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The 100 Top-cited Articles in Main Allergy Journals: A Bibliometric Analysis

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ABSTRACT

The objective of this study was to identify the characteristics of the top 100 cited studies in main allergy journals.

The 100 top-cited studies in allergy journals from the Web of Science were enrolled. The key characteristics included citation, year, authors, country, institution and journal were analyzed.

The number of citations of the 100 top-cited studies ranged from 409 to 2313. They were published between 1972 and 2014. Journal of Allergy and Clinical Immunology published the largest number of top-cited studies (n=74), followed by Allergy (n=13) and Clinical and Experimental Allergy (n=9). The greatest number of studies were USA (n=45), followed by England (n=10), Canada (n=7), and Sweden (n=7). The institution with the largest number of studies was the Icahn School of Medicine at Mount Sinai in the USA (n=8). The country with the largest number of top institutions was the USA (n=8). The reviews had higher average citation times than articles.

Our study can give a historical perspective on the scientific progress of allergy, as well as provide important insights into priorities and trends of allergy and could serve as sources for future studies.

Keywords: Allergy; Bibliometric analysis; Citation analysis; Citation; Top-cited

INTRODUCTION

Allergy is a reaction by the immune system to something in the environment that usually causes minor problems in most people.[1] It is very common, and many people are affected by it. The most common reactions include sneezing, red eyes, an itchy rash, runny nose, shortness of breath, or swelling.[2,3] The purpose of

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studies in allergy include reporting the condition of allergy, developing of new allergy diagnosis and tests, discovering the etiology of allergy, investigating potential prevention and treatment method, and so on.[4-6] There have been many studies published over the past few decades and the number of studies is still increasing every day. Among these studies, some classic studies have had dramatic effects on the promotion of allergy. However, little work has been done to identify these classic studies.

Many methods have been used to identify classic studies, among them, citation analysis is the most important one.[7,8] Identifying citations of studies can be used to systematically evaluate the research performance,[9,10] and help to achieve optimized research allocation, reorientation research support, rationalize research organizations, etc.[11] Citation number is always considered as a measure of importance in the scientific research field. There have been a lot of such studies including oncology,[12] respiratory system,[13] cancer immunotherapy,[11] diabetes,[14] tuberculosis[15,] and radiology.[16] These studies have helped us in a better understanding of the characteristics of diseases. However, no study has analyzed the most cited studies in the field of allergy. Our aim was to identify the 100 top-cited studies in main allergy journals and to determine the principal characteristics of these studies.

MATERIALS AND METHODS

This was a retrospective analysis based on the online database, so ethics board approval was not needed. A search of Web of Science (Clarivate Analytics) was performed on February 19th, 2019. There were 27Journals with the subject category "Allergy" in the Journal Citation Reports (JCR) for 2017. All 27 journals were analyzed in the study (Table 1).

Table 1. List of journals that were search with the subject category ''Allergy'' in the Web of Science from Journal Citation Reports (2017)

Ranking	Full Journal Title	Journal Impact Factor(2017)
1	Journal of Allergy and Clinical Immunology	13.258
2	Journal of Allergy and Clinical Immunology-In Practice	6.966
3	Clinical Reviews In Allergy & Immunology	6.442
4	Allergy	6.048
5	World Allergy Organization Journal	5.676
6	Clinical and Experiment Allergy	5.158
7	Contact Dermatitis	4.275
8	Pediatric Allergy and Immunology	4.137
9	Allergology International	4.045
10	Allergy Asthma & Immunology Research	3.809
11	Immunology and Allergy Clinics of North America	3.694
12	Current Opinion in Allergy and Clinical Immunology	3.544
13	Clinical and Translational Allergy	3.539
14	Journal of Investigational Allergology and Clinical Immunology	3.457
15	Current Allergy and Asthma Reports	3.449
16	Annals of Allergy Asthma & Immunology	3.263
17	International Archives of Allergy and Immunology	2.437
18	Allergy and Asthma Proceedings	2.213
19	Allergy Asthma and Clinical Immunology	2.051
20	Journal of Asthma	2.014
21	Allergologia Et Immunopathologia	1.644
22	PostepyDermatologii I Alergologii	1.471
23	Iranian Journal of Allergy Asthma and Immunology	1.049
24	Asian Pacific Journal of Allergy and Immunology	0.976
25	Pediatric Allergy Immunology and Pulmonology	0.533
26	Revue Francaise D Allergologie	0.306
27	Allergologie	0.220

We searched the journal-title for each journal and combined the results with the 'OR' operator. The top 100-cited studies were identified based on the citation numbers. The following information was extracted from each study: title, number of citations, journal name, year of publication, country of origin, author, and institution. In this study, the address provided for the corresponding author was used to determine the institution and country origin.

