

Evolution of homeopathy: A scientometric analysis of global homeopathy literature between 1975 and 2017



Engin Şenel^{a,b,c,*}

^a Hitit University Faculty of Medicine, Department of Dermatology and Venereology, Çorum, Turkey

^b Hitit University, Traditional and Complementary Medicine Application and Research Center, Çorum, Turkey

^c Hitit University, Beekeeping and Bee Products Application and Research Center, Çorum, Turkey

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ABSTRACT

Objective: Scientometrics is the evaluation of scientific literature in a certain field. Although popularity and use of homeopathy have increased in the recent years, scientific literature lacks a bibliometric or scientometric evaluation of homeopathy literature.

Methods: We collected all data of this study from four databases provided by Web of Science. All documents published between 1975 and 2017 were included. The keywords we searched for in detail were “homeopathy”, “homeopathic”, “homoeopathy” and “homoeopathic”. We used Spearman’s correlation test to investigate a possible correlation between publication numbers or the productivity and features of the countries. We created infographics and infomaps by using GunnMap and VOSviewer sources. Gross domestic product (GDP) ranking data of countries was procured from The World Data Bank.

Results: Our search retrieved a total of 4183 articles. The great majority of documents were original articles ($n = 3043$, 72.75%). The UK dominated homeopathy literature with 950 articles followed by the USA, Germany, India and Brazil ($n = 636$, 590, 277 and 246 items, respectively). Switzerland was found to be most productive country (20.41) followed by the UK, Norway and Israel (14.35, 11.31 and 8.41, respectively). University of Exeter (UK) was the leading institutions with 204 items (4.88%). Most productive journal was *Homeopathy* dominating and covering 24% of all literature. We detected very high correlation between publication number and citation number by year ($r = 0.95$, $p < 0.001$). A high correlation was measured between gross domestic product (GDP) per capita and productivity of the countries. A moderate correlation was measured between GDP and publication number of the countries ($r = 0.66$ and $p < 0.001$). In scientometric network analysis, the USA, the UK and Germany were noted to be three major association centers.

Conclusions: We detected that developed countries dominated homeopathy literature and we suggest that physicians from least-developed and developing countries should be funded and encouraged to carry out homeopathy studies.

1. Introduction

Homeopathy is a medicinal term derived from Greek words “*Homoios*” (=similar or same) and “*pathos*” (=suffering) [1]. It is an important application of complementary and integrative medicine based on the idea of “*similia similibus curentur*” in English: “let like be cured by like” [2]. Homeopathy uses highly diluted substances to cure a wide range of disorders. Scientometrics is the assessment of various qualitative and quantitative aspects of scientific literature in a certain field. Scientific studies evaluate characteristics and features of the authors, organizations and countries of the articles in the literature [3]. Although homeopathy is a popular complementary therapy today and

200 million people take homeopathy drugs worldwide on their daily basis, the literature lacks a bibliometric article investigating scientific documents published in homeopathy field [4]. In this study we aimed to evaluate scientometric features of homeopathy literature and to the best of our knowledge, our study was the first to investigate bibliometric and scientometric networks of homeopathic literature.

2. Material and methods

All data analyzed in this study was retrieved from four databases (Web of Science Core Collection, SciELO Citation Index, Russian Science Citation Index and Korean Journal Database) provided by Web

* Hitit University Faculty of Medicine, Department of Dermatology and Venereology, 19200, Çorum, Turkey.

E-mail address: enginsenel@enginsenel.com.

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Table 1
Types of publications on homeopathy literature ^a.

| Document type | Number | % ^a |
|--------------------|-------------|----------------|
| Original article | 3043 | 72.747 |
| Case report | 111 | 2.654 |
| Review | 623 | 14.894 |
| Meeting report | 168 | 4.016 |
| Abstract | 250 | 5.977 |
| Letter | 689 | 16.471 |
| Editorial material | 397 | 9.491 |
| Biography | 63 | 1.506 |
| Other/Unspecified | 1232 | 29.452 |
| News | 70 | 1.673 |
| Correction | 15 | 0.359 |
| Total | 4183 | 100 |

^a Total percentage may exceed 100% because certain items were included in more than one category.

