Original Research

The Top 100 Cited Articles on Ocular Trauma: A Bibliometric Analysis

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ABSTRACT

Objective: Eye injuries are one of the leading causes of disabling ocular morbidity. The objective of this bibliometric study was to evaluate the top 100 cited articles on ocular trauma published between 1975 and 2018 via multidimensional citation analysis.

Methods: We analyzed the top 100 cited articles among 3,768 ocular trauma articles published between 1975 and 2018; these articles were obtained from the databases in Web of Science and PubMed based on their citation rates per article, publication years, countries of origin, institutions or organizations, the most common subjects, funding status, article types, and levels of evidence. The data obtained were analyzed with the SPSS® 20.0 software package program.

Results: In the top 100 cited articles on ocular trauma, the total number of authors was 420 and the average authorship was 4.20±2.23 (range: 1–14). In our study, 70 of the top 100 cited articles were published in journals with an impact factor (IF) of ≥2.00 (range: 2.016–8.806), and Q index or quartile score of these journals was mostly Q1. Although the most preferred journal was Ophthalmology according to the total number of citations and articles (n=2,183 and n=23, respectively), Eye was the most preferred journal according to the mean number of citations per article. Besides, the three most common topics among the top 100 cited articles were mechanical eyeball injury (40 articles), epidemiology of ocular trauma (19 articles), and traumatic eye infection (17 articles). The average level of evidence was found to be 3.14±0.66 (range: 1–4), and the mean number of citations per article was the highest level at 2. Moreover, we also found that the most commonly preferred article type by authors was clinical research (92 articles), and most of them were in the B level of evidence group (70 articles).

Conclusion: Analysis of the top 100 most cited articles on ocular trauma as an update study can provide us scientific contributions and vital current data in clinical implementations.

Keywords: Ocular trauma, top cited article, bibliometric analysis

INTRODUCTION

Ocular trauma is a common, treatable, and preventable health problem (1). It is the most common cause of monocular blindness and visual impairment worldwide (2). Ocular trauma is directly responsible for bilateral blindness in about 5% of population (3). The World Health Organization Program for the Prevention of Blindness had presented the following findings: some 55 million eye injuries that restrict activities for more than one day occur each year, in which 750,000 cases, including some 200,000 open globe injuries, will require hospitalization each year; approximately 1.6 million people are blinded from eye injuries; and an additional 2.3 million people with bilateral low vision and almost 19 million with unilateral blindness or low vision are blinded from eye injuries (4). Many studies report that one out of five adults have a history of ocular trauma (5). The rate of ocular trauma history in the childhood is around 12%–38%, and it is one of the most important preventable causes of blindness in the childhood (6). Poor vision or visual impairment due

to ocular trauma causes a severe financial load and workforce loss on both individuals and the national economy. This burden occurs because trauma-inflicted eye injuries are imminent eye diseases that require long-term hospitalization, special patient visits, long-term treatment and patient follow-up, and visual rehabilitation. In addition to the prevention of ocular traumas, several scientific studies have been conducted worldwide on ocular traumas to determine and develop their quick and effective medical and surgical treatments. Furthermore, we can categorize these studies mainly as epidemiologic, diagnostic, therapeutic, and prognostic. To the best of our knowledge, we have not found any update study that comprised all these fields in the literature.

A bibliometric study is the quantitative analysis of the publications in the literature via statistical and mathematical methods (7, 8). These studies are trending topics or updates studies, which can significantly help in determining the research tendencies of scientific studies conducted over a certain time period. Nowa-

days, bibliometric studies are more increasingly involved in the current scientific literature for determining and evaluating the influential literature (9, 10). Furthermore, bibliometric analysis studies are also considerably helpful in determining the impact and number of citations of a scientific article after it is published (11). Garfield E. was the first researcher to present the "citation classics" concept in 1987 for the most cited articles published in *JAMA* (12). The trend of bibliometric analysis of current studies started with Garfield at *JAMA* spread with other studies comprising bibliometric article analyses conducted by many researchers in different medical fields in the following years (13). However, the review of current literature revealed that there are few bibliometric studies in the realm of ophthalmology, and most of them are focused on ophthalmic epidemiology as well as the evaluation of ophthalmology journals, cataract surgery, and dry eye (7, 11, 14, 15). However, we did not found any bibliometric analysis studies on ocular trauma in the current literature.