RESULTS

Main Characteristics of the Included Studies

Table 2shows the 100 top-cited articles in descending order according to citations. The numbers of citations were from 409 to 2313. The first 10 studies exceeded 1000 citations each, and the top 60 studies had more than 500 citations each. It is possible to comment only on the three most cited studies. The most cited study named 'Allergic rhinitis and its impact on asthma (ARIA) 2008 update' and was published in Allergy.[17] The second most cited study named 'The global burden of asthma: executive summary of the GINA Dissemination Committee Report', it was published in 2004 in Allergy.[18] The third most cited study named 'Allergic rhinitis and its impact on asthma' and was published in 2001 in the Journal of Allergy and Clinical Immunology.[19]

Table 2. The 100 top cited studies in main allergy journals

Ranking	Title	Journal	Article type	Citation times	Publication year
1	Allergic rhinitis and its impact on asthma (ARIA) 2008 update (in collaboration with the World Health Organization, GA(2)LEN and AllerGen)	Journal of Allergy and Clinical Immunology	Review	2313	2008
2	The global burden of asthma: executive summary of the GINA Dissemination Committee Report	Allergy	Review	1833	2004
3	Allergic rhinitis and its impact on asthma	Journal of Allergy and Clinical Immunology	Review	1790	2001
4	Standardization of bronchial inhalation challenge procedures	Journal of Allergy and Clinical Immunology	Article	1575	1975
5	Adipose tissue, adipokines, and inflammation	Journal of Allergy and Clinical Immunology	Review	1385	2005
6	Revised nomenclature for allergy for global use: Report of the Nomenclature Review Committee of the World Allergy Organization, October 2003	Journal of Allergy and Clinical Immunology	Article	1222	2004
7	Development of the asthma control test: A survey for assessing asthma control	Journal of Allergy and Clinical Immunology	Article	1196	2004
8	A revised nomenclature for allergy - An EAACI position statement from the EAACI nomenclature task force	Allergy	Review	1141	2001
9	Guidelines for the Diagnosis and Management of Food Allergy in the United States: Report of the NIAID-Sponsored Expert Panel	Journal of Allergy and Clinical Immunology	Article	1096	2010
10	Fatalities due to anaphylactic reactions to foods	Journal of Allergy and Clinical Immunology	Article	1002	2001
11	Eosinophilic esophagitis: Updated consensus recommendations for children and adults	Journal of Allergy and Clinical Immunology	Review	990	2011
12	Utility of food-specific IgE concentrations in predicting symptomatic food allergy	Journal of Allergy and Clinical Immunology	Article	924	2001

