Review Article

A Bibliometric Analysis of Most Cited Papers on Vesiculobullous Oral Lesions

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ABSTRACT

Aim: A well-known method for quantitatively evaluating scholarly work is bibliometric analysis. Best-cited papers raise awareness of the influential publications and patterns in the literature on a specific subject. The aim was to conduct bibliometric analysis to determine most cited articles on vesiculobullous oral lesions. This is the first study on citation analysis with respect to vesiculobullous oral lesions. **Materials and Methods:** A retrospective data search was explored on December 2022 using the Scopus database. The articles were evaluated, and fundamental data for bibliometric analysis was reviewed. Standard details about the author, linked organizations, publishing year, and place of origin were noted. Statistical analysis was performed using Chi-square analysis. VOSviewer software was used to determine the bibliometric network analysis for co-occurrence among coauthors and commonly used keywords. **Results:** A total of 344 articles published from 1971 to 2022 were included in the study. A total of 6680 citations and 19.41 citations per article were observed. The journal *Archives of Dermatology* received the most citation. There was a significant association between the number of citations and the journal type (open access vs. non-open access) ($P < 0.05$). Four to five highly related clusters with the help of VOSviewer software were found during co-occurrence network analysis. **Conclusions:** The top 10 articles on vesiculobullous oral lesions that received the most citations were listed in detail in the present study. This will be a valuable resource for academics, clinicians, and researchers in the fields of dermatology, general pathology, oral pathology, and oral medicine.

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Introduction

A vesiculobullous lesion (VBL) of the skin comprises dermatological diseases with erratic clinicopathological findings. It can either present as a vesicle or bullae and can affect both skin and oral mucosa. The etiological parameters could be due to genetics, infections, inflammations, drug-induced, and autoimmune diseases. Due to the wide range of indistinct clinical differential diagnosis, it is pivotal for appropriate management, thus further reducing the mortality and morbidity of the disease.[1,2] The histopathological analysis of VBL could provide basic information like mechanism of bulla formation along with the level of epithelial and connective tissue splits. The punch biopsy along with direct immunofluorescence are the cornerstones for the diagnosis as well as prognosis of the VBL.[1]

The comprehensive knowledge of a particular subject can be achieved by two ways: one is the literature review, which includes both narrative review and systematic review; the narrative review focus on overall research finding and draws a generalized conclusion.[3] The systematic review has a well-defined research question along with precise inclusion and exclusion criteria.[4] The second technique is through bibliometric analysis (BA), which uses analytical and mapping methods to quantitatively evaluate the impact of published articles and citations.[5,6]

The BA is a pivotal tool that provides an encyclopedic overview of literature. The databases such as PubMed, Scopus, and Web of Science are extensively used for extracting citations. More the number of citations received by an article is directly proportional to the distinction achieved.[7] BA has been carried out in different topics of dentistry that include oral submucous fibrosis,[8] ameloblastoma,[9] oral cancer,[10] maxillofacial surgery,[11] endodontics, etc.[12] The BA can provide information on productivity rates, publication patterns, and further provide statistical descriptions. It is also used to explore the productiveness of the researcher, organizations, trends of a journal, countries for a particular subject, and research trends in various fields of study.[13] Thus, narrowing down the number of most cited research papers in a particular field/topic can immensely support the researcher and help in emphasizing the bibliography for references from a huge ocean of publications.[7]

According to the information available, an inclusive study with respect to most cited articles on the topic "Vesiculobullous Oral Lesions" has not been explored till date. To fill this gap, the present study aimed to explore BA of oral VBLs from 1971 to 2022 indexed in Scopus database. The objectives of the study were as follows:

1) To examine the research growth carried out in oral VBLs worldwide.
2) To identify the most productive country, institutions, author, most cited journal, and article with respect to total citations
3) To recognize top keywords and co-authorship network among authors using VOSVeiwer software.

Materials and Methods

Search criteria

The institutional review board of the research unit under the College of Dentistry had approved the study, since the study was based on retrospective assessment of public data, the need for ethical committee approval was exempted. The Scopus database was used for the extraction of citation information from published papers on vesiculobullous oral lesions, accessed on 27th December 2022. The keywords "Vesiculobullous" and "Oral Lesions" were used for the search strategy in the Scopus database. The search criteria included original articles, reviews, whereas the exclusion criteria were conference papers, editorials, commentaries, letter, notes, and short surveys. Articles published in the English language from the year 1971 to 2022 were included. Complete bibliometric information of the top 350 most cited articles were downloaded, of which 300 were original articles, 44 reviews, and the remaining 6 citations were excluded. The extracted data were exported on the Microsoft Excel sheet and were evaluated by two independent examiners.