The objective of this study is to systematically analyze the most cited articles "key papers or classic papers" according to the data obtained from PubMed and Web of Science (WoS) in the field of ocular trauma. We have determined the number of citations with ranking; publications by years and journals; mean number of citations per article by journals, type, and subtype of articles; institutions and countries of origin; the most common topic of frequently cited articles; level of evidence with the number of mean citations per article; and authorship status of the classic papers in this bibliometric research.

METHODS

Study Design
Study type: Retrospective clinical research

Level of evidence: 3 or Group B (according to Scottish Intercollegiate Guidelines Network; SIGN) (16).

Data Collection and Inclusion Criteria
The data used in this bibliometric citation analysis were obtained from Thomson Reuters' WoS Core Collection database (Philadelphia, Pennsylvania, USA) and PubMed (US National Library of Medicine – National Institutes of Health). We accessed the WoS database (accessed date: December 2, 2018) using the keyword "ocular trauma" for the period between 1975 and 2018. Consequently, we obtained 3,768 articles and conducted analysis of the top 100 cited articles among these results. We accessed the remaining data pertaining to the analyzed articles via PubMed. Three of the authors (X, Y, and Z) independently evaluated the top 100 cited articles with consensus. Being a first author or co-author was accepted as the authorship criterion in this study. To shorten the same obtained table, we limited the quantitative values to "2 or more and 3 or more." The level of evidence of the top 100 cited articles was detected in accordance with the SIGN criteria (16). According to these criteria, Group A evidence (levels 1a and 1b) comprised randomized clinical trials (RCTs) or meta-analysis of RCTs. Group B evidence (levels 2a, 2b, and 3) comprised cohort studies, case–control studies, and comparison of groups, where the data were collected retrospectively, as well as semi-experimental studies. Group C evidence (level 4) comprised case reports and series as well as expert opinions or expert committee reports (excluding levels 1 and 3 of evidence).

Statistical Analysis
We used descriptive statistical methods in this study. The mean (±SD) was calculated for continuous variables while categorical variables were presented as frequencies. The normal distribution of the data was tested using the one-sample Kolmogorov–Smirnov test. The statistical analyses were performed using the Statistical Package for Social Sciences 20.0 software (IBM SPSS Corp.; Armonk, NY, USA) for Windows.

Ethical Statement
All authors declare that the research was conducted according to the principles of the World Medical Association Declara-tion of Helsinki "Ethical Principles for Medical Research Involving Human Subjects." This study did not need to be approved by an ethics committee because it performed a bibliometric analysis or citation analysis of existing published classical papers studies.

RESULTS

Contributions, Attributions, and Research Groups
We found that the average citation of the top 100 cited articles on ocular trauma was 88.07±41.97 (range: 50–269), the sum of times the article were cited was 8,807 and the number of self-citations was 239 (according to Thomson Reuters' WoS Core Collection). The publishing language was English in all the articles. We determined that the most cited article (times cited: 269) on ocular trauma was the perspective article by Pieramici DJ et al. about the classification of mechanical ocular trauma with the following topic: "A system for classifying mechanical injuries of the eye (globe). *American Journal of Ophthalmology*; 1997: 123(6): 820–831." The last three articles in the rankings that had the same number of citations (50). Their subjects were fungal keratitis (Wang L et al.), traumatic macular hole (Yamada H et al.), and blindness after facial trauma (Zachariades N et al.), respectively (Appendix 1). In this study, there was no clearly defined study group but we found that the most cited article had an ocular trauma classification group.

The analyses of the publications (between 1982 and 2013) and citation rates in each year (between 1982 and 2018) of the "key papers" on ocular trauma revealed that the highest number of publications was observed in 1996 (10 publications) and the highest number of citations was observed in 2012 (661 citations)

Main Points:

- This study was performed a bibliometric analysis of popular ocular trauma articles via the use qualitative and quantitative methods.
- Trending topics or updates ophthalmologic studies, which can significantly help in determining the research tendencies of scientific studies conducted over a certain time period.
- Ocular traumas are important and have revealed the need for a new and more comprehensive classification on ocular traumas.

(Fig. 1 and Fig. 2). The total number of self-citations for top 100 cited articles was 239. Besides, we have added the current citation information to this study for determining the articles' influence on this bibliometric study (Appendix 1).

Authorship
We found that the total number of authors was 420, and the mean number of authorships was 4.20±2.23 (1-14) in these influential papers (according to Thomson Reuters' WoS Core Collection and PubMed). We analyzed the distribution of 25 authors who were included in two and more articles among the classic papers and found that the first three ranks were shared by Kuhn F, Tielsch JM, and Witherspoon CD, respectively, with five articles and more. Additionally, we observed that the most frequent first author of key papers included in our research was Kuhn F with five articles, and Tielsch JM, Witherspoon CD, and Morris R were found to be the most frequent co-authors with four articles and more (Table 1).