13	Update on food allergy	Journal of Allergy and Clinical Immunology	Review	908	2004
14	Guidelines for transepidermal water-loss (tewl) measurement - a report from the standardization-group-of-the european-society-of-contact-dermatitis	Contact Dermatitis	Article	784	1990
15	Relationship between food-specific IgE concentrations and the risk of positive food challenges in children and adolescents	Journal of Allergy and Clinical Immunology	Article	760	1997
16	Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines: 2010 Revision	Journal of Allergy and Clinical Immunology	Article	757	2010
17	Radioimmunosorbent assay of allergens	Journal of Allergy and Clinical Immunology	Article	748	1972
18	The prevalence of food allergy: A meta-analysis	Journal of Allergy And Clinical Immunology	Article	737	2007
19	Distinct patterns of neonatal gut microflora in infants in whom atopy was and was not developing	Journal of Allergy and Clinical Immunology	Article	720	2001
20	Allergy development and the intestinal microflora during the first year of life	Journal of Allergy and Clinical Immunology	Article	702	2001
21	Omalizumab, anti-IgE recombinant humanized monoclonal antibody, for the treatment of severe allergic asthma	Journal of Allergy and Clinical Immunology	Article	699	2001
22	Bronchial responsiveness to histamine or methacholine in asthma - measurement and clinical-significance	Journal of Allergy and Clinical Immunology	Article	698	1981
23	Pollen and eosinophilic esophagitis	Journal of Allergy and Clinical Immunology	Letter	690	2003
24	Allergen immunotherapy: Therapeutic vaccines for allergic diseases - A WHO position paper	Journal of Allergy and Clinical Immunology	Article	687	1998
25	Allergen-induced increase in bronchial responsiveness to histamine - relationship to the late asthmatic response and change in airway caliber	Journal of Allergy and Clinical Immunology	Article	668	1982
26	Pollen immunotherapy reduces the development of asthma in children with seasonal rhinoconjunctivitis (the PAT-Study)	Journal of Allergy and Clinical Immunology	Article	661	2002
27	The eosinophil and bronchial-asthma - current understanding	Journal of Allergy and Clinical Immunology	Article	651	1990
28	Cytokines in symptomatic asthma airways	Journal of Allergy and Clinical Immunology	Article	644	1992
29	Benefits of omalizumab as add-on therapy in patients with severe persistent asthma who are inadequately controlled despite best available therapy (GINA 2002 step 4 treatment): INNOVATE	Allergy	Article	609	2005
30	Asthma and inflammation	Journal of Allergy and Clinical Immunology	Review	608	1991
31	Lessons for management of anaphylaxis from a study of fatal reactions	Clinical And Experimental Allergy	Article	604	2000
32	Worldwide severity and control of asthma in children and adults: The global Asthma Insights and Reality surveys	Journal of Allergy and Clinical Immunology	Article	603	2004

33	IL-17 is increased in asthmatic airways and induces human bronchial fibroblasts to produce cytokines	Journal of Allergy and Clinical Immunology	Article	598	2001
34	The eosinophil and the pathophysiology of asthma	Journal of Allergy and Clinical Immunology	Article	597	1986
35	Worldwide variations in the prevalence of symptoms of atopic eczema in the international study of asthma and allergies in childhood	Journal of Allergy and Clinical Immunology	Article	596	1999
36	IL-18: A T-H1-inducing, proinflammatory cytokine and new member of the IL-1 family	Journal of Allergy and Clinical Immunology	Review	594	1999
37	Double-blind, placebo-controlled food challenge (dbpcfc) as an office procedure - a manual	Journal of Allergy and Clinical Immunology	Article	594	1988
38	Probiotics: A novel approach in the management of food allergy	Journal of Allergy and Clinical Immunology	Article	589	1997
39	Eosinophils, t-lymphocytes, mast-cells, neutrophils, and macrophages in bronchial biopsy specimens from atopic subjects with asthma - comparison with biopsy specimens from atopic subjects without asthma and normal control subjects and relationship to bronchial hyperresponsiveness	Journal of Allergy and Clinical Immunology	Article	583	1991
40	Further fatalities caused by anaphylactic reactions to food, 2001-2006	Journal of Allergy and Clinical Immunology	Letter	582	2007
41	Food allergy. Part 1: Immunopathogenesis and clinical disorders	Journal of Allergy and Clinical Immunology	Review	577	1999
42	The intestinal microflora in allergic Estonian and Swedish 2-year-old children	Clinical and Experimental Allergy	Article	568	1999
43	Allergenic pollen and pollen allergy in Europe	Allergy	Review	568	2007
44	Development and testing of a new measure of health-status for clinical-trials in rhinoconjunctivitis	Clinical and Experimental Allergy	Article	558	1991
45	Food allergy	Journal of Allergy and Clinical Immunology	Article	555	2010
46	The diagnosis and management of rhinitis: An updated practice parameter	Journal of Allergy and Clinical Immunology	Review	553	2008
47	Probiotics in the management of atopic eczema	Clinical and Experimental Allergy	Article	547	2000
48	The EAACI/GA(2)LEN/EDF/WAO Guideline for the definition, classification, diagnosis, and management of urticaria: the 2013 revision and update	Allergy	Article	541	2014
49	Toll-like receptor function and signaling	Journal of Allergy and Clinical Immunology	Review	539	2006
50	Characterization of the severe asthma phenotype by the National Heart, Lung, and Blood Institute's Severe Asthma Research Program	Journal of Allergy and Clinical Immunology	Article	535	2007
51	Mechanisms of eosinophil-associated inflammation	Journal of Allergy and Clinical Immunology	Review	534	2000
52	Specific immunotherapy has long-term preventive effect of seasonal and perennial asthma: 10-year follow-up on the PAT study	Allergy	Article	528	2007