Data analysis

The following variables were evaluated that included total citations, citation impact, name of the institutions, authors, affiliated universities, productive periods, name of the journal, and bibliographic description of the article additionally, the Visualization of Similarities viewer (VOSviewer, Leiden University, Leiden, The Netherlands, Europe) software (version 1.6.10 developed by Van Ecl and Waltman[14]) was used.

The bibliometric maps can be inspected in detail using the VOSviewer program. There are two types of maps, which are distance-based and graph-based maps used in BA. Distance-based maps are based on the distance between two objects and demonstrate the strength of the relation between the objects. A closer distance denotes a stronger relationship. Graph-based maps show relationships between objects when lines are drawn between them.[14] It is challenging to see the strength of the relation between two objects when using graph-based maps as opposed to distance-based maps. The VOSviewer visualizes bibliometric networks that assign a set of closely related color nodes into several conglomerates in a two-dimensional space, where the same color indicates a high correlation.[14] In the present study, VOSviewer was used to generate a network map for coauthors among countries and co-occurrence network between author keywords.

Statistical analysis

Based on the Fisher exact, Chi-square ($P < 0.05$) analysis, and mid-*P* exact value, there was a significant association between journal type (open and non-open access) and the number of citations [Table 1].

Results

The data with reference to studies done on vesiculobullous oral lesions are shown in Table 2.

Table 1: Chi-square analysis of articles in open and non-open access journals and their citations

Journal type	Articles	Citations
Open access	69	755
Non-open access	275	5925
Total	344	6680

Fisher exact 0.000*, Mid-P Exact 0.000*

Periodic growth of articles

A total of 344 articles were published in a span of 52 years with an average of 6.16 articles per year [Figure 1]. The first article was published in 1971, whereas 33 (9.59%) articles were published in the first 12 years (1971–1982), and 52 (15.11%) articles were published in the second phase of 10 years from 1983 to 1992. Almost the same number of articles (n = 55; 15.98%) were published in the next 10 years from 1993 to 2002. More than one-fourth (n = 88; 25.58%) of articles were published from 2003 to 2012. The highest number of articles, which was slightly more than one-third (n = 116; 33.72%), were published in the last 10 years (2013-2022) of the study. Overall, the fluctuations observed in publication growth and the highest number of articles (n = 23) were published in 2020.

Best-cited articles by country and institution

The list of the top 10 most cited articles according to the country and institute were extracted from the Scopus database [Table 3]. The maximum number of cited articles according to the country was published by the

Table 2: Distribution of various data on oral vesiculobullous lesions

Data	Results
Time span	1971–2022
Articles retrieved	350 total; 300 original research articles, 44 review articles
Articles selected	344
Total citations	6680
Citations per article	19.41
Cited and noncited articles	285 cited (82.84%) 59 noncited (17.15%)
Open accessed articles	69 articles, citations: 755, citation impact: 10.94
Non-open accessed articles	275 articles, citations: 5925, citation impact: 21.54