Origins of Countries and Institutions or Organizations
The three most commonly listed countries with two and more publications in our study were the USA (53%), the UK (7%), and Germany (5%), respectively. In total, 23 countries were listed 117 times in the top 100 cited articles (range: 1–62) (Table 2). This study showed that the most commonly listed institution or organization was the Johns Hopkins University (USA), which was listed 13 times in the top 100 cited articles. Moreover, the number of institutions or organizations that published two and more publications were found to be 19/25 (76%), and majority of these institutions were in the USA (Table 3).

Funding Status
In addition to this finding, we also found that 22 of the top 100 cited articles on ocular trauma, which are considered "topic trends," received grants from 9 different funding agencies, and

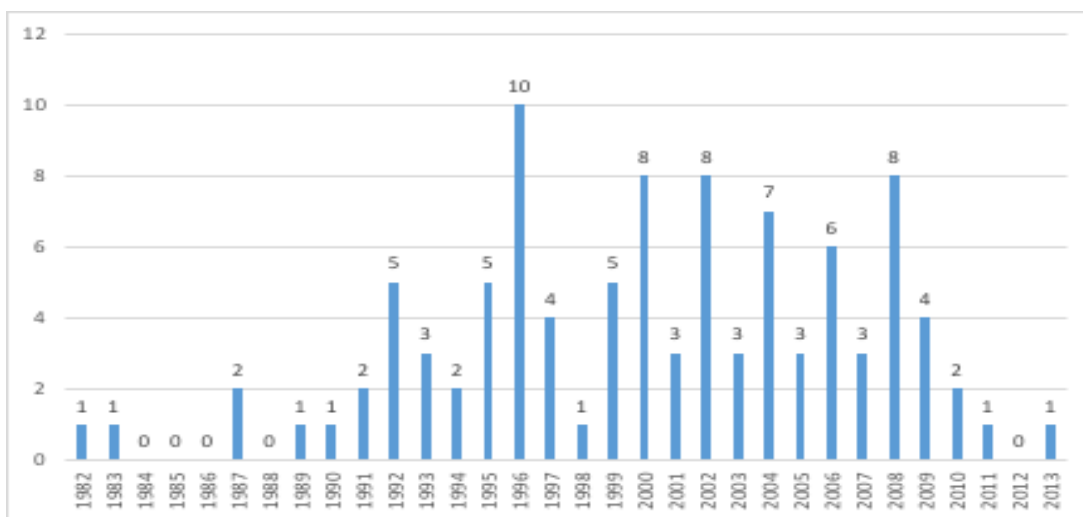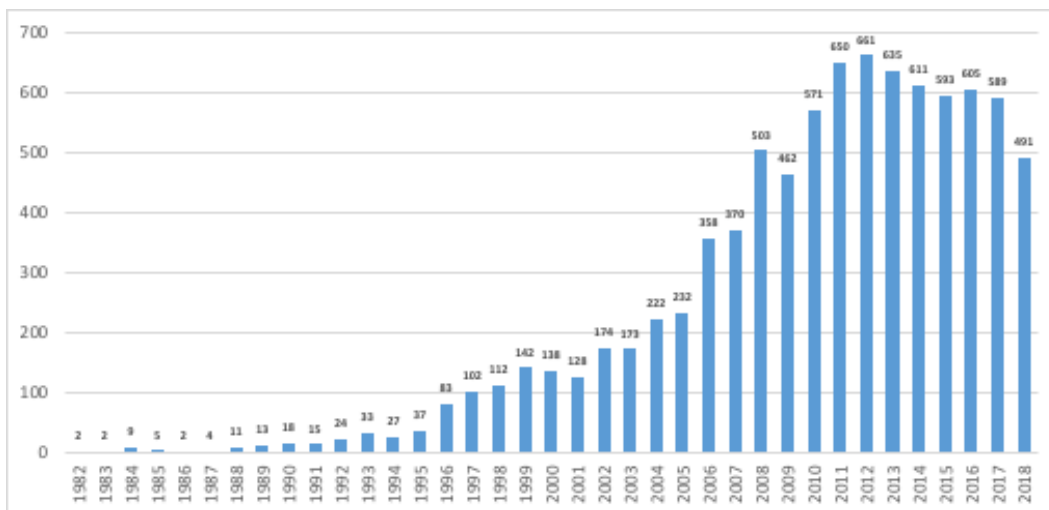Figure 1. The top 100 cited articles published in each year (1982–2013)

