The Depigmented Literature: A Holistic Analysis of Global Vitiligo Publications between 1975 and 2017

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Abstract

Background: Vitiligo is a common depigmenting disorder with a prevalence of 0.5–2%. Despite the increasing popularity of bibliometric studies in recent years, medical literature lacks a report investigating bibliometric features of vitiligo literature. Aim: It was aimed to analyze vitiligo literature by evaluating productivity of countries, institutions, and authors, and performing assessment of publication trends, bibliometric networks, and correlations.

Material and Methods: We collected all data in this study by searching databases provided by Web of Science. All documents published on vitiligo literature between 1975 and 2017 were included. We performed correlation analyses between productivity and demographical and economical features of the countries publishing vitiligo articles. Results: A total of 7187 documents were detected and 72.2% of which was original article. The peak year for publication number by year was 2016 with 528 articles and the highest number of citations was reported in 2017. The USA was the leading country by total publication number (24.82%) followed by the United Kingdom (UK), India, China, and Italy (10.91%, 8.64%, 7.54%, and 6.87% respectively). Estonia was found to be the most productive country of vitiligo literature (13.01) followed by Netherlands, the UK, and Switzerland (12.64, 11.78, and 9.25, respectively). We found a high correlation between GDP per capita and the productivity of the countries ($r = 0.732$, $P < 0.001$). Conclusion: As revealed in our study, although vitiligo occurs worldwide, developed countries dominated vitiligo literature. Researchers from developing and least-developed countries should be encouraged and supported to perform novel vitiligo studies.

Key Words: Bibliometric, publication, scientometric, trend analysis, vitiligo

Introduction

Vitiligo is a common acquired cutaneous depigmentation disorder with a variable course. It is clinically characterized by well-defined depigmented macules or patches.[1] The etiology of vitiligo is not exactly clarified yet. It affects 0.5–2% of the general population without any sexual, racial, or regional predominance.[2,3]

Bibliometrics is the statistical analysis of published documents, such as scientific articles or books in a certain literature.[4] Bibliometric methods can be used in various fields to investigate the effects of authors, institutions, and demographic or sociological features of countries to certain scientific field.[5] Although there has been a rising popularity of bibliometric studies in the last years, to the best of our knowledge, relatively few reports have specifically focused on the dermatological literature and medical literature lacks a study investigating bibliometric features of the documents published on vitiligo. In this study, we aimed to perform a detailed bibliometric and trend analysis of vitiligo literature.

Material and Methods

The data of this study were collected by using four databases provided by Thomson Reuters WoS (Thomson Reuters, New York, NY, USA) titled Web of Science Core Collection, SciELO Citation Index, Korean
Journal Database, and Russian Science Citation Index. We used “vitiligo,” “segmental vitiligo,” “non-segmental vitiligo,” “early onset vitiligo,” and “late onset vitiligo” keywords to retrieve data from databases. We included all documents published in vitiligo literature between 1975 and 2017 and excluded all items produced in 2018. Articles from England, Scotland, Northern Ireland, and Wales were united under the United Kingdom (UK) heading. All documents published from East Germany, West Germany, and Federal Republic of Germany were collected under “Germany” title. We used the system of United Nations (UN) to classify countries.

Gross domestic product (GDP) is one of the criteria for a country’s economic size and power. It is the value of all final goods and services produced in a country within a certain period. All current data of GDP and GDP per capita of the countries were collected from the World Bank Database.

We performed statistical analyses by using SPSS (Version 22.0, SPSS Inc., Chicago, IL, USA; licensed for Hitit University, Çorum, Turkey). Spearman’s correlation coefficient analysis was performed for the evaluation of the association between scientific and demographic features of the countries. GunnMap 2 was our tool to create Infomaps showing distribution of publication density of the world countries. Infographics revealing bibliometric networks were generated by using a freeware named VOSviewer software.

Results

Total number of published items

The first basic search with the keywords retrieved a total of 7187 documents published between 1975 and 2017 from 4 databases and 22% of which was open-accessed. We detected that 85.93% of total documents were included in WoS Core Collection and a great majority of the published items were original articles (72.2%). Other most produced document types were abstracts, case reports, and meeting reports (17.25%, 14.62%, and 12.33%, respectively) [Table 1]. The USA dominated vitiligo literature with 1784 documents (24.82%) followed by the UK, India, China, and Italy (10.91%, 8.64%, 7.54%, and 6.87%, respectively) [Figures 1 and 2].

Productivity scores of the countries

We measured a productivity score with a simple formula (\( P = \frac{\text{total production number}}{\text{population} \times 1000000} \)) that was reported previously in the recent bibliometric and scientometric studies for each country. Estonia was found to be the most productive country of vitiligo literature (13.01) followed by Netherlands, the UK, and Switzerland (12.64, 11.78, and 9.25, respectively) [Figure 3]. As we ranked the countries by their productivity scores, the USA was 15th (5.46) and not included in the top 10 most productive countries list [Figure 4].