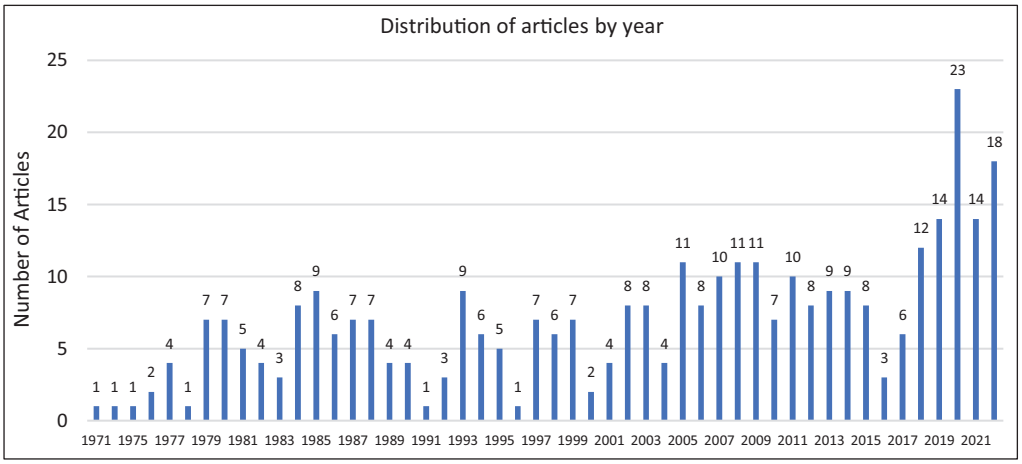

Figure 1: Distribution of articles by year

Table 3: Most cited articles by countries and institutions

Top 10 countries				Top 10 institutions			
Country	Total articles	Total citations	Citation impact	Name of institutions	Total articles	Total citations	Citation impact
United states	87	2205	25.34	Eastman Dental Institute, UK	16	935	58.44
United Kingdom	45	1623	36.07	University College London, UK	11	569	51.73
India	39	186	4.77	Saveetha Dental College, India	11	25	2.27
Italy	27	801	29.67	Università degli Studi di Napoli Federico II, Italy	9	260	28.89
Brazil	21	288	13.71	Universidade de São Paulo, Brazil	6	28	4.67
Japan	19	496	26.11	Università degli Studi di Foggia, Italy	5	204	40.80
Germany	14	300	21.43	University at Buffalo, The State University of New York, USA	5	70	14.00
Spain	13	517	39.77	University of Florida, USA	5	96	19.20
France	12	209	17.42	Barts and The London School of Medicine and Dentistry, UK	4	164	41.00
Turkey	12	111	9.25	University of London, UK	4	244	61.00

Table 4: Top 10 contributing authors for oral vesiculobullous lesions

Serial No.	Authors	Productive period	Total articles	Total citations	Citation impact
1.	Scully C	1990–2008	16	879	54.93
2.	Bhattacharyya I.	1999–2022	5	67	13.4
3.	Cohen DM	1999–2019	5	118	23.6
4.	Islam, MN	2007–2022	4	45	11.25
5.	Lo Muzio L	2001–2012	4	168	42.00
6.	Mignogna MD	2001–2009	4	134	33.50
7.	Williams DM	1989–1993	3	66	22.00
8.	Gorsky M	1986–2002	3	118	39.33
9.	Hashimoto T	1991–2004	3	101	33.66
10.	Lozada-Nur F	1986–2002	3	172	57.33

USA, whereas the greatest number of cited articles by an institute was Eastman Dental Institute, United Kingdom.

Top 10 most cited authors

A total of 1232 authors contributed to 344 articles, 1165 (94.56%) authors contributed in one article each, and 67 authors contributed in two more than two articles, whereas the top 15 authors contributed in three or more than three articles. Among the top 10 most cited authors, Scully contributed the most number of articles, followed by Bhattacharyya, Cohen, Islam, Mignogna, Williams, Gorsky, Hashimoto, and Lozada-Nur [Table 4].

Top 10 most cited journals

The leading journal was the *International Journal of Dermatology* followed by *Archives of Dermatology*, *British Journal of Dermatology*, *Oral Surgery Oral Medicine Oral Pathology*, *Journal of Periodontology*, *Oral Diseases*, *Journal of the American Academy of Dermatology*, *Clinical and Experimental Dermatology*, *Dermatology and Annales De Dermatologie Et De Venereologie* giving a total count of 95 articles from top 10 journals [Table 5].

Top 10 most cited articles

The studies were accordingly arranged in a descending order based on the frequency of citations. The leading three articles that received the most citations were Hall *et al.* Bullous eruption of systemic lupus erythematosus: Dramatic response to dapsone therapy (*Annals of Internal Medicine*:1982), Berk *et al.*: The treatment of bullous pemphigoid with tetracycline and niacinamide: A preliminary report (*Archives of Dermatology*;1986), and finally, Carreras-Presas *et al.*: Oral vesiculobullous lesions associated with SARS-CoV-2 infection; (*Oral Diseases*; 2021) [Table 6].

Coauthor occurrence of top-12 countries

A total of 1232 authors belonging to 61 countries contributed to 344 articles. The authors who belonged to 32 countries contributed to only one article each, authors belonging to 29 countries contributed either two or more than two articles each, whereas the authors of 15 countries contributed to five or more than five articles.