Figure 2. Citations in each year (last 36 years, source: Web of Science database)

Table 1. The most common first and total authors with presence in two or more articles in the top 100 cited articles on ocular trauma

Author	Affiliation	First	Total
Kuhn F	University of Alabama at Birmingham (USA)	5	6
Tielsch JM	Wilmer Eye Institute, John Hopkins University, Baltimore (USA)	1	5
Witherspoon CD	University of Alabama at Birmingham/Eye Foundation Hospital, Birmingham (USA)	0	5
Morris R	University of Alabama at Birmingham/Eye Foundation Hospital, Birmingham (USA)	0	4
Bower KS	Johns Hopkins Medicine, Baltimore (USA)	0	3
Colyer MH	Walter Reed Army Medical Center, Washington (USA)	2	3
Desai P	London School of Hygiene and Tropical Medicine, London (UK)	2	3
Gilliland MGF	East Carolina University School of Medicine, Greenville (USA)	2	3
MacEwena CJ	University of Southampton, Southampton General Hospital, Southampton (USA)	1	3
Ryan SJ	University of Southern California School of Medicine, and the Doheny Eye Institute, Los Angeles (USA)	1	3
Weichel ED	Walter Reed Army Medical Center, Washington, District of Columbia (USA)	1	3
Wong TY	Singapore National Eye Center and Singapore Eye Research Institute (Singapore)	3	3
Aaberg TM	Emory University School of Medicine, Atlanta (USA)	0	2
Baines P	London School of Hygiene and Tropical Medicine, London (UK)	0	2
Brechner RJ	The Johns Hopkins University School of Hygiene and Public Health, Baltimore (USA)	0	2
Bucolo C	Ocular Pharmacology, University of Catania, Catania (Italy)	0	2
Cardillo JA	University of Southern California School of Medicine, Los Angeles (USA)	1	2
Danis RP	University of Wisconsin School of Medicine and Public Health, Madison (USA)	0	2
Dannenberg AL	The Johns Hopkins University School of Hygiene and Public Health, Baltimore (USA)	1	2
De Juan E	Wilmer Ophthalmological Institute, Johns Hopkins Hospital, Baltimore (USA)	0	2
Dick JS	Kaiser Permanente Health System, San Diego (USA)	0	2
Dutton GN	Tennent Institute of Ophthalmology, Western Infirmary Glasgow (UK)	0	2
Flynn HW	Bascom Palmer Eye Institute, University of Miami School of Medicine, Miami (USA)	0	2
Folberg R	University of Iowa College of Medicine, Iowa (USA)	0	2

Table 2. The most commonly listed countries with presence in two and more articles in the top 100 cited articles

Country	Number
The United States of America (USA)	62
The United Kingdom	9
Germany	6
India	5
Scotland	5
Australia	4
Italy	3
Japan	3
Singapore	3
Israel	2
Nepal	2
People's Republic of China	2

most of them were NEI NIH HHS (12 studies), NCRR NIH HHS (2 studies), and PHS HHS (2 studies) (according to Thomson Reuters's WoS Core Collection).

Journals and Proceedings Papers
Our study showed that 70 of the top 100 cited articles were published in the journals with an IF of ≥2.00 (range: 2.016–8.806) (according to Clarivate Analytics, 2018), and Q categories of these journals according to the Scimago Journal & Country Rank, 2017 were Q1, except for *Journal of Inflammation*, which was Q2. Although the most preferred journal was *Ophthalmology* according to the total number of citations and articles (n=2,183 and n=23, respectively), *Eye* was the most preferred journal according to the mean number of citations per article (Table 4). Besides, we observed that the number of proceedings papers among the top 100 articles in 1 national and international scientific activities was 6, and the most presented proceedings paper was presented at the "56th Annual Meeting of the AAST" (date: November 11–14, 2006; Las Vegas, USA)" (according to Thomson Reuters' Core Collection).