of Science (WoS) (Thomson Reuters, New York, NY, USA). The keywords we searched for in detail were “homeopathy”, “homeopathic”, “homoeopathy” and “homoeopathic”. All items published during the period of 1975–2017 were included into the study. We excluded all papers published in 2018. Documents published from England, Wales, Scotland and Northern Ireland were united under the United Kingdom (UK) title. Publications from Germany, East Germany, West Germany and Federal Republic of Germany were collected under “Germany” heading. “China” was used as the country name for the articles from China, P.R.C. and People's Republic of China. We used SPSS (version 22.0, SPSS Inc., Chicago, IL, USA; licensed for Hitit University, Çorum, Turkey) to perform statistical analyses. We used Spearman's correlation test to investigate a possible correlation between publication numbers or the productivity and features of the countries. p value < 0.05 was considered statistically significant. We generated infographics (infomaps) showing world distribution density of homeopathy literature by using GunnMap free resource [5]. Gross domestic product (GDP) ranking data of countries was procured from The World Data Bank [6]. We created scientometric networks showing co-authorship, usage density and of the associations of keywords in the documents and the relationships of institutions. The more seen

keywords, authors and institutions formed the larger rings than the others with lower usage in network images. Related and connected keywords, institutions and authors were placed close to each other with the same color. Network images were created by using free VOSviewer software in our study [7].

3. Results

3.1. Total number of publications

Our search of homeopathy literature retrieved a total 4183 documents (Access date: February 1, 2018) from four databases and only 706 items of which were open-access. Web of Science Core Collection included 66.98% of all documents in the literature. We detected that the great majority of documents were original articles ($n = 3043$, 72.75%) followed by letters, reviews and editorial materials (16.47, 14.89 and 9.49%, respectively) (Table 1). English was the primary language of homeopathy literature with 3497 documents (83.6%) and major non-English languages were German, Spanish, French and Portuguese (10.49, 2.58, 2.53 and 2.46%, respectively). The UK dominated homeopathy literature with 950 articles followed by the USA, Germany, India and Brazil ($n = 636$, 590, 277 and 246 items, respectively) (Figs. 1 and 2).

3.2. Productivity of the countries

We measured a productivity score for each country producing documents in homeopathy literature with a reported formula (total production number/population $\times 1,000,000$) [8]. We retrieved all current population data of the countries from United Nations Database [9]. Switzerland was found to be most productive country (20.41) followed by the UK, Norway and Israel (14.35, 11.31 and 8.41, respectively) (Fig. 3). The UK which ranked #1 in the homeopathy literature (22.71%) with the total publication number was #2 in this ranking (Fig. 4).

3.3. Research areas, authors, journals and institutions

Integrative Complementary Medicine, Health Care Sciences



Fig. 1. Top ten countries publishing homeopathy publications by total number of documents between 1975 and 2017.