VOSviewer software generated the network of co-authorship among the 12 countries [Figure 2]. Twelve countries were divided into five clusters based on co-authorship. The authors of five countries, Germany, India, Saudi Arabia, Turkey, and the USA, consisted of

the first cluster of red spheres. The second cluster of green spheres comprised three countries that are Israel, Spain, and United Kingdom, whereas two countries, France and Italy, consisted of a third cluster of blue spheres. Finally, Japan and Brazil represent separately for the fourth and fifth clusters of yellow and indigo spheres, respectively.

Keywords co-occurrence network

A total of 484 keywords have been used by authors in 344 articles, 239 (69.74%) keywords were used one time, whereas 105 keywords were used two or more than two times. Table 7 provides the detail of the top 20 most frequently occurring keywords, which were utilized five or more than five times. The keywords "Pemphigus," "Vesiculobullous," and "Pemphigus vulgaris" were used around 20, 18, and 17 times, respectively. The keywords, "oral," "autoimmune" and "skin" had the highest total link strength with 51, 49, and 48, respectively. The word "total link strength" means the number of publications in which two keywords occur together.[14]

Of the top 20 keywords, 19 keywords met the threshold criteria of co-occurrence network in VOSviewer software. Nineteen keywords distributed into four clusters are shown in Figure 3. Six keywords (bullous pemphigoid, direct immunofluorescence, mucous membrane pemphigoid, pemphigus, pemphigus vulgaris, and VBL) comprised the first cluster of red spheres. The second cluster consisted of five green spheres, which represented the five keywords (autoantibodies, benign mucous membrane pemphigoid,

Table 5: Top 10 most cited journals for oral vesiculobullous lesions

Name of journal	Cite score	Total articles	Total citations	Citation impact
International Journal of Dermatology	3.8	15	262	17.47
Archives of Dermatology	NA	14	694	49.57
British Journal of Dermatology	13.6	11	598	54.36
Oral Surgery Oral Medicine and Oral Pathology	NA	10	293	29.30
Journal of Periodontology	10.5	9	190	21.11
Oral Diseases	6.3	8	449	56.13
Journal of The American Academy of Dermatology	8.1	8	179	22.38
Clinical and Experimental Dermatology	2.8	8	130	16.25
Dermatology	5.1	6	189	31.50
Annales De Dermatologie Et De Venereologie	0.9	6	125	20.83

Table 6: Top 10 most cited articles based on bibliographic description

No.	Bibliographic description of the articles	Total citations
1.	Hall RP, Lawley TJ, Smith HR, Katz SI. Bullous eruption of systemic lupus erythematosus: Dramatic response to dapsone therapy. *Annals of Internal Medicine*. 1982 Aug 1;97(2):165-70.	179
2.	Berk MA, Lorincz AL. The treatment of bullous pemphigoid with tetracycline and niacinamide: A preliminary report. *Archives of Dermatology*. 1986 Jun 1;122(6):670-4.	166
3.	Carreras-Presas CM, Sánchez JA, López-Sánchez AF, Jané-Salas E, Pérez ML. Oral vesiculobullous lesions associated with SARS-CoV-2 infection. *Oral Diseases*. 2021 Apr;27(Suppl 3):710.	137
4.	Scully C, Challacombe SJ. Pemphigus vulgaris: Update on etiopathogenesis, oral manifestations, and management. Critical Reviews in Oral Biology & Medicine. 2002 Sep;13(5):397-408.	120
5.	Kneisel A, Hertl M. Autoimmune bullous skin diseases. Part 1: Clinical manifestations. *JDDG: Journal der Deutschen Dermatologischen Gesellschaft*. 2011 Oct;9(10):844-57.	119
6.	Laskaris G, Sklavounou A, Stratigos J. Bullous pemphigoid, cicatricial pemphigoid, and pemphigus vulgaris: A comparative clinical survey of 278 cases. *Oral Surgery, Oral Medicine, Oral Pathology*. 1982 Dec 1;54(6):656-62.	111
7.	Leonard JN, WRIGHT P, Williams DM, Gilkes JJ, Haffenden GP, McMinn RM, FRY L. The relationship between linear IgA disease and benign mucous membrane pemphigoid. *British Journal of Dermatology*. 1984 Mar;110(3):307-14.	98
8.	Venning VA, Frith PA, Bron AJ, Millard PR, Wojnarowska F. Mucosal involvement in bullous and cicatricial pemphigoid. A clinical and immunopathological study. *British Journal of Dermatology*. 1988 Jan;118(1):7-15.	95
9.	Tagami H, Iwatsuki K, Iwase Y, Yamada M. Subcorneal pustular dermatosis with vesiculo-bullous eruption. Demonstration of subcorneal IgA deposits and a leukocyte chemotactic factor. *British Journal of Dermatology*. 1983 Nov;109(5):581-7.	93
10.	Bickle KM, Roark TK, Hsu S. Autoimmune bullous dermatoses: A review. *American Family Physician*. 2002 May 1;65(9):1861.	86