Research areas, top authors, journals, and institutions

We detected that dermatology was the most studied research area covering 85.84% of the vitiligo literature (n = 6184 items) followed by immunology, biochemistry, and molecular biology (32.27% and 29.94%, respectively) [Table 2]. Schallreuter KU from Bradford School of Medical Sciences, UK, was found to be the most productive author with 237 publications and he reported 3.3% of all literature. All first 10 authors but Parsad who was the only author from a developing country, were from developed countries [Table 3]. University of Colorado System (USA)
was the leading institution with 291 items (4.05%). All institutions in top 10 list but Postgraduate Institute of Medical Education and Research (India) were from developed countries [Table 4]. Journal of Investigative Dermatology dominated vitiligo literature and covered 10% of all documents followed by British Journal of Dermatology and Journal of The European Academy of Dermatology and Venereology (8.49% and 5.25%, respectively) [Table 5].

**Progression of publications, correlations, and citations**

H-index is a metric to measure productivity and citation impact of an author of a scientific field. H-index of vitiligo literature was calculated to be 122. Total citation number of the literature was measured to be 113,067 (66,366 without self-citations) and average citations per item were 15.75 times. The most cited document was an original article titled “Cancer regression and autoimmunity induced by cytotoxic T lymphocyte-associated antigen 4 blockade in patients with metastatic melanoma” written by Phan et al. published in 2003 in Proceedings of the National Academy of Sciences of the United States of America.[8] This article was cited 1031 times (64.44 times, average citations/year). We detected that most cited items in vitiligo literature were the original articles investigating melanoma, autoimmunity, and immunotherapy [Table 6]. Although the peak year for publication number by year was 2016 with 528 articles, the highest number of citations was reported in 2017 [Figure 5].
Correlation analyses were performed between publication features and demographic features of the countries (Spearman's rank correlation coefficient). We found correlation between total publication number and population of the countries ($r = 0.337$, $P = 0.01$). No correlation was detected between publication productivity and population of the countries. We found a high correlation between GDP per capita and the productivity of the countries ($r = 0.732$, $P < 0.001$). We measured a very high correlation between total publication number and number of the citations by year ($r = 0.97$, $P < 0.001$) [Table 7].
Table 5: The first 10 journal source according to the number of published documents

| Journal name                                           | Number of publications | Percentage |
|--------------------------------------------------------|------------------------|------------|
| Journal of Investigative Dermatology                   | 746                    | 10.38      |
| British Journal of Dermatology                         | 610                    | 8.49       |
| Journal of the European Academy of Dermatology and Venereology | 377                    | 5.25       |
| Journal of the American Academy of Dermatology          | 365                    | 5.08       |
| Dermatology                                            | 287                    | 3.99       |
| Journal of Dermatology                                  | 231                    | 3.21       |
| International Journal of Dermatology                   | 227                    | 3.16       |
| Dermatologic Surgery                                    | 216                    | 3.01       |
| Pigment Cell Melanoma Research                         | 172                    | 2.39       |
| Archives of Dermatology/JAMA Dermatology               | 154                    | 2.14       |

Table 6: The 10 most cited manuscripts in the vitiligo literature

| Article                                                                 | Author       | Journal name                                      | Year | Total citation | Average citation/year |
|------------------------------------------------------------------------|--------------|--------------------------------------------------|------|----------------|-----------------------|
| Cancer regression and autoimmunity induced by cytotoxic T-lymphocyte-associated antigen 4 blockade in patients with metastatic melanoma | Phan et al.  | Proceedings of the National Academy of Sciences of the United States of America | 2003 | 1031           | 64.44                 |
| Epidemiology and estimated population burden of selected autoimmune diseases in the United States | Jacobson et al. | Clinical Immunology and Immunopathology | 1997 | 875            | 39.77                 |
| Mutations at the mouse microphthalmia locus are associated with defects in a gene encoding a novel basic-helix-loop-helix-zipper protein | Hodgkinson et al. | Cell | 1993 | 840 | 32.31 |
| In-vivo confocal scanning laser microscopy of human skin - melanin provides strong contrast | Rajadhyaksha et al. | Journal of Investigative Dermatology | 1995 | 693 | 28.88 |
| Immune and clinical responses in patients with metastatic melanoma to CD34(+) progenitor-derived dendritic cell vaccine | Banchereau et al. | Cancer Research | 2001 | 667 | 37.06 |
| Combination immunotherapy of B16 melanoma using anti-cytotoxic T lymphocyte-associated antigen 4 (CTLA-4) and granulocyte/macrophage colony-stimulating factor (GM-CSF)-producing vaccines induces rejection of subcutaneous and metastatic tumors accompanied by autoimmunity depigmentation | van Elsas, Hurwitz, and Allison | Journal of Experimental Medicine | 1999 | 661 | 33.05 |
| Clinical variation of autoimmune polyendocrinopathy candidiasis ectodermal dystrophy (APECED) in a series of 68 patients | Ahonen et al. | New England Journal of Medicine | 1990 | 619 | 21.34 |
| Tumor regression and autoimmunity after reversal of a functionally tolerant state of self-reactive CD8+ T cells | Overwijk et al. | Journal of Experimental Medicine | 2003 | 595 | 37.19 |
| Toxic effects of ultraviolet radiation on the skin | Matsumura and Ananthaswamy | Toxicology and Applied Pharmacology | 2004 | 508 | 33.87 |
| Mushroom tyrosinase: recent prospects | Seo; Sharma; and Sharma | Journal of Agricultural and Food Chemistry | 2003 | 483 | 30.19 |

Table 7: Correlations between total number of publications and economic and demographic indices of the countries

| Publication number | GDP | GDP per capita | Productivity | Population | GDP | GDP per capita |
|--------------------|-----|----------------|--------------|------------|-----|----------------|
| r=0.337*          |     |                |              | P=0.208    |     |                |
| P=0.01            |     |                |              | P=0.928    |     |                |
| r=0.66*           |     |                |              | P=0.732*   |     |                |
| r=0.254*          |     |                |              | P=0.001    |     |                |
| r=0.09*           |     |                |              | P=0.057    |     |                |

*Statistically significant (0.00 < r < 0.25: Little if any correlation, 0.26<r<0.49: Low correlation, 0.50<r<0.69: Moderate correlation, 0.70<r<0.89: High correlation, 0.90<r<1.00: Very high correlation), GDP: Gross domestic product
Bibliometric network analyses

We created scientometric network infographics of keywords, coauthorship, and institutional collaboration in vitiligo literature. The most used keywords were found to be “vitiligo”, “autoimmunity”, “melanocytes”, “melanoma”, and “psoriasis” [Table 8 and Figure 6]. The bibliometric network of the countries producing vitiligo articles revealed the most collaborative countries, the USA, China, the UK, India, Italy, Germany, and Turkey. The USA had the largest network in collaboration on producing vitiligo publications [Figure 7]. As we chose 30 items as a minimum number of documents, only 30 of 4023 institutions met the thresholds and the most collaborative institutions were detected to be University of Amsterdam (Netherland), University of Bradford (UK), Postgraduate Institute of Medical Education and Research (India), and University of Massachusetts (USA) [Figure 8].

Discussion

Although vitiligo occurs across the world, its prevalence was reported to vary among continents of the Earth. According to the published population or community-based studies, the highest prevalence of vitiligo was noted in Oceania comprising Australasia, New Zealand, Fiji, and Papua New Guinea.\[9\] None of the countries in Oceania was found to be in top 10 most productive countries list in this study. We detected that all the countries in both top 10 countries lists were in the “developed” classification of UN.\[6\] Only one developing country, India, was detected to be included in the most productive authors and institutions lists. GDP per capita was found to be indicator for the productivity of the countries in vitiligo literature ($r = 0.732, P < 0.001$).

There have been limited numbers of published studies investigating bibliometric features of dermatological topics in the literature. Sako et al. performed a bibliometric analysis of psoriasis literature between 1960 and 2010 by searching MEDLINE database and their search retrieved a total of 869 original articles. Retrospective studies were found to be the most common study type (37%). They detected that the number of articles increased 18-fold over five decades. The study had only trend analysis and document-type features and included no information on bibliometric components, such as countries, authors, and institutions.\[10\] Şenel et al. reported a bibliometric study

| Table 8: Most used 20 keywords in vitiligo literature |
|---|---|
| Keyword (times) | Keyword (times) |
| Vitiligo (1383) | Alopecia areata (58) |
| Autoimmunity (144) | Treatment (53) |
| Melanocytes (143) | Depigmentation (52) |
| Melanoma (137) | Polymorphism (47) |
| Psoriasis (112) | Repigmentation (47) |
| Phytotherapy (101) | Hypopigmentation (47) |
| Quality of life (70) | Skin (43) |
| Oxidative stress (68) | Pigmentation (40) |
| Melanogenesis (59) | Autoimmune diseases (39) |
| Tyrosinase (59) | Leukoderma (39) |

Figure 5: Publication and citation number by year in vitiligo literature

Figure 6: Keyword network in vitiligo literature
on Behçet literature during the period of 1980–2014 by using WoS database and they found that Turkey which had the highest reported prevalence of Behçet disease ranked first in the literature with both publication number and productivity score (25.14) followed by Tunisia, Israel, and Greece (21.03, 17.04, and 12.02, respectively). Countries that had high prevalence of Behçet were detected to have high productivity score on Behçet literature.[5] Şenel and Demir performed a bibliometric analysis of teledermatology literature between 1980 and 2013 and found that the USA was the leading country (36%) followed by the UK and Australia (18.17 and 8.74, respectively).[11]

**Conclusion**

To the best of our knowledge, our study is the first bibliometric analysis of vitiligo literature. Our study revealed that although vitiligo is a worldwide disease, developed countries dominated vitiligo literature. Physicians from developing and least-developed countries should be encouraged, supported, and funded to carry out novel vitiligo studies.

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**Conflicts of interest**
There are no conflicts of interest.
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