria reported severe ROP in 16% (50/316) of infants with GA less than 27 weeks⁽⁹⁾.

Bibliometric analyses are the statistical and mathematical analyses of publications, such as books and articles, produced by an institution or country in a specific area of research⁽¹⁰⁻¹³⁾. The aim of bibliometric studies is to analyze the increasing rate and development of studies in a specific area or discipline, summarize literature, and evaluate the current status of scientific publication policies of a country^(14,15). Bibliometric studies allow comparisons between countries, institutions, or authors on various subjects^(4,16,17).

In parallel with the technological developments and improvements in neonatal care, the increase in survival

rates of preterm newborns with a lower GA led to an increase in the frequency of ROP, which continues to be a significant problem. Although ROP affects preterm newborns at a significant rate, no comprehensive bibliometric study on the subject has been conducted to date. This study aimed to use bibliometric methods to present a summary of articles published on ROP between 1980 and 2019 and identify the articles most cited in the field, the most active journals, and subjects of trends. With this bibliometric analysis, readers are introduced to the articles published on ROP as a whole. The results of the study will be of guidance to researchers in terms of which subjects require more research and what subjects of new research could be.

METHOD

Articles published on ROP between 1980 and 2019 were downloaded from the Web of Science database (WoS; Web of Science by Clarivate Analytics) and analyzed with bibliometric methods. The literature scan was made using the keywords in the "title" section as follows: "retinopathy of prematurity," "retrolental fibroplasia" (in all research areas), and "ROP" (only in ophthalmology and pediatrics research areas because ROP is used with different meanings such as ring-opening polymerization in different research areas). (#1: Title: ("retinopathy of prematurity"), #2: Title: ("retrolental fibroplasia"), #3: Title: ("ROP") refined by: WoS Categories: (Ophthalmology or Pediatrics). #1 OR #2 OR #3 Timespan: 1975-2019. Indexes: SCI-Expanded, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI).

Statistical Analysis

This research method included all articles published on this subject. Bibliometric analyses were performed using VOSviewer (Version 1.6.13) software. The correlations between the number of publications in a country and gross domestic

product (GDP) and GDP per capita (purchasing power parity, GDP PPP) values were analyzed using Spearman's correlation coefficient. Spearman's correlation coefficient was evaluated as follows: 0.90-1.00 was considered very high; 0.70-0.89, high; 0.50-0.69, moderate; 0.26-0.49, low. The number of articles to be published in the period 2019-2024 was estimated using linear regression analysis. Statistical analyses were performed using SPSS version 22.0 software (SPSS Inc., Chicago, IL, USA). A value of $p < 0.05$ was considered statistically significant.

RESULTS

Based on the literature scan, 4,575 publications on ROP were identified. Of these, 51.25% ($n = 2345$) were articles, 26.49% ($n = 1212$), meeting abstracts, 9.73% ($n = 445$), letters, 5.83% (267), proceedings papers, 5.29% (242), editorial materials, and 3.45% (158), reviews, and the remaining (79) were other types of publication (correction, book chapter, note, early access, book review, discussion, correction addition, news item, reprint, retracted publication).

Of the 2345 published articles, 96.162% ($n = 2255$) were in English and the remaining were in other languages: German (44), Spanish (15), French (13), Portuguese (6), Turkish (4), Korean (3), Italian (2), Polish (1), and Slovenian (1).

Two thousand three hundred and forty-five (2345) articles received 52,141 citations (without self-citations: 26,018), and the mean number of article title citations was 22.23. The total h-index of the articles was 86.

Research Areas

Of the total articles, 67.80% ($n = 1590$) were published in the field of ophthalmology, followed by pediatrics (670; 28.57%), general internal medicine (112; 4.77%), obstetrics gynecology (112; 4.77%), research experimental medicine (64; 2.72%), surgery (56; 2.38%), biochemistry molecular biology (37; 1.57%), science technology and other topics (36; 1.53%), cell biology (19; 0.81%), and neurosciences neurology (14; 0.59%).

Development of Publications

The distribution of the articles by year is shown in Figure 1. According to the regression analysis, it was estimated that 181 articles would be published in 2020 [95% confidence interval (CI): 159-203] and 246 in 2025 (95% CI: 199-293). The other results are shown in Figure 1.