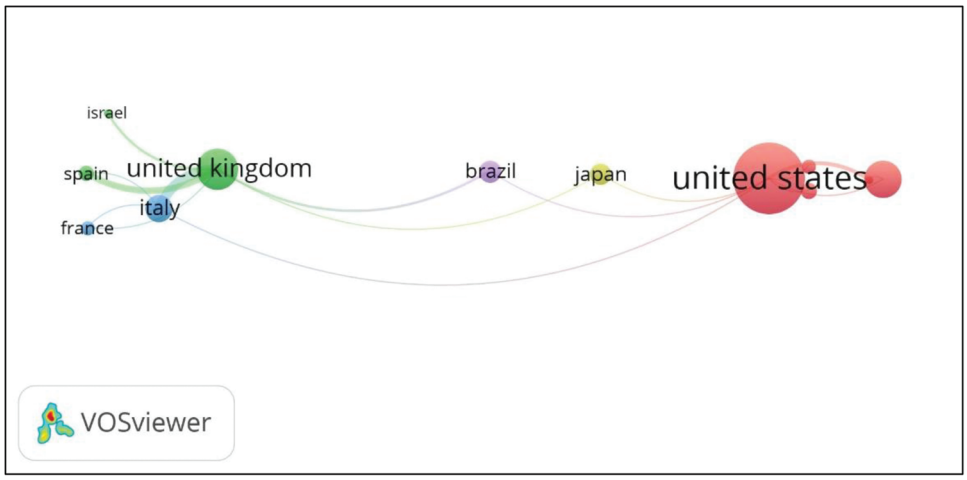

Figure 2: Network map visualization of coauthor occurrence of top 12 countries

Table 7: Top 20 keywords

No.	Keyword	Occurrences	Total link strength
1.	Pemphigus	20	34
2.	Vesiculobullous	18	39
3.	Pemphigus vulgaris	17	15
4.	Skin	14	48
5.	Oral	13	51
6.	Autoimmune	12	49
7.	Corticosteroids	10	32
8.	Desquamative gingivitis	10	14
9.	Vesiculobullous lesion	10	8
10.	Immunosuppressants	9	47
11.	Mucous membrane pemphigoid	8	10
12.	Pemphigoid	8	25
13.	Erythema multiforme	7	13
14.	Oral mucosa	7	8
15.	Bullous pemphigoid	6	6
16.	Autoantibodies	5	7
17.	Benign mucous membrane pemphigoid	5	4
18.	Direct immunofluorescence	5	6
19.	Oral manifestations	5	0
20.	Systemic lupus erythematosus	5	2

desquamative gingivitis, and oral mucous pemphigoid). There were four keywords for both the third cluster of blue spheres and the fourth cluster of yellow spheres. The keywords for the blue spheres were (autoimmune, corticosteroids, immunosuppressants, and oral), whereas the keywords for yellow spheres were (erythema multiforme, skin, systemic lupus erythematosus, and vesiculobullous), respectively.

Discussion

BA in the field of medical literature is used by researchers to identify the specific impact of a topic in the field of research.[7] The published article in the BA not only imparts a historical outlook on scientific advancement in the particular field of interest but also depicts the trend in research.[15] This BA included extensive research on topmost cited articles on vesiculobullous oral lesions. To our awareness, no BA has been carried out till date on 344 articles published on vesiculobullous oral lesions. In recent decades, an increased number of publications on vesiculobullous oral lesions have been identified.