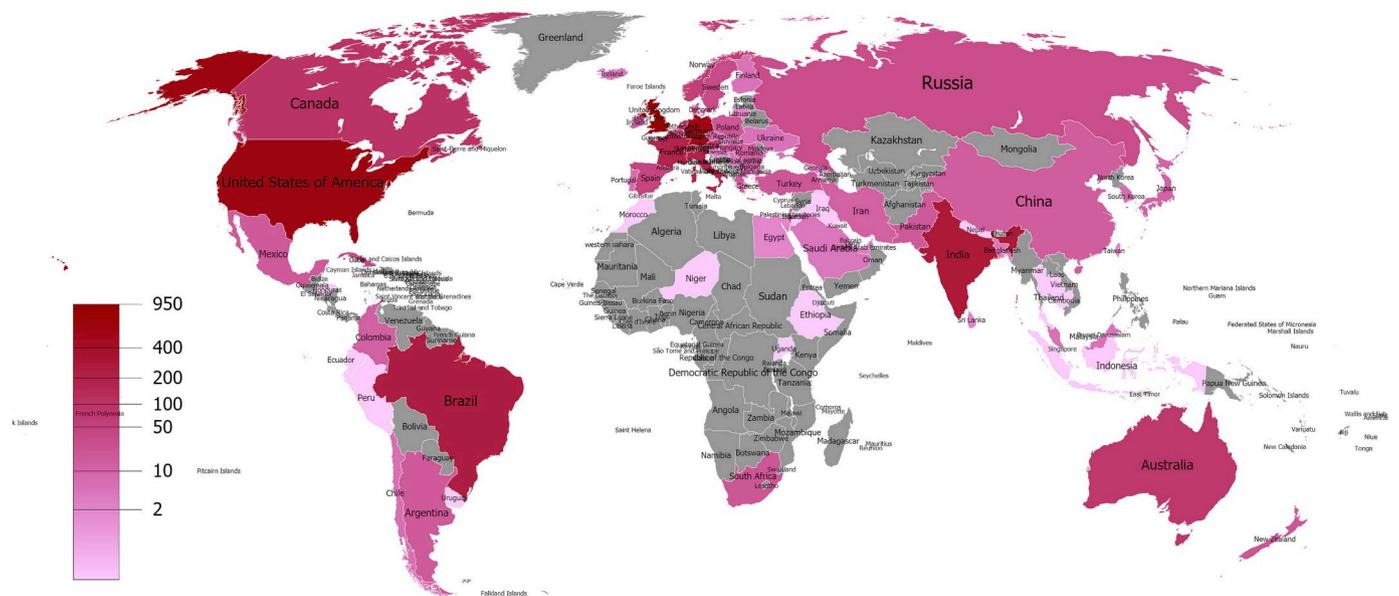


Fig. 2. Total homeopathy publication density of world countries between 1975 and 2017.

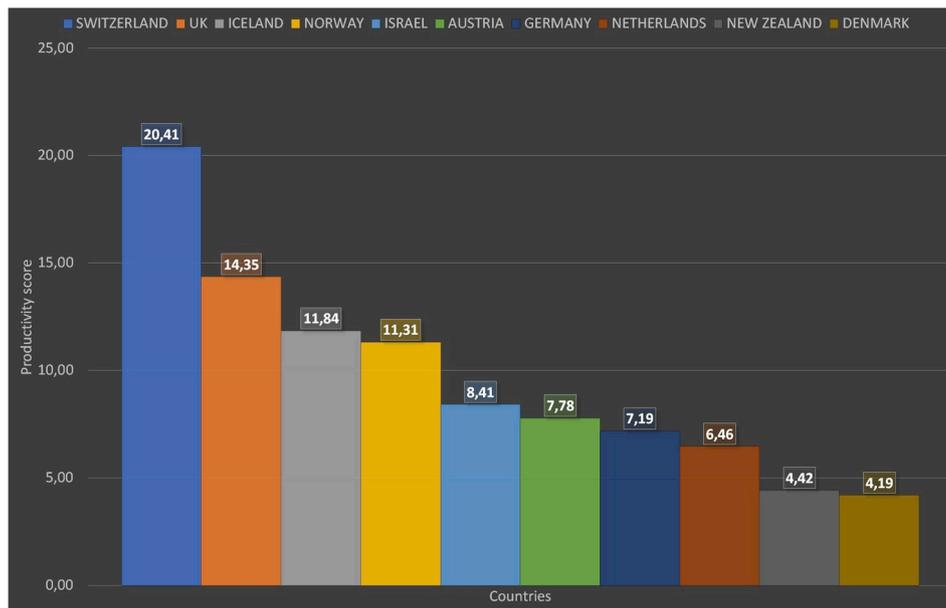


Fig. 3. Top ten countries in productivity of homeopathy literature (Productivity score = total production number/population x 1,000,000).

Services and Pharmacology were noted to be the most studied research areas (2820, 1780 and 1599 items, respectively) (Table 2). Ernst E from Peninsula Medical School, University of Exeter (UK) was detected to be most productive author in this field with 165 documents and he produced 3.94% of total items of homeopathy literature (Table 3). The author produced more items than all the universities published alone. University of Exeter (UK) was the leading institution with 204 items (4.88%) (Table 4). All most productive authors and institutions were found to be from developed countries. *Homeopathy, the Journal of the Faculty of Homeopathy* dominated homeopathy literature and covered 24% of all documents followed by *Journal of Alternative and Complementary Medicine* and *Forschende Komplementärmedizin (Research in Complementary Medicine)* (8.65 and 6.33%, respectively) (Table 5).

3.4. Progression of publications and citations and the correlations

H-index of homeopathy literature was calculated to be 81. Documents published in homeopathy literature were cited 49,452 times (36,428 times without self-citations) in total between 1977 and 2017. Average citations per item was measured to 11.81 times. Peak year for citations was 2012 ($n = 3437$) after the years of 2010 and 2011 which the largest number of publications ($n = 217$) were produced in (Fig. 5). We detected very high correlation between publication number and citation number by year ($r = 0.95, p < 0.001$).