Active Countries and Correlation Analysis

The leading 15 countries producing the most articles on ROP were determined to be the USA (978), UK (187), Turkey (156), India (140), China (121), Germany (96), Canada (84), Japan (81), Sweden (76), Australia (75), Italy (48), South Korea (48), Taiwan (48), Brazil (41), and Iran (41). Countries producing publications on ROP are shown in Figure 2.

A statistically significant positive correlation was determined between the number of ROP articles and GDP and GDP PPP values of countries ($r = 0.688$, $p < 0.001$; $r = 0.664$, $p < 0.001$).

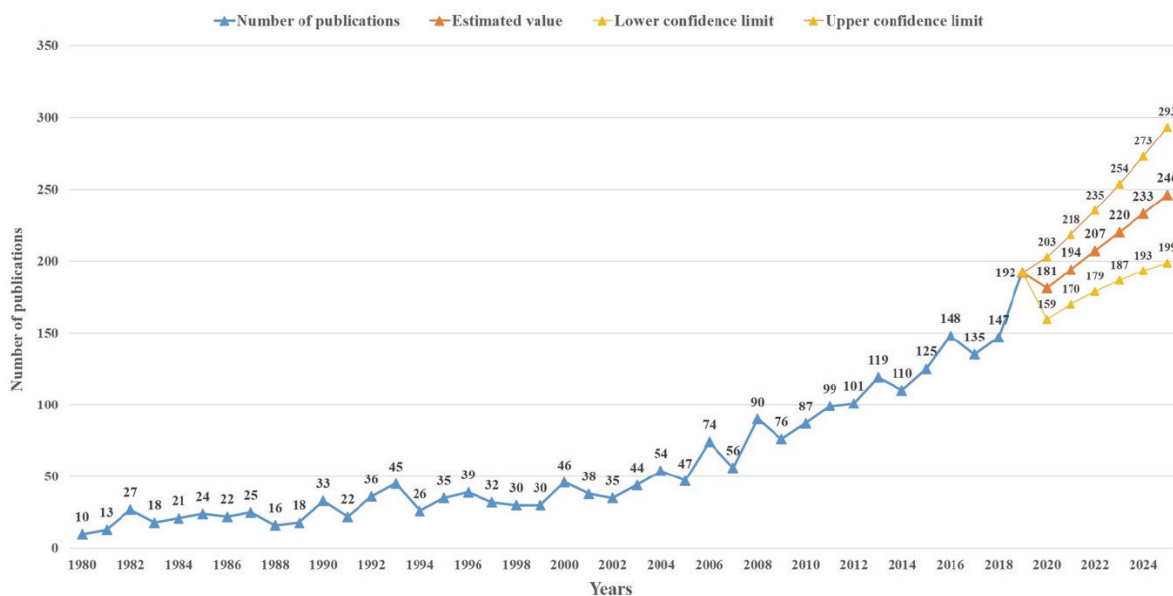


Figure 1. Number of publications by year on the topic of retinopathy of prematurity



Figure 2. World map for the publication productivity of worldwide countries on the topic of retinopathy of prematurity. **Footnote:** In the indicator given at the bottom left of the figure, productivity increases from green to red

Eighty-one countries produced articles on ROP. The international collaboration network visualization map between the 44 countries that produced at least five articles is shown in Figure 3.

Active Authors

The authors who produced the most publications on ROP were Quinn GE. (n = 98), Chiang MF (59), Tung B. (49), Trese MT. (47), Palmer EA. (46), Hellstrom A. (44), Dobson V. (43), Capone A. (42), Hardy RJ. (41), and Hartnett ME. (41).

Active Organization

The organizations most productive on the subject of ROP and organizations-enhanced are shown in Table 1.

Active Journals

Three hundred and fifty-one journals had publications on ROP. The leading 40 journals publishing the most articles on this subject are shown in Table 2. The total number of citations received by the ROP articles in the journals is shown in the last column of Table 2. The citation network visualization map between these journals is shown in Figure 4.

Citation Analysis

The 20 articles receiving the most citations are shown in Table 3. The mean number of citations received by the articles per year is shown in the last column of Table 3.

Cocitation Analysis

A total of 19,731 publications were cited in the references of 2,345 articles. The cocitation density map between the 73 articles cited at least 60 times is shown in Figure 5. The five articles with the most cocitations were Good, 2003, with 647 citations, Gole, 2005, with 559 citations, Garner, 1984, with 422 citations, Palmer, 1988, with 309 citations, and Palmer, 1991 with 302 citations⁽¹⁷⁻²¹⁾.