VBLs include Pemphigus vulgaris, Pemphigus foliaceus, IgA pemphigus, and paraneoplastic pemphigus, which belong to the autoimmune bullous dermatoses of the Pemphigus family. Significant morbidity and death are traits of the pemphigus family. Pemphigus commonly manifests between the 5th and 6th decades of life, with an estimated incidence rate of 0.5–3.2 cases per 100,000 population. Evaluation for suspected pemphigus illness frequently necessitates a complete clinical assessment and laboratory testing due to the dangers involved with

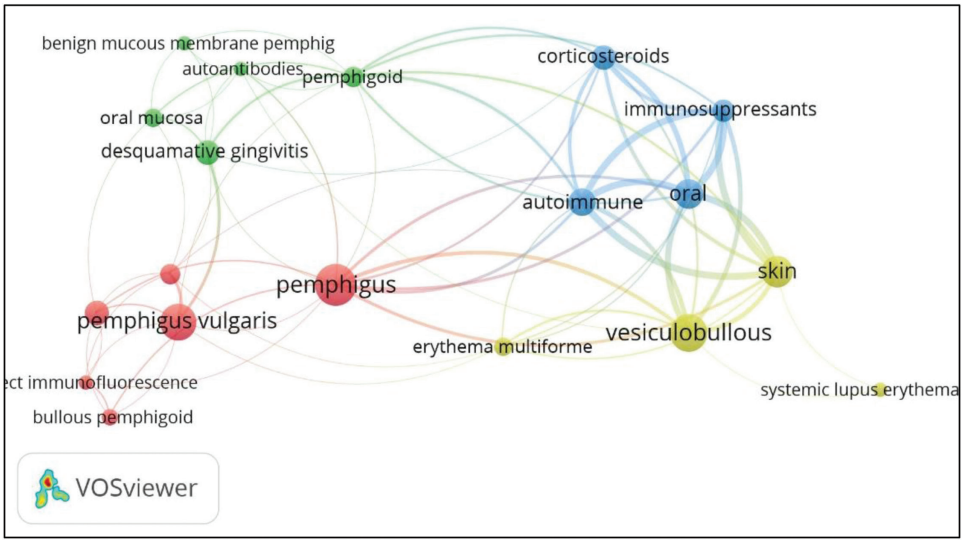

Figure 3: Co-occurrence network map visualization of keywords

a delayed or incorrect diagnosis as well as the possibility of overlap in clinical symptoms and treatments.[16,17]

Understanding the distinctive features of published matter on vesiculobullous oral lesions can be favorable for numerous reasons. A total of around 344 articles were retrieved from the Scopus database and published in a span of 51 years from the period of 1971 to 2022. The research revealed a total of 8099 references, cited in 344 articles, an average of 23.54 references have been used in each article. The last decade witnessed an increase in the publication of articles, which could be due to better research funding,[18] publishing culture among different academic specialities[19,20] and introduction of keyword plus indexing, which was introduced in 1990.[21]

The scientific quality of an article doesn't depend on the number of citations received; the weightage comes when it is recognized by the scientific community and further succeeding publication.[15] The present study received 6680 citations, that is, 19.41 citations per article and 285 (82.84%) cited articles, whereas 59 (17.51%) articles were not cited. Also, in the present study, non-open access journals had higher citations compared with open access and showed statistical significance ($P < 0.05$). This may be due to libraries procuring non-open access journals with high impact factor, which are made available to researchers. Usually, where no or less access to non-open access journals are prevalent their open access journals receive more citations.[22]

The paper that earned the most citations in the present study, published in 1982, received 179 citations. The date of publication is a pivotal factor in an article's citation count. The citation of a scientific publication usually follows a time-lapse, it is typically not cited until 1–2 years after publication, peaks in 3–10 years, and then declines. When compared with newly published articles, older articles had a higher chance of being cited because they have had more time to be recognized, as a result recently published articles could not be identified. Also, the citation count differs for every speciality and could be affected by a number of researchers who publish in a particular field.[23,24]

The United States of America and United Kingdom were the top two contributors, accounting for around 38.27% of total number of publications among the top 10 countries. There are various factors that contribute to the discrepancies in publication output among different countries. The reasons could be due to research-associated capital funding, English fluency, accessibility to internet databases, and keywords utilized for searching data etc.[6,25] The top 10 academic institutions that published most articles were mainly from United Kingdom, which could be due to funding sources, scientific population, and active research community.[23,26] There were limited Asian countries listed among the top 10 cited articles and factors such as insufficient funds, language obstacles, health care system, and restricted access to research data could curb the research progress.[26]