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Table 3. Institutions of origin with two or more appearances in the top 100 cited articles

Rank	Institutions	Number*
1	Johns Hopkins University (USA)	13
2	The United States Army (USA)	7
3	The United States Department of State (USA)	7
4	University of Alabama at Birmingham (USA)	5
5	University of Alabama System (USA)	5
6	Walter Reed National Military Medical Center (USA)	5
7	Wilmer Eye Institute at Johns Hopkins (USA)	5
8	Baylor College of Medicine (USA)	4
9	Uniformed Services University of the Health Sciences (USA)	4
10	University College London (United Kingdom)	4
11	University of London (United Kingdom)	4
12	University of Southern California (USA)	4
13	Doheny Eye Institute (USA)	3
14	East Carolina University (USA)	3
15	Madigan Army Medical Center (USA)	3
16	Medical College of Wisconsin (USA)	3
17	Singapore National Eye Centre (Singapore)	3
18	Thomas Jefferson University (USA)	3
19	University of Cologne (Germany)	3
20	University of Dundee (United Kingdom)	3
21	University of Melbourne (Australia)	3
22	University of Miami (USA)	3
23	University of North Carolina (USA)	3
24	Alaska Native Medical Center (USA)	2
25	American Society of Ocular Trauma (USA)	2

*Number of times listed out of total 25 institutions in the top 100 cited articles.

Main Topics

The three most common topics among the top 100 cited articles were mechanical eyeball injury including open and closed globe injury (40 articles), the epidemiology of ocular trauma (19 articles), and traumatic eye infection (17 articles), respectively (Table 5). Mechanical eye trauma was more common than non-mechanical ones among the top 100 cited ocular trauma articles (Fig. 3).

Study Types and Levels of Evidence with Mean Number of Citation per Article

Additionally, the most preferred study type and subtype among researchers in the top 100 cited articles on ocular trauma were clinical studies (92 articles) and retrospective–descriptive study studies (38 articles), respectively. Our study found that the mean level of evidence was 3.14±0.66 (range: 1–4), and the mean number of citations per article was the highest level 2, which was experimental study according to the levels of evidence. Furthermore, the evidence group of 70 articles was group B (prospective/retrospective comparative studies, retrospective cohort studies, case–control studies, descriptive studies, cross-sectional studies, and validation studies), and the evidence group of 28 articles was group C (reviews, expert committee reports, and expert opinions). Finally, the level of evidence of two articles were group A (meta-analysis of RCT, systematic review, RCT, and prospective cohort study) (Table 6).

We determined that the most commonly preferred article type and subtype by authors were clinical research (92 articles) and retrospective–descriptive study studies (38 articles), respectively.

DISCUSSION

The eye is an important sense organ, to such an extent that it was mentioned in the Codes of Hammurabi, the Babylonian King (17). Eye injuries are one of the main causes of disabling ocular morbidity; hence, they require an immediate and comprehensive care. For ocular trauma to be better interpreted and understood in the literature, many studies on ocular trauma's classification and epidemiology have been conducted in the past. However, because there is no mutual consensus on this subject, we believe that there will be more studies in the future.

Although it is often criticized for its limited analysis and methodology, bibliometric research is quite important in providing scientific and topic trends for a specific period of time. For these reasons, we conducted a bibliometric study in the realm of ocular trauma. In particular, this kind of studies can present important clues about the current best-cited or landmark articles to researchers because it reflects scientific improvements in the respective field along with landmark papers and topic trends in chronological and systematic perspectives (12, 13, 18). In the last 30 years, many bibliometric analyses of articles have been conducted in the different fields of clinical medicine (19, 20). Scientometric analysis, which includes altmetric scores at different publication levels or values, has also been added to these studies in the recent years (21, 22).

We used the contemporary medical databases, primarily the WoS database and PubMed, in our bibliometric analysis. Although many international medical databases (such as PubMed, ScienceDirect, Medline, Scopus, Embase, EBSCO Host, and so on) have been used in citation analysis studies, the most frequently used source is Thomson Reuters' WoS Core Collection. The WoS database includes important information about the number of citations and researching other relevant academic effects (23).

Table 4. List of journals that have two and more published articles on ocular trauma

Rank	Journals	Number of articles	Impact Factor (2017)*	Total number of citations	Mean number of citation per article±SD	Q categories (2017)**
1	Ophthalmology	23	2.016	2183	94.91±43.66	Q1
2	JAMA Ophthalmology (formerly known as the Archives of Ophthalmology)	10	6.669	800	77.03±22.76	Q1
3	American Journal of Ophthalmology	7	4.795	708	101.14±78.37	Q1
4	British Journal of Ophthalmology	7	3.384	580	81.12±18.30	Q1
5	Survey of Ophthalmology	5	3.764	314	62.80±10.18	Q1
6	Cornea	4	2.464	387	96.75±81.74	Q1
7	Eye	3	2.478	368	122.66±70.60	Q1
8	Graefe's Archive for Clinical and Experimental Ophthalmology	3	2.249	250	83.33±29.67	Q1
9	Biomaterials	2	8.806	229	101.75±74.24	Q1
10	Drugs	2	4.690	152	76.00±29.69	Q1
11	Inflammation	2	2.884	179	89.50±0.70	Q2
12	Clinical and Experimental Ophthalmology (formerly known as the Australian and New Zealand Journal of Ophthalmology)	2	3.217	155	72.45±38.89	Q1