Trend Topics

A total of 1850 keywords were used in 2345 articles. Of these keywords, 74, which were used in at least eight articles, were subjected to cluster analysis (Table 4). The network maps related to the results, trend word analysis, and citation analysis are shown in Figures 6, 7, and 8, respectively.

DISCUSSION

When the results of the bibliometric analysis were evaluated, a continuously increasing trend for publications on ROP was observed. Ten to fifty articles were published each year in the period of 1980-2003, 50-100 articles between 2004 and 2011, more than 100 articles between 2012 and 2019, and recently, almost 200 articles. This increase was confirmed in the regression analysis results, which showed that there could be an increasing trend in the number of articles.

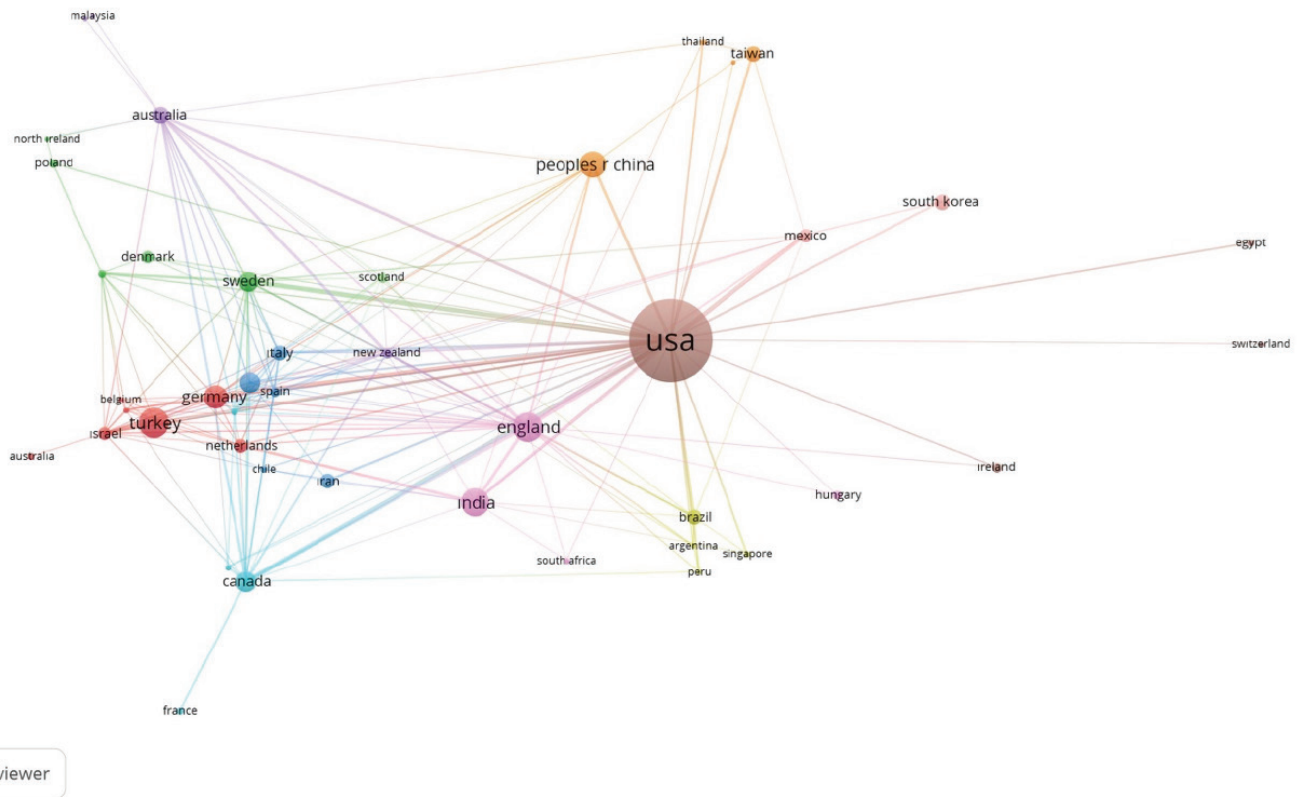


Figure 3. Network visualization map for international collaboration of worldwide countries on the topic of retinopathy of prematurity. **Footnote:** The size of the circle shows the large number of publications, the colors indicate the cluster of collaboration, and the thickness of the lines indicates the strength of collaboration

Table 1. Active organization and organizations-enhanced searches on retinopathy of prematurity