The BA with respect to contributing authors were published in countries the USA and United Kingdom. Similar pattern have been observed in other fields of bibliometric research like forensic odontology, depressions etc.[7,27] In the present study, the most productive author was Scully, with 16 articles and 879 citations. It has been found that countries with development level, population size, scientific infrastructure, and higher economic ranks perform well in terms of the amount and quality of biomedical publications.[7,28] Furthermore, around USD 10,202 per resident is spent in the USA, which outspends all other

countries in health expenditure, thus explaining why the country has the most publications.[27,29]

In the present study, the journal *Archives of Dermatology* received the maximum citation of 694, whereas the article that received the most citation was Hall *et al*. (Bullous eruption of systemic lupus erythematosus: dramatic response to dapsone therapy), which received 179 citations. The article and the journal both contributed to the specialization given the international recognition and scientific accomplishments in the specialized topic.[23,30] A research article is regarded as having accomplished a milestone in the realm of scientific study when it receives the most citations in its field.[23,31] Depending on the research specialization, Garfield claims that an article with 100 or more citations in the field of study may qualify as a classic article.[23,32] Some journals prefer to publish many articles, whereas others may prefer high-quality articles with higher impact factor values and more citations.[27]

The evaluation of scientific articles written by various author team, aid in the naming and defining of research teams and the relationships between them. Co-authorship of research articles is one approach to recognize a scientific collaboration process.[33] The effectiveness and emergence of scientific collaborations are influenced by authors' network locations in co-authorship networks.[33] In the present study, VOSviewer was used to construct a map of coauthors and keywords based on co-occurrence data. The separation between two items reveals how strongly they are related, that is, closer distance denotes a stronger relationship. Items are frequently scattered over distance-based maps, which makes it simple to detect cluster of similar objects. But on the other hand, it can occasionally make it challenging to label every item on a map without overlap. The clustering technique was used to allocate a country and keywords indicated by the color.[14]

Keywords are an important part of a research article; when conducting a literature search, using keywords yields more relevant results than using sentences or phrases. The keywords serve as a code for locating the necessary scientific articles.[23] The proximity and prevalence of research topics in scientific fields may be demonstrated by the co-occurrence analysis of keywords.[27]

Finally coming to the take-home message, oral VBLs such as pemphigus vulgaris and paraneoplastic pemphigus are fatal autoimmune condition that affects the skin and mucous membranes. The majority of patients first show signs of the disease as oral lesions. Dentist and physicians must be sufficiently knowledgeable about the clinical signs and symptoms of this disorder to ensure early detection and treatment, which would affect the disease's prognosis. A multidisciplinary approach is mandatory to improve the quality of life.

Limitations of the Study

There are several limitations in the present study, the retrieved data was only from the Scopus database, and articles from other databases were not analyzed. Yet, the Scopus is still regarded as the most reliable database for citation analysis and is frequently utilized in the literature. Due to time constraints, the top 10 articles with the most citations were only included, excluding many articles from the list of classic articles. Self-citation, including writers referring their own works and authors citing more works from the journals they wish to publish in, may be one of the causes for numerous citations. Analyzing the frequency of self-citation and how it affects the article requires more study.

Conclusion

This is the first BA study on oral VBLs, which included publication production from the past 50 years retrieved from the Scopus database. The present study showed substantial growth in the research field with the USA and United Kingdom having the most number of publications, whereas Eastman Dental Institute was the most active institute. Scully was the most productive author, whereas the most dominant keywords and co-occurrence network keywords were pemphigus, vesiculobullous, and pemphigus vulgaris. We believe that the list of top 10 most cited articles in the present study will be a valuable resource for researchers, students, and clinicians working in the fields of oral medicine, oral/general pathology, and dermatology to plan strategies for upcoming research on oral VBLs.

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Conflicts of interest

The authors declare no potential conflicts of interest with respect to the authorship and/or publication of this article.

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Writing–review and editing: Ali Anwar Aboalela, Salman Siddeeque, Sulthan Raja Khan, Kiran Iyer, Abbiramy GK.

Ethical policy and institutional review board statement

Research project is a bibliometric study done on publicly available data from published researches and does not include any human or animal involvement as subjects or data. Based on this, the project can be IRB exempted and is not considered for full board IRB review.

Patient declaration of consent

No patient data used.

Data availability statement

The article includes the study's original contributions; for more information, kindly contact the corresponding author.

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