*2017 Journal Citation Reports® (Clarivate Analytics, 2018) **2017 Scimago Journal & Country Rank (SJR)

Figure 3. New perspective of ocular trauma classification

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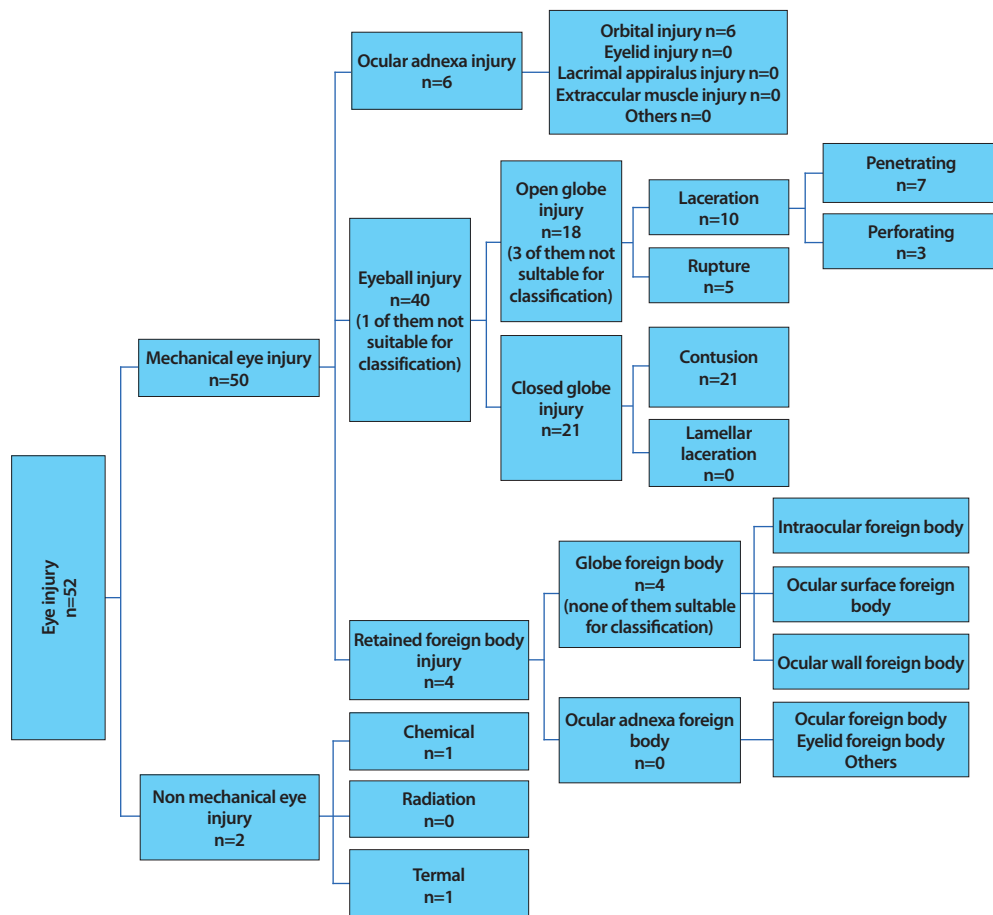
Various research methods are employed along with bibliometric studies to determine the effect size of a study; for example, the altmetric score studies have becoming increasingly popular in recent years among these methods.

Table 5. The most common topics among the top 100 cited articles

Main subject	Number
Mechanical eyeball injury (Open and closed glob injury)	40
Epidemiology of ocular trauma	19
Traumatic eye infection	17
Ocular adnexa injury	6
Medical therapeutic approaches for ocular trauma	6
Classification of mechanical ocular trauma	4
Retained foreign body–induced eye injury	4
Diagnostic method for ocular trauma	2
Thermal ocular injury	1
Chemical ocular injury	1

In our study, we found that the total number of citations of the top 100 cited articles between 1982 and 2018 is 8,568, except self-citations (range: 50–269). The average number of citations was 88.07, and the values of the mode and median were 52 and 78, respectively. Two of the three top cited articles were on ocular trauma classification, whereas one was a review related to ocular infection epidemiology caused by ocular trauma. The highest cited article in our study was written by Pieramici et al. (24), whose research included the ocular classification group. They presented the first classification concept on ocular trauma in their article, which was included in the perspective category. In their study, they not only classified mechanical eye injury but also standardized the terminology that will be used on ocular trauma cases.