53	Activation of cd4+ T-cells, increased t(h2)-type cytokine messenger-RNA expression, and eosinophil recruitment in bronchoalveolar lavage after allergen inhalation challenge in patients with atopic asthma	Journal of Allergy and Clinical Immunology	Article	526	1993
54	Prevalence of peanut and tree nut allergy in the United States determined by means of a random digit dial telephone survey: A 5-year follow-up study	Journal of Allergy and Clinical Immunology	Article	525	2003
55	Asthma Control Test: Reliability, validity, and responsiveness in patients not previously followed by asthma specialists	Journal of Allergy and Clinical Immunology	Article	523	2006
56	Asthma endotypes: A new approach to classification of disease entities within the asthma syndrome	Journal of Allergy and Clinical Immunology	Article	521	2011
57	Food allergy: Epidemiology, pathogenesis, diagnosis, and treatment	Journal of Allergy and Clinical Immunology	Review	516	2014
58	US prevalence of self-reported peanut, tree nut, and sesame allergy: 11-year follow-up	Journal of Allergy and Clinical Immunology	Article	512	2010
59	A prospective-study of cow milk allergy in danish infants during the 1st 3 years of life - clinical course in relation to clinical and immunological type of hypersensitivity reaction	Allergy	Article	509	1990
60	Dust mite allergens and asthma - report of a 2nd international workshop	Journal of Allergy and Clinical Immunology	Article	501	1992
61	Allergen immunotherapy: A practice parameter third update	Journal of Allergy and Clinical Immunology	Article	491	2011
62	Comparative effects of inhaled salbutamol, sodium cromoglycate, and beclomethasone dipropionate on allergen-induced early asthmatic responses, late asthmatic responses, and increased bronchial responsiveness to histamine	Journal of Allergy and Clinical Immunology	Article	488	1987
63	Eosinophilic gastrointestinal disorders (EGID)	Journal of Allergy and Clinical Immunology	Review	487	2004
64	Sublingual immunotherapy for allergic rhinitis: systematic review and meta-analysis	Allergy	Article	480	2005
66	Dust mite allergens and asthma - a worldwide problem	Journal of Allergy and Clinical Immunology	Article	477	1989
67	Incidence of immediate allergy to latex gloves in hospital personnel	Contact Dermatitis	Article	477	1987
65	Position paper - allergen standardization and skin-tests	Allergy	Article	477	1993
68	Prominent neutrophilic inflammation in sputum from subjects with asthma exacerbation	Journal of Allergy and Clinical Immunology	Article	476	1995
69	A comparative-study of the effects of an inhaled corticosteroid, budesonide, and a beta-2-agonist, terbutaline, on airway inflammation in newly diagnosed asthma - a randomized, double-blind, parallel-group controlled trial	Journal of Allergy and Clinical Immunology	Article	475	1992