Organization	RC	Organization-enhanced	RC
Harvard University	132	University of Pennsylvania	91
University of Pennsylvania	121	Harvard University	81
Children’s Hospital of Philadelphia	111	Oregon Health & Science University	81
University of Texas System	87	Children’s Hospital of Philadelphia	75
Boston Children’s Hospital	86	Duke University	61
Oregon Health Science University	81	Children’s Hospitals	56
Duke University	68	University of Texas	44
University of California System	61	William Beaumont Hospital	44
University of Texas Health Science Center at Houston	60	University of North Carolina	42
University of London	54	University of Gothenburg	41
Baylor College of Medicine	50	Baylor College of Medicine	40
Beaumont Health	48	University of Illinois	39
University of Texas School Public Health	46	University of Utah	33
Johns Hopkins University	45	Stanford University	32
University of Gothenburg	45	University of Miami	31

RC: Record count

Table 2. Active journals on retinopathy of prematurity

Journal	RC	C	AC	Journal	RC	C	AC
Journal of AAPOS	138	2282	16.5	Acta Ophthalmologica Scandinavica	22	461	21.0
Ophthalmology	129	5414	42.0	Documenta Ophthalmologica	21	211	10.0
British Journal of Ophthalmology	118	3001	25.4	Journal of Pediatrics	21	607	28.9
Archives of Ophthalmology	116	8137	70.1	Current Eye Research	20	202	10.1
Investigative Ophthalmology Visual Science	95	2891	30.4	Ophthalmologe	20	67	3.4
Journal of Pediatric Ophthalmology Strabismus	92	817	8.9	Archives of Disease in Childhood Fetal and Neonatal Edition	19	422	22.2
Retina, The Journal of Retinal and Vitreous Diseases	82	1887	23.0	Canadian Journal of Ophthalmology Journal (Canadien D'Ophthalmologie)	19	192	10.1
American Journal of Ophthalmology	79	1811	22.9	International Ophthalmology	19	75	3.9
Pediatrics	65	5329	82.0	Pediatric Research	19	611	32.2
Eye	62	1052	17.0	PLOS One	19	232	12.2
Graefe's Archive for Clinical and Experimental Ophthalmology	56	963	17.2	Japanese Journal of Ophthalmology	17	114	6.7
Indian Journal of Ophthalmology	48	213	4.4	Journal of Ophthalmology	17	66	3.9
Acta Ophthalmologica	41	409	10.0	Klinische Monatsblätter Fur Augenheilkunde	17	52	3.1
Jama Ophthalmology	33	501	15.2	Arquivos Brasileiros De Oftalmologia	16	73	4.6
Ophthalmic Surgery, Lasers and Imaging Retina	32	198	6.2	Molecular Vision	16	491	30.7
Journal of Perinatology	31	391	12.6	Neonatology	16	252	15.8
Acta Paediatrica	27	400	14.8	BMC Ophthalmology	15	54	3.6
European Journal of Ophthalmology	26	230	8.8	Ophthalmologica	15	212	14.1
Early Human Development	25	983	39.3	Clinical and Experimental Ophthalmology	14	196	14.0
International Journal of Ophthalmology	24	61	2.5	Clinics in Perinatology	14	292	20.9

RC: Record count, C: Number of citations, AC: Average citation per document

On studying the countries producing publications on ROP, it was shown that countries that had a strong economy, such as the USA, UK, China, Germany, Canada, Japan, Sweden, Australia, Italy, South Korea, and Taiwan, had effective publications on this subject. However, the contribution of developing countries to this subject is noticeable, with Turkey and India as the third and fourth countries producing the most publications. Moreover, Brazil and Iran were among the 15 leading countries producing the most publications. Several studies in the literature have shown that the development and economic strength of a country are determinants of publication productivity ^(10,12-14). The findings of the current study are parallel with those results. The significant correlation found between the economic indicators and production of publications confirmed this result. When the common authorship results between countries were examined, an effective collaboration of geographical regions was observed.

The most active journals publishing more than 100 articles were the Journal of American Association for Pediatric Ophthalmology and Strabismus (AAPOS), Ophthalmology, British Journal of Ophthalmology, and Archives of Ophthalmology, respectively. The journals receiving the most citations in total were determined to be the Archives of Ophthalmology, Ophthalmology, Pediatrics, British Journal of Ophthalmology, Investigative Ophthalmology Visual Science, and Journal of AAPOS. The journals receiving the most citations per article were Pediatrics, Archives of Ophthalmology, Ophthalmology, Early Human Development, Pediatric Research, Investigative Ophthalmology Visual Science, Molecular Vision, and Investigative Ophthalmology Visual Science. Submission of articles for evaluation by these journals can be recommended to researchers of this subject.