An original article titled “Trends in alternative medicine use in the United States, 1990–1997 - Results of a follow-up national survey” by Eisenberg, DM et al. published in 1998 in JAMA was the most cited document of homeopathy literature with 4315 citations (Table 6). We detected that almost all most cited documents were the original articles

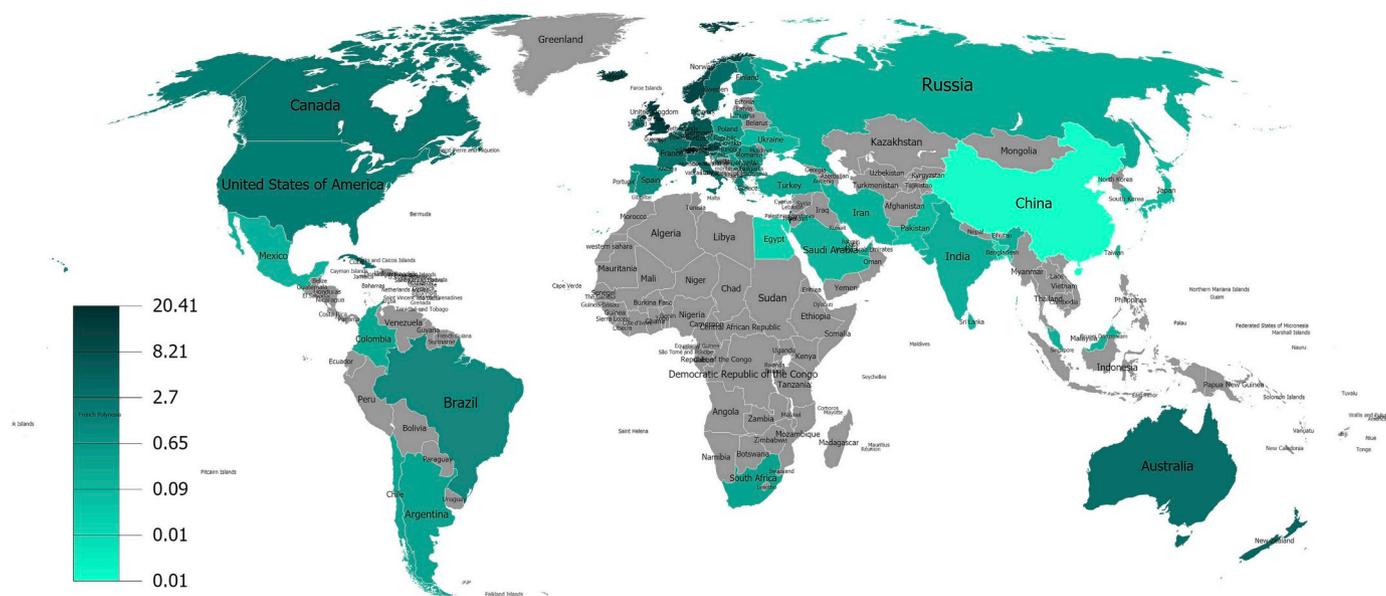


Fig. 4. Homeopathy productivity density of the world countries between 1975 and 2017.

Table 2
The top ten research areas of documents in homeopathy literature.

| Research Areas | Number of publications | % |
|--|------------------------|-------|
| Integrative Complementary Medicine | 2820 | 67.4 |
| Health Care Sciences Services | 1780 | 42.54 |
| Pharmacology Pharmacy | 1599 | 38.22 |
| Communication | 1173 | 28.03 |
| General Internal Medicine | 1091 | 26.08 |
| Psychology | 722 | 17.26 |
| Behavioral Sciences | 710 | 16.97 |
| Veterinary Sciences | 578 | 13.81 |
| Pediatrics | 482 | 11.52 |
| Public Environmental Occupational Health | 413 | 9.87 |

Table 3
The first ten authors by record count on homeopathy.

| Author | Institution | Country | Record Count | % ^a |
|---------------|---|---------|--------------|----------------|
| Ernst E | University of Exeter | UK | 165 | 3.94 |
| Fisher P | Royal London Hospital for Integrated Medicine | UK | 128 | 3.06 |
| Lewith GT | University of Southampton | UK | 83 | 1.98 |
| Lüdtke R | Karl und Veronica Carstens-Stiftung | Germany | 71 | 1.7 |
| Bellavite P | University of Verona | Italy | 68 | 1.62 |
| Mathie RT | Homeopathy Research Institute | UK | 64 | 1.53 |
| Walach H | European University Viadrina | Germany | 60 | 1.43 |
| Baumgartner S | University of Witten-Herdecke | Germany | 59 | 1.41 |
| Willich SN | Charité - Universitätsmedizin | Germany | 56 | 1.34 |
| Bell IR | The University of Arizona College of Medicine | USA | 55 | 1.31 |

^a Of total documents published in homeopathy literature.

performing a general evaluation of complementary medicine and including a section of homeopathy.