70	Atopic dermatitis: New insights and opportunities for therapeutic intervention	Journal of Allergy and Clinical Immunology	Review	473	2000
71	Prevalence of hay fever and allergic sensitization in farmer's children and their peers living in the same rural community	Clinical and Experimental Allergy	Article	466	1999
72	Intestinal barrier function: Molecular regulation and disease pathogenesis	Journal of Allergy and Clinical Immunology	Review	463	2009
73	Diagnosis and Management of Rhinitis: Complete guidelines of the Joint Task Force on Practice Parameters in Allergy, Asthma and Immunology	Annals of Allergy Asthma & Immunology	Review	461	1998
74	A distinct subset of antineutrophil cytoplasmic antibodies is associated with inflammatory bowel-disease	Journal of Allergy and Clinical Immunology	Article	456	1990
75	Late cutaneous allergic responses in isolated IgE - dependent reactions	Journal of Allergy and Clinical Immunology	Article	456	1973
76	Comparison of results of skin-tests, rast, and double-blind, placebo-controlled food challenges in children with atopic-dermatitis	Journal of Allergy and Clinical Immunology	Article	454	1984
77	Selective probiotic bacteria induce IL-10-producing regulatory T cells in vitro by modulating dendritic cell function through dendritic cell-specific intercellular adhesion molecule 3-grabbing nonintegrin	Journal of Allergy and Clinical Immunology	Article	453	2005
78	Reduced risk of hay fever and asthma among children of farmers	Clinical and Experimental Allergy	Article	453	2000
80	Promoter polymorphisms in the chromosome-5 gene-cluster in asthma and atopy	Clinical and Experimental Allergy	Article	452	1995
79	Drug provocation testing in the diagnosis of drug hypersensitivity reactions: general considerations	Allergy	Article	452	2003
81	Fatalities from immunotherapy (it) and skin testing (st)	Journal of Allergy and Clinical Immunology	Article	443	1987
82	IL-31: A new link between T cells and pruritus in atopic skin inflammation	Journal of Allergy and Clinical Immunology	Article	442	2006
83	Eosinophils: Biological properties and role in health and disease	Clinical and Experimental Allergy	Editorial Material	441	2008
84	Standardization of food challenges in patients with immediate reactions to foods - position paper from the European Academy of Allergology and Clinical Immunology	Allergy	Review	435	2004
85	The natural course of atopic dermatitis from birth to age 7 years and the association with asthma	Journal of Allergy and Clinical Immunology	Article	434	2004
86	New concepts in the pathogenesis of bronchial hyperresponsiveness and asthma	Journal of Allergy and Clinical Immunology	Review	434	1989
87	Rhinovirus illnesses during infancy predict subsequent childhood wheezing	Journal of Allergy and Clinical Immunology	Article	431	2005
88	Noncompliance and treatment failure in children with asthma	Journal of Allergy and Clinical Immunology	Article	431	1996

89	The relative risks of sensitivity to grass-pollen, house dust mite and cat dander in the development of childhood asthma	Clinical and Experimental Allergy	Article	428	1989
90	Early consumption of peanuts in infancy is associated with a low prevalence of peanut allergy	Journal of Allergy and Clinical Immunology	Article	426	2008
91	Differentiation of chronic sinus diseases by measurement of inflammatory mediators	Allergy	Article	424	2006
92	Prevalence of challenge-proven IgE-mediated food allergy using population-based sampling and predetermined challenge criteria in infants	Journal of Allergy and Clinical Immunology	Article	423	2011
93	Food allergy	Journal of Allergy and Clinical Immunology	Article	423	2006
94	Early-life respiratory viral infections, atopic sensitization, and risk of subsequent development of persistent asthma	Journal of Allergy and Clinical Immunology	Article	422	2007
95	Changes in bronchial hyperreactivity induced by 4 weeks of treatment with antiasthmatic drugs in patients with allergic-asthma - a comparison between budesonide and terbutaline	Journal of Allergy and Clinical Immunology	Article	422	1985
96	Probiotics and prebiotic galacto-oligosaccharides in the prevention of allergic diseases: A randomized, double-blind, placebo-controlled trial	Journal of Allergy and Clinical Immunology	Article	416	2007
97	Prevalences of positive skin test responses to 10 common allergens in the US population: Results from the Third National Health and Nutrition Examination Survey	Journal of Allergy and Clinical Immunology	Article	416	2005
98	Worldwide variations in prevalence of symptoms of allergic rhinoconjunctivitis in children: the international study of asthma and allergies in childhood (ISAAC)	Pediatric Allergy and Immunology	Article	415	1997
99	Significant variability in response to inhaled corticosteroids for persistent asthma	Journal of Allergy and Clinical Immunology	Article	410	2002
100	Lymphocyte subsets in healthy children from birth through 18 years of age: The pediatric AIDS clinical trials group P1009 study	Journal of Allergy and Clinical Immunology	Article	409	2003

Author Distribution

Authors with more than one study as the first author or corresponding author are listed in Table 3. Eight authors had more than one study as the first author, and 8 authors had more than one study as the corresponding author. The author named ‘Sampson, HA’ had the largest number of studies as the first author (*n*=5), while Sicherer, SH published most of the studies as the corresponding author (*n*=5).