According to the total and mean numbers of citations, the most effective study was "The International Classification of Retinopathy of Prematurity Revisited" by Gole et al. ⁽¹⁸⁾

Table 3. The 20 most cited manuscripts on retinopathy of prematurity						
No	Article	Author	Journal	PY	TC	AC
1	The international classification of retinopathy of prematurity revisited	Gole et al.	Archives of Ophthalmology	2005	1217	76.06
2	Vascular endothelial growth factor acts as a survival factor for newly formed retinal vessels and has implications for retinopathy of prematurity	Alon et al.	Nature Medicine	1995	1198	46.08
3	Revised indications for the treatment of retinopathy of prematurity: results of the early treatment for retinopathy of prematurity randomized trial	Good et al.	Archives of Ophthalmology	2003	953	52.94
4	An international classification of retinopathy of prematurity	Garner et al.	Archives of Ophthalmology	1984	756	20.43
5	Efficacy of intravitreal bevacizumab for stage 3+ retinopathy of prematurity	Mintz-Hittner, et al.	New England Journal of Medicine	2011	572	57.2
6	Multicenter trial of cryotherapy for retinopathy of prematurity -preliminary results	Palmer et al.	Archives of Ophthalmology	1988	465	14.09
7	Incidence and early course of retinopathy of prematurity	Palmer et al.	Ophthalmology	1991	442	14.73
8	Supplemental therapeutic oxygen for prethreshold retinopathy of prematurity (STOP-ROP), a randomized, controlled trial. I: primary outcomes	Phelps et al.	Pediatrics	2000	405	19.29
9	Characteristics of infants with severe retinopathy of prematurity in countries with low, moderate, and high levels of development: implications for screening programs	Gilbert et al.	Pediatrics	2005	375	23.44
10	Low IGF-I suppresses VEGF-survival signaling in retinal endothelial cells: direct correlation with clinical retinopathy of prematurity	Hellstrom et al.	Proceedings of The National Academy of Sciences of the United States of America	2001	357	17.85
11	Regulation of vascular endothelial growth factor by oxygen in a model of retinopathy of prematurity	Pierce et al.	Archives of Ophthalmology	1996	335	13.4
12	Retinopathy of prematurity: a global perspective of the epidemics, population of babies at risk and implications for control	Gilbert et al.	Early Human Development	2008	324	24.92
13	Screening examination of premature infants for retinopathy of prematurity	Lichtenstein et al.	Pediatrics	2006	316	21.07
14	Screening examination of premature infants for retinopathy of prematurity	Fierson, Walter et al.	Pediatrics	2013	298	37.25
15	Can changes in clinical practice decrease the incidence of severe retinopathy of prematurity in very low birth weight infants?	Chow et al.	Pediatrics	2003	298	16.56
16	Postnatal serum insulin-like growth factor I deficiency is associated with retinopathy of prematurity and other complications of premature birth	Hellstrom et al.	Pediatrics	2003	297	16.5
17	The incidence and course of retinopathy of prematurity: findings from the early treatment for retinopathy of prematurity study	Good et al.	Pediatrics	2005	265	16.56
18	Retinopathy of prematurity in middle-income countries	Gilbert C	Lancet	1997	252	10.5
19	Retinopathy of prematurity	Hellstrom Ann	Lancet	2013	250	31.25
20	Roles of vascular endothelial growth factor and astrocyte degeneration in the genesis of retinopathy of prematurity	Stone J	Investigative Ophthalmology & Visual Science	1996	235	9.4