We found a low correlation between total number of publications and population ($r = 0.337$ and $p = 0.01$). No correlation was noted between population and productivity. We detected high correlation between gross domestic product (GDP) per capita and productivity of

Table 4
The top ten institutions by number of publications in homeopathy.

| Organizations | Document number | % |
|---|-----------------|------|
| University of Exeter, UK | 204 | 4.88 |
| University of Bern, Switzerland | 136 | 3.25 |
| University of London, UK | 129 | 3.08 |
| University College London, UK | 95 | 2.27 |
| University of São Paulo, Brazil | 93 | 2.22 |
| University of Southampton, UK | 90 | 2.15 |
| University of Plymouth, UK | 90 | 2.15 |
| University of Verona, Italy | 90 | 2.15 |
| Free University of Berlin, Germany | 84 | 2.01 |
| Charité Medical University of Berlin, Germany | 74 | 1.77 |

Table 5
The first 10 journal source according to the number of published documents.

| Journal Name | Number of publications | % |
|---|------------------------|------|
| Homeopathy | 1004 | 24 |
| Journal of Alternative and Complementary Medicine | 362 | 8.65 |
| Forschende Komplementärmedizin | 254 | 6.33 |
| BMJ | 225 | 5.38 |
| The Veterinary Record | 139 | 3.32 |
| The Lancet | 115 | 2.75 |
| Complementary Therapies in Medicine | 90 | 2.15 |
| Praktische Tierarzt | 70 | 1.67 |
| Tierärztliche Umschau | 62 | 1.48 |
| Evidence Based Complementary and Alternative Medicine | 57 | 1.36 |

the countries although no correlation was calculated between GDP and productivity. A moderate correlation was measured between GDP and publication number of the countries ($r = 0.66$ and $p < 0.001$) (Table 7).

3.5. Scientometric network analyses

As we performed a detailed keyword analysis the most used five keywords were found to be “homeopathy”, “complementary