Factors such as the number of citations being in favor of old journals and publications, scientific articles less cited within one or two years after their publication, and post-publication citation peak being between three and ten years, and articles losing their importance after that period are the main limitations in determining the value of articles in citation classics studies (13, 25). We found that the quick increase in the number of citations in the last ten years was related to the previous articles being published in the previous years.

Table 6. Study design and levels of evidence by SIGN* of the top 100 cited articles on ocular trauma

Study type and subtype	Level of evidence	Group	Number	Mean number of citation per article±SD
Clinical research				
Systematic review	1	A	1	94.50±44.54
Randomized controlled trial (RCT)	1	A	1	
Retrospective comparative study	2	B	2	89.00±32.52
Retrospective cohort study	3	B	1	81.50±32.38
Case–control study	3	B	1	
Case series	3	B	9	
Case report	3	B	1	
Prospective–descriptive study	3	B	9	
Retrospective–descriptive study	3	B	38	
Cross–sectional–descriptive study	3	B	1	
Review	4	C	24	97.00±55.89
Expert committee report	4	C	3	
Expert opinion (editorial, letter, and note)	4	C	1	
Experimental human cadaveric study				104.25±50.88
Prospective comparative study	2	B	1	
Experimental animal study				
Prospective comparative study	2	B	7	

*SIGN: Scottish Intercollegiate Guidelines Network

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Garfield stated that the review type studies are mainly the most cited articles (12). However, in our study, the most cited study was expert opinion or expert committee report with review being the second most cited article. However, it is noteworthy that the review type studies have received a large number of citations.

Our research data show that among the 100 most classical articles in ocular trauma, USA has an impressive stronghold both in terms of the number of authors who were included in more than one article and the number of presented proceedings papers and scientific activities (23).

The official language of the country of origin of publications is an important factor for the selection of language for articles. The publication language of the top 100 cited articles was English in our study. Although different languages were used, the common ones in the recent medical literature were published in English (25).

Our bibliometric study showed that the institutions or organizations located in the USA are more prominent both in terms of the number of institutions producing publications and in the number of publications per institution. The USA has the highest production of scientific publications, including in medicine and other health science fields. Moreover, the USA has the highest number of scientific publications in many fields (26, 27).

The result of our bibliometric study demonstrates that 22% of the classic papers are being supported by funding agencies in the USA. Although the amount of allowance has been reduced in recent years, educational and scientific studies are generally supported with funding in developed countries to a greater extent relative to developing countries (28, 29).

High IF is an important scientometric criterion in determining the journal quality (30). However, in the recent years, Q categories have gained more prominence in the determination of the scientific value of a journal (31). IF of the most of the journals in our "The Top 100 Cited Articles on Ocular Trauma" study was ≥2.0. This observation means that the key articles on ocular trauma are preferred by journals with a high IF. When we evaluated the top 3 journals in our study based on the most number of publications and citations on ocular trauma, *Ophthalmology* is the leading journal (23 articles and 2,183 citations). The second position was held by *JAMA Ophthalmology*, formerly known as the *Archives of Ophthalmology* (10 articles and 800 citations). The third rank belonged the *American Journal of Ophthalmology* (7 articles and 708 citations). Although the first three journals based on total number of citations are listed above, it is significant that the leader based on mean citation per article is *Eye*. Besides, we also realized that the name of *Australian and New Zealand Journal of Ophthalmology* was changed to *Clinical and Experimental Ophthalmology* during the literature review. Lin et al. (7) and Liu et al. (14) conducted bibliometric studies in different fields of ophthalmology. They stated that the most published and cited journal was *Ophthalmology* in their studies. The joint evaluation of their results with ours indicates that the *Ophthalmology* is an influential and preferred journal in this field.

Although Garfield reported that the most cited articles were review type (level of evidence: 4), we determined the retrospective–descriptive type studies (level of evidence: 3) as the most cited article (12). Moreover, most articles in the list were clinical outcome studies with an evidence level of 3, indicating that case series or prospective and retrospective–descriptive studies can still attract the interest of researchers and readers in the ocular trauma. Clinical type studies are the more preferred ones because of their conduct and easily accessible data (15).