AC: Average citation per document, PY: Publication year, TC: Total citation

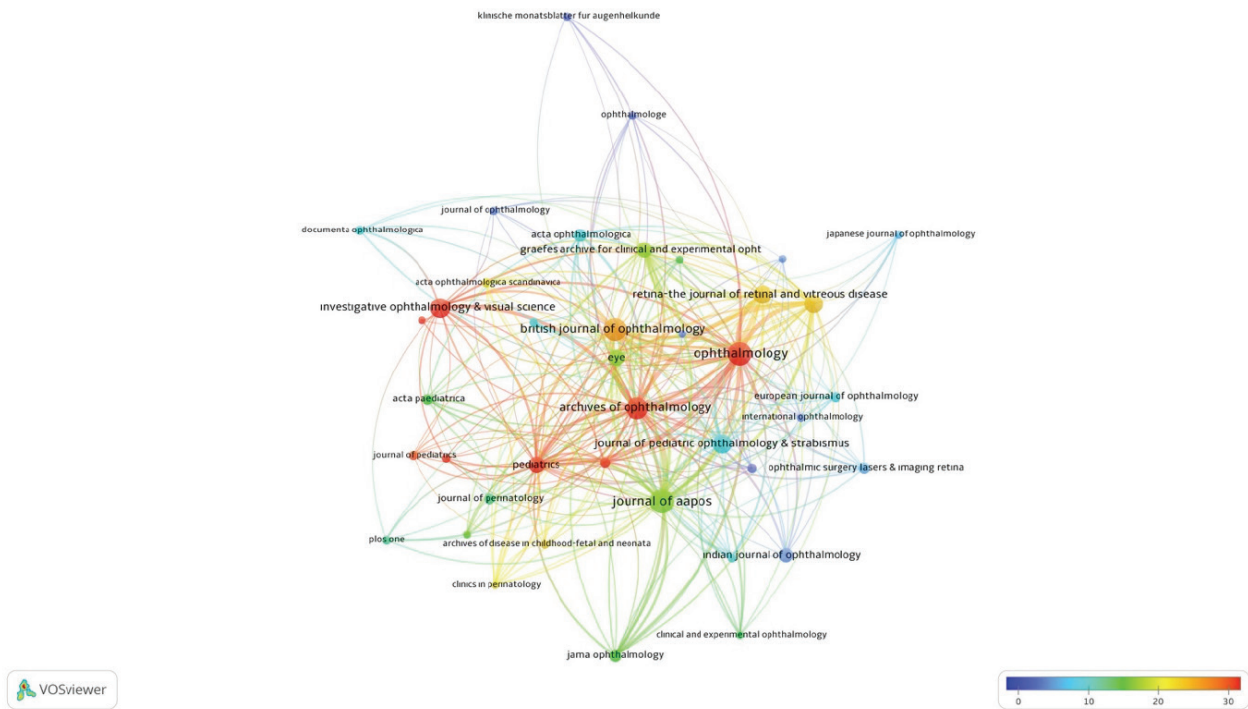


Figure 4. Network visualization map for citation analysis of active journals on the topic of retinopathy of prematurity. **Footnote:** The number of average citations from blue to red (blue-green-yellow-red) increases. The size of the circle shows the large number of publications. The thickness of the lines indicates the strength of citation collaboration

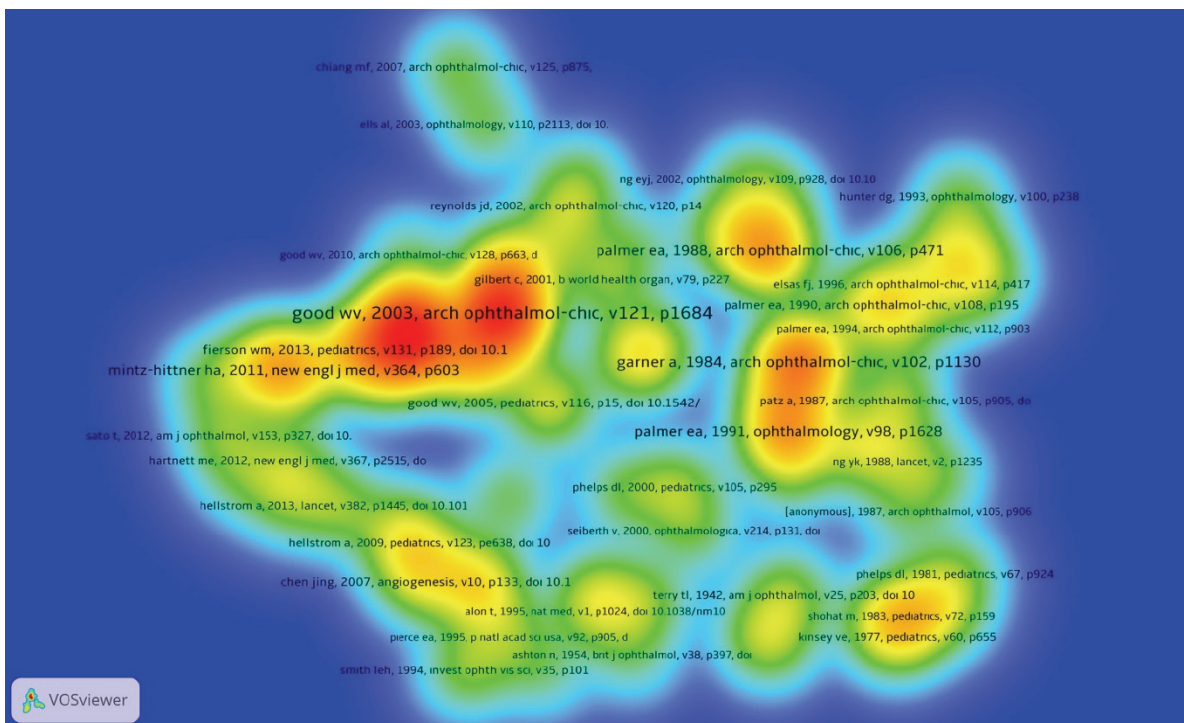


Figure 5. Density visualization map for cocitation analysis for articles on the topic of retinopathy of prematurity. **Footnote:** The number of citations from blue to red (blue-green-yellow-red) increases

Table 4. The first 65 trend keywords on retinopathy of prematurity

Keyword	O	Keyword	O	Keyword	O	Keyword	O
Retinopathy of prematurity	823	Infant	25	Pain	15	Oxygen therapy	9
Prematurity	108	Telemedicine	25	Plus disease	15	Prevalence	9
Risk factors	77	Aggressive posterior retinopathy of prematurity	24	Anti-VEGF	14	Retinal neovascularization	9
Screening	63	Angiogenesis	24	Neonate	14	Visual acuity	9
ROP	60	Low birth weight	23	Vitrectomy	14	Extremely low birth weight	8
Bevacizumab	57	Premature infant	23	Laser therapy	12	Fluorescein angiography	8
Vascular endothelial growth factor	53	Laser	22	Laser treatment	12	Hyperglycemia	8
Retinopathy	50	Neovascularization	22	Very low birth weight	12	Neonatal intensive care	8
Retinopathy of prematurity	47	Retinal detachment	21	Bronchopulmonary dysplasia	11	Newborn	8
Preterm infant	45	Myopia	20	Diode laser	11	Pediatric ophthalmology	8
Gestational age	44	Blindness	19	IGF-I	11	Photocoagulation	8
Laser photocoagulation	40	Oxygen	19	Intravitreal injection	11	Propranolol	8
Birth weight	39	Premature	19	Optical coherence tomography	11	Sepsis	8
Ranibizumab	33	Oxygen-induced retinopathy	18	Erythropoietin	10	Strabismus	8
Cryotherapy	32	VEGF	18	Polymorphism	10		
Retina	29	Preterm	16	Childhood blindness	9		
Incidence	25	Treatment	16	Epidemiology	9		

O: Number of occurrences, VEGF: Vascular endothelial growth factor

published in the Archives of Ophthalmology, followed by “Vascular Endothelial Growth Factor Acts as a Survival Factor for Newly Formed Retinal Vessels and Has Implications for Retinopathy of Prematurity” by Alon et al. ⁽¹⁹⁾ published in Nature Medicine. Apart from these studies, other effective studies according to the mean number of citations were “Efficacy of Intravitreal Bevacizumab for Stage 3+ Retinopathy of Prematurity” by Mintz-Hittner HA (2011) and “Revised Indications for the Treatment of Retinopathy of Prematurity-Results of the Early Treatment for Retinopathy of Prematurity Randomized Trial” by Good et al. ⁽¹⁷⁾ (Early Treatment For Retinopathy of Prematurity Cooperative Group) ⁽²⁰⁾. It is recommended that researchers working on this subject read the previously mentioned articles and other articles on the list.

Based on the keyword analysis, it was observed that subjects such as epidemiology, optical coherence tomography, aggressive posterior ROP, ranibizumab, telemedicine, polymorphism, pain, and screening were studied more in

the past, whereas recently, subjects such as laser therapy, oxygen-induced retinopathy, oxygen therapy, angiogenesis, anti-VEGF, birth weight, GA, prevalence, and incidence have emerged. The keywords receiving the most citations were determined to be preterm infants, bronchopulmonary dysplasia, oxygen therapy, very low birth weight, incidence, erythropoietin, visual acuity, and strabismus.

No bibliometric study on ROP was found in the literature. Paras et al. (2017) analyzed a 40-year period of literature (1976-2015) on ROP. The focus of that study was only on countries producing the most publications and levels of development of those countries, journals publishing the most publications, and distribution of publications by year ⁽²¹⁾. The current study is much more comprehensive than the previously mentioned study. In addition to the information provided in the previous study, keyword analyses and trend subjects were determined in the current study, and by creating network maps, important articles and journals were revealed.

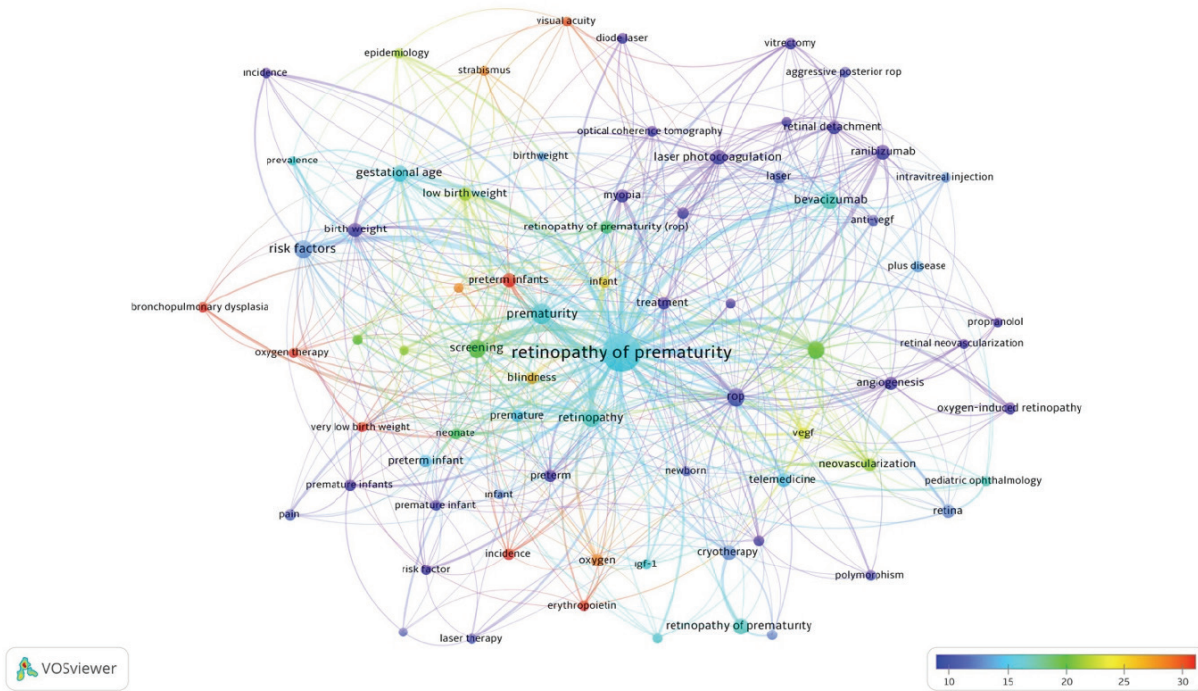


Figure 8. Network visualization map for the most cited keyword on the topic of retinopathy of prematurity. **Footnote:** The number of citations received by the keyword increases from blue to red (blue-green-yellow-red). The size of the circles indicates that the keyword is used frequently. The thickness of the lines indicates the strength of relationship

Study Limitations

A potential limitation of the current study is that the literature search was made only using the WoS Index. However, in recent literature, only WoS has been widely used in bibliometric studies (10,11-16,22) because WoS is a more reliable index than other databases for journals scanned and quotations. The impact factor of all journals indexed in WoS is high.

CONCLUSION

In parallel with the increasing importance of ROP, this comprehensive study, which holistically evaluated articles in this field, will be of guidance to clinicians, academicians, and students interested in this subject. Additionally, the study results will provide new ideas to researchers planning a new research on this subject. The productivity of ROP research was closely related to the economic strength and level of development of the country. However, the finding that some developing countries, such as Turkey, were among the most productive countries is explained by the increase in research productivity parallel to the increased number of patients with ROP, as a result of investment in NICU throughout the country.

Ethics Committee Approval: This article does not contain any studies with human participants or animals performed by any of the authors.

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