Country Distribution

The country of the corresponding author’s affiliation was used to analyze the country's contributions (Table 4). Briefly, the top 100-cited studies were from 16 countries (USA, England, Canada, Sweden, Finland, Germany, Denmark, Netherlands, France, New Zealand, Australia, Austria, Belgium, Italy, Japan, and Switzerland). The country with the most top-cited studies was USA (*n*=45), followed by England (*n*=10), Canada (*n*=7), and Sweden (n=7). The country with the most citations was the USA with 28337 citations, followed by England with 5409 citations. The country with most citations on average was France (*n*=1402), followed by

New Zealand (*n*=1131). Most of the studies were from European countries and only 1 study was from Asian.

Institution Distribution

To analyze contributions from institutions, those who published at least two studies based on the first address of the corresponding author were evaluated(Table 5). Sixteen institutions with more than one study were included. The institution with the largest number of studies was the Icahn School of Medicine at Mount Sinaiin the USA (*n*=8), followed by the National Jewish Medical and Research Centre (*n*=5) in the USA. Eight intuitions from the USA published more than one study.

Distribution by Year

The distribution by year of the 100 top-cited studies is shown in Table 6. The top-cited studies were published between 1972 and 2014. The years with the most studies were 2001 and 2004, with 8 studies each, followed by 2000(*n*=7) and 2007(*n*=7). The year with the most citations was 2004 with 7118 citations, followed by 2001 with 7058 citations. The year with the most citations on average was 1975 with 1575 citations; followed by 2008 with 1263citations.

Distribution by Journal

Although 27 journals were used for data analysis, the top 100 cited studies were published in only 6 journals (Table 7). The journal with the largest number of studies was the Journal of Allergy and Clinical Immunology (n=74), followed by Allergy (n=13) and Clinical and Experimental Allergy (n=9). The journal with the most citations was the Journal of Allergy and Clinical Immunology with 46802, followed by Allergywith 10310 citations. The journal with the highest average number of citations per study was Allergywith 793 citations, followed by the Journal of Allergy and Clinical Immunology with 632 citations.

Publication Type

For publication type, as shown in Table 8, 76 studies were articles, 21 studies were reviews, 2 studies were letters, and 1 study was editorial material. The reviews had higher average citations(*n*=838) than articles (*n*=585).

Table 3. Authors with more than one study as first or corresponding authors

Author	Name	Number of studies
First author	Bjorksten, B	2
	Bock, SA	3
	Bousquet, J	3
	Gleich, GJ	2
	Johansson, SGO	2
	Plattsmills, TAE	3
	Sampson, HA	5
	Sicherer, SH	5
Corresponding author	Bjorksten, B	2
	Bock, SA	3
	Bousquet, J	3
	Gleich, GJ	2
	Johansson, SGO	2
	Plattsmills, TAE	2
	Sampson, HA	4
	Sicherer, SH	5

Table 4. Country of origin of the 100 top-cited studies: based on country of the corresponding author

Country	Number of studies	Total citation	Average citation
USA	45	28337	630
England	10	5409	541
Canada	7	4223	603
Sweden	7	5292	756
Finland	6	3224	537
Germany	4	1870	468
Denmark	3	1472	491
Netherlands	5	3010	602
France	3	4208	1402
New Zealand	2	2261	1131
Australia	3	1286	429
Austria	1	409	409
Belgium	1	876	876
Italy	1	568	568
Japan	1	539	539
Switzerland	1	448	448

Table 5. Institutions with at least two studies based on the institution of the corresponding author

Institution	Number of studies	Country
McMaster University	3	Canada
Odense University Hospital	2	Denmark
National Heart & Lung Institute	2	England
Kings Coll London	2	England
University of Turku	2	Finland
University of Helsinki	2	Finland
University of Tampere	2	Finland
Karolinska Institutet	3	Sweden
Mayo Clinic	3	USA
Joint Council of Allergy, Asthma and Immunology	2	USA
Cincinnati Children's Hospital Medical Center	2	USA
The University of Virginia	3	USA
University of Wisconsin Hospital and Clinics	2	USA
Icahn School of Medicine at Mount Sinai	8	USA
University Colorado	3	USA
National Jewish Medical and Research Centre	5	USA

Table 6. Journals in which the 100 top-cited studies were published

Journal	Number of studies	Total citation	Average citation
Allergy	13	10310	793
Annals of Allergy Asthma & Immunology	1	461	461
Clinical and Experimental Allergy	9	4517	502
Contact Dermatitis	2	1261	631
Journal of Allergy and Clinical Immunology	74	46802	632
Pediatric Allergy and Immunology	1	415	415

Table 7. Year distribution of the 100 top cited studies

Year	Number of studies	Total citation	Average citation
1972	1	748	748
1973	1	456	456
1975	1	1575	1575
1981	1	698	698
1982	1	668	668
1984	1	454	454
1985	1	422	422
1986	1	597	597
1987	3	1408	469
1988	1	594	594
1989	3	1339	446
1990	4	2400	600
1991	3	1749	583
1992	3	1620	540
1993	2	1003	502
1995	2	928	464
1996	1	431	431
1997	3	1764	588
1998	2	1148	574
1999	5	2901	542
2000	7	3279	468
2001	8	7058	882
2002	3	1432	477
2003	3	1302	434
2004	8	7118	826
2005	6	3774	629
2006	5	2351	470
2007	7	3506	500
2008	3	3788	1263
2009	1	463	463
2010	4	2920	730
2011	4	2425	606
2014	2	1057	529

Table 8. Type of study in the 100 top-cited studies on allergy

Type of study	Number of studies	Total citation times	Average citation time per study
Article	76	44451	585
Editorial Material	1	441	441
Letter	2	1272	636
Review	21	17602	838

DISCUSSION

Allergy has exponentially grown during the past few decades. In this study, using a bibliometric method to identify the 100 top-cited studies in main allergy journals allows us to uncover trends in the historical development of the field. Not surprisingly, we found that the 100 top-cited studies were written by authors in a variety of countries. In addition, the top 100-cited studies were published in only a few journals which are different from some other research fields, such as spinal oncology.[12]

The100 top-cited studies published in main allergy journals were cited from 409 to 2313 times. This number is considerably less than those in the diabetes field,[14] in which studies received citations from 1121 to 10292 times. The number is almost the same in urology studies (418 to 1435)[11]and orthopedic surgery studies (353 to 1435).[20] The different citation rates might reveal a different number of researchers working in a specific scientific field. Although allergies affect many western populations, it is not the heaviest burden of diseases. Unlike other diseases such as oncology,[11] digestive diseases[21] or diabetes,[14] the citation numbers also explains that there are much fewer journals of the allergy and articles.

Our study found that almost all the 100 top-cited studies were from developed countries such as the USA, England, and Canada which is similar to the fields of diabetes[14] and tuberculosis.[15] We have to mention the data from the USA. Our results revealed that 45 of 100 studies originated from the USA, also 8of 16 top institutions of Allergy are located in the USA. These findings prove the USA's overwhelming impact on allergy researches. In addition, the average citations for each review were much higher than the article, which was very consistent with other studies.

All the 100 top-cited studies were published in 6 journals. The top 1 journal was the *Journal of Allergy and Clinical Immunology* with seventy-four published studies. The journal is the official journal of the American Academy of Allergy, Asthma and Immunology with the first rank of impact factor in the category of allergy journals. These results might be consistent with the previous idea that American authors tended to cite local studies and US reviewers preferred US studies.[21,22]Previous studies suggested that the impact factor of the journal was the strongest indicator for the number of citations that was confirmed in our study. Our results also supported the application of Bradford's law,[23] which suggested that most researchers obtained their citations from a few main journals in their research fields.[23]

There are some limitations to this study. First, we performed the current analysis based on journals with an impact factor in Web of Science, this criterion preferentially favored articles from USA, England, and Canada. For the non-English journals, most studies were cited in their own language; therefore, we might fail to capture some landmark studies in allergy with high citations. Second, we could not rule out other potential factors that might affect the citation rates, such as journals and author self-citations, incomplete citing, and omission bias.[24] Third, we restricted our search to the main allergy journals. In the field of allergy, there have been frequently cited studies published outside of these journals, especially published in journals such as Nature, Cell, Science, and New England Journal of Medicine. Fourth, the study did not perform subgroup data analysis about research topics that should be analyzed in further studies.

The100 top-cited studies reflect major advances in allergy researches and a number of hot topics during the last few years. Our findings provide important insights into priorities and trends of allergy and could serve as sources for future studies.

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