For the first time, Kuhn et al. (32) standardized the ocular trauma terminology and classified it under the title of "classification of eye injuries" to provide a more understandable communication between the physicians attending to clinical ophthalmology. Later on, other studies suggested the extended classifications comprising all the eye injuries (33, 34). By evaluating the articles that are included in our study, we preferred to classify the eye injuries as mechanical and non-mechanical instead of only mechanical. This way, all the eye injuries could be gathered under a single algorithm. We used the classification of mechanical eye injuries suggested by Xiao et al. (33) in 2014, which they called the mechanical eye trauma and included the eyeball and ocular adnexa all together. For non-mechanical eye injuries, we based our study on the classification suggested by Shukla et al (34). Additionally, we used these classifications and grouped the eye injuries detailed in the top 100 ocular trauma articles in a new classification chart (Fig. 3). This update study can provide a new point of view for ocular trauma classification that includes all the eye injuries.

The most common topic in our study is mechanical eyeball injury; these injuries are divided into two groups—open and closed globe injuries. In this study, we determined that closed globe injuries were more common than open globe injuries. When the articles detailing the injuries are evaluated among these ocular trauma articles, it was observed that the most commonly reported type of closed globe injuries was contusion type injury, wherein the zone 3 area is largely affected. Additionally, penetrating eye injuries, wherein zone 3 area is mostly affected, are more common types of open globe injuries. In their study, in which they retrospectively reviewed the epidemiology of eye injuries, Oum et al. (35) stated that the prevalence of closed globe injuries was six times higher than that of open globe injuries. Moreover, Karaman (36) and Syal et al. (37) reported that contusion is the most common type of closed globe injuries, whereas penetration is the most common type of open globe injuries. We also found that eight (38%) of the closed globe traumas were associated with head traumas in children. Retinal bleedings and retinal folds suggested the presence of diagnostic findings for severe head injuries in childhood head trauma in some studies (38, 39).

The second most common topic in our study is ocular trauma epidemiology. The importance of this topic comes from ocular trauma being a preventable major cause of monocular blindness and visual impairment (2). It is important to reduce the cost of treatment and rehabilitation that will result from ocular morbidity and eye injuries. Therefore, it is important to adopt preventive

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measures for eye injuries as well as identify agents and risk factors causing eye injuries to decrease the related economic costs. Hence, this might be the other reason for researchers to focus on articles on ocular traumas. Many of the studies in this field have stated that the victims who underwent these eye injuries are mostly men and that the incident locations are mostly home or workplace (40, 41).

The third most common topic in our study are traumatic eye infections comprising keratitis and endophthalmitis. Endophthalmitis is mostly observed in open globe injuries and is a devastating complication with undesirable consequences on visual prognosis. Andreoli et al. (42) evaluated endophthalmitis rate in a large series of open globe traumas, and the comparison of their results with other studies revealed that the rate of endophthalmitis cases was lower in their study. They attributed the lower rate of endophthalmitis in their study on the usage of prophylactic broad-spectrum antibiotics and early surgical applications. Fungal keratitis is more commonly observed in the closed globe injuries, wherein the cornea is affected. This is because cornea traumas are mostly observed in agricultural workers (43). Many studies have observed *Fusarium* species as the most commonly observed traumatic fungal keratitis pathogen. Although bacterial keratitis is rare in these traumas, *Staphylococcus species* is the most commonly observed bacterial pathogen (44, 45).

Strengths
Beyond a bibliometric analysis, the strength of this study is that we have determined the average number of citations per journals and the average number of citations by the level of evidence together with Q categorization of journals. Furthermore, this study offers a new perspective on the ocular trauma classifications.

Future Directions
This bibliometric analysis study suggested that ocular traumas are important and have revealed the need for a new and more comprehensive classification on ocular traumas. Additionally, we realized that preventive medicine is important on ocular traumas as in all the preventable traumas.

CONCLUSION
Bibliometric studies are the analysis of publications in the literature via the use qualitative and quantitative methods. If their analysis can be conducted very well and produce a deducible interpretation of results, then bibliometric studies will not only provide valuable information for future literature but can also gain new scientific approaches to ocular trauma. This study's results suggest the importance of mechanical eyeball injuries as the most serious eye injuries that can still threaten vision, emphasize the determination of preventable causes in eye injuries, and present the standardization of ocular trauma terminology with the classification of ocular trauma including all the eye injuries necessary for the ophthalmologist to communicate more comprehensively with each other.

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