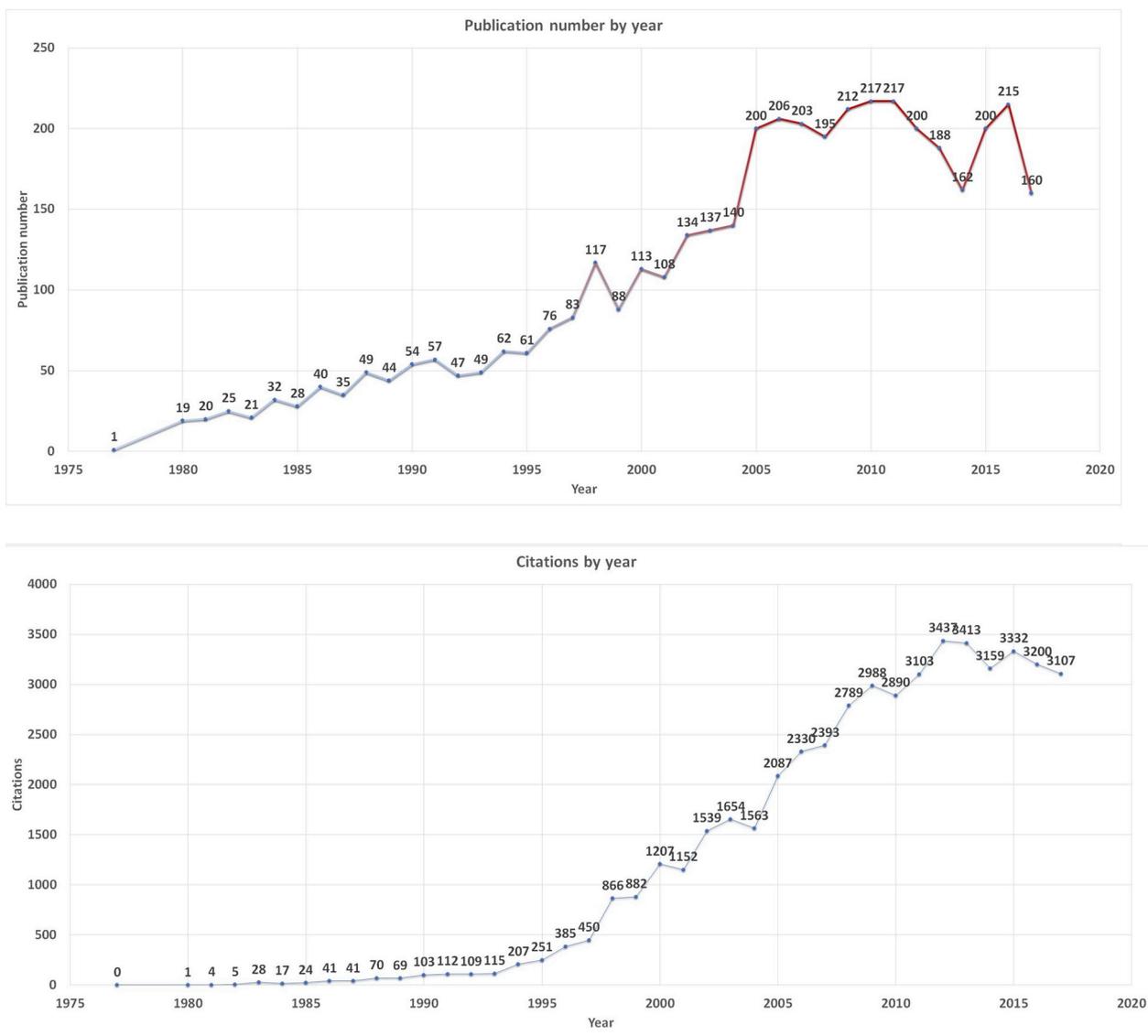


Fig. 5. Number of homeopathy publications and citations by year.

medicine”, “complementary and alternative medicine”, “alternative medicine” and “acupuncture” (Table 8). We created a keyword network infographic by retrieving the most used keywords from WoS Core Collection database according to the keyword frequency (Fig. 6). As we generated a co-authorship network of the countries publishing in homeopathy literature, the USA, the UK and Germany were noted to be three major association centers (Fig. 7). For instance, we could see in the network that India connected to the same-colored countries such as France, Japan and Chile. The network of institutional relationships revealed that University of Bern centered in the scientometric network as the most affiliated institution (Fig. 8). As seen in the institutional network, universities of Bern and Exeter were the most collaborative institutions and University of Exeter connected to its collaborative institutions with the same color such as University of Aberdeen, University of London and University of Southampton (Fig. 8).

4. Discussion

Scientometrics and bibliometrics are novel scientific areas

providing statistical application to investigate academic documents published in a certain field. Campbell undertook the first scientometric study in the literature in 1896 and performed a statistical analysis of subject scattering in the literature [3]. In 1969, Pritchard coined the term of “bibliometrics” instead of a previous confusing term of “statistical bibliography” [10]. Although the popularity and use of traditional and complementary medicine has been increased in the last decades, only a few scientometric studies have been published in this area and almost all of which have investigated acupuncture literature [11].

Ma et al. evaluated acupuncture literature and found a total of 13,320 documents in PubMed database. It was reported that China, the USA and the UK were the first three countries in this literature (47.4%, 17.5% and 8.2%, respectively) [12]. Fu et al. investigated traditional and complementary medicine literature and used WoS database as in our study. They found 17,002 documents published between 1980 and 2009 and detected that 70% of items were original articles and the USA was noted to be the most contributor country in this field followed by China and India although we found that the UK was the leading country in homeopathy literature. China Medical

Table 6
The 10 most cited manuscripts in the homeopathy literature.

| Article | Author | Journal Name/Published | Total Citation | Average Citations per Year |
|--|---|--|----------------|----------------------------|
| Trends in alternative medicine use in the United States, 1990–1997 - Results of a follow-up national survey | Eisenberg, DM et al. | JAMA-Journal of The American Medical Association | 4315 | 205.48 |
| Unconventional Medicine in The United-States - Prevalence, Costs, And Patterns of Use | Eisenberg, DM et al. | New England Journal of Medicine | 2795 | 107.5 |
| Are the clinical effects of homeopathy placebo effects? A meta-analysis of placebo-controlled trials | Linde, K et al. | Lancet | 553 | 25.14 |
| Use of complementary and alternative medicine in cancer patients: a European survey | Molassiotis, A et al. | Annals of Oncology | 468 | 33.43 |
| Medicine in Europe .8. Complementary Medicine in Europe | Fisher, P and Ward, A | British Medical Journal | 464 | 18.56 |
| Long-term trends in the use of complementary and alternative medical therapies in the United States | Kessler, RC et al. | Annals of Internal Medicine | 439 | 24.39 |
| Use and expenditure on complementary medicine in England: a population-based survey | Thomas, KJ; Nicholl, JP; Coleman, P | Complementary Therapies in Medicine | 429 | 23.28 |
| Are the clinical effects of homeopathy placebo effects? Comparative study of placebo-controlled trials of homeopathy and allopathy | Shang, AJ; Huwiler-Muntener, K; Nartey, L, et al. | Lancet | 424 | 30.29 |
| Complementary and alternative medicine for menopausal symptoms: A review of randomized, controlled trials | Kronenberg, F; Fugh-Berman, A | Annals of Internal Medicine | 346 | 20.35 |
| Clinical-Trials of Homeopathy | Kleijnen, J; Knipschild, P and Terriet, G | British Medical Journal | 337 | 12.04 |

University located in Taiwan was noted to be the most contributor institution although the top publishing organization was University of Exeter in the UK in our study [13]. Zhou et al. carried out a bibliometric assessment of acupoint herbal patching literature which had been used widely in Chinese medicine for thousands of years and a total of 937 articles published was found in this field and almost all studies were from China (99.89%) [14]. Aromatherapy literature was assessed by Koo and the USA was found to be most contributor country with 107 documents (19.5% of total literature) [15]. In none of the above articles a productivity score was measured, and therefore countries were ranked only by the total publication number. Şenel and Demir performed a scientometric analysis of apitherapy literature and found that top three countries in this area were Brazil, the USA and China in ranking by the total publication number (889, 818 and 572 items, respectively). In productivity, the ranking was changed completely, and Switzerland became the leading country followed by Croatia and Bulgaria (2.98, 2.07 and 1.84, respectively) [16].

Homeopathy has been included in the national health systems in certain countries such as India, Switzerland, Chile, Mexico, Brazil and Pakistan. Homeopathy is practiced in 40 out of 42 European countries but as far as we know, only Switzerland from developed countries had Homeopathy in its national health system [17]. Switzerland was detected to be the most productive country in our study followed by the UK and Norway (Fig. 3). State insurance financing for homeopathy was withdrawn after a 2005 review of the health system in Switzerland. The 2009 referendum vote called for a further payment for these treatments for state-funded health insurance. In 2012, the government independently reassessed the effectiveness and cost-effectiveness of homeopathic treatments and re-commissioned it for a trial period by 2017 [18]. These contradictory decisions in Switzerland may have increased interest in homeopathy in recent years. As we analyzed the articles produced from Switzerland, we detected that the peak year in publication of homeopathic documents was 2005 that was the year of the review of the health system for the traditional and complementary therapies including homeopathy. And we also measured that 73% of all homeopathic articles were produced during a period of 2005–2017 in Switzerland.

According to Homeopathy Research Institute, there are 400 doctors in the UK that use homeopathy in daily practice and application of homeopathy is regulated by Faculty of Homeopathy and promoted by British Homeopathic Association [19]. Also there are nearly 1500 homeopaths regulated by the Society of Homeopaths in the UK. Although the UK produced the highest number of publications in homeopathy, Switzerland had high academic productivity compared to its low population.

We detected that all the most productive ten authors were from developed countries and the authors from the UK took the first three places in the productivity. We found half of the first ten productive institutions was from the UK. The only institution from developed countries in top ten institutional list was University of São Paulo in Brazil.

Our study had one limitation. Due to the lack of a previous related bibliometric or scientometric study in homeopathy literature we could only compare our results with the works reported in the other fields of complementary medicine.

5. Conclusion

Developed countries dominated homeopathy literature and we suggest that physicians from least-developed and developing countries should be funded and encouraged to carry out homeopathy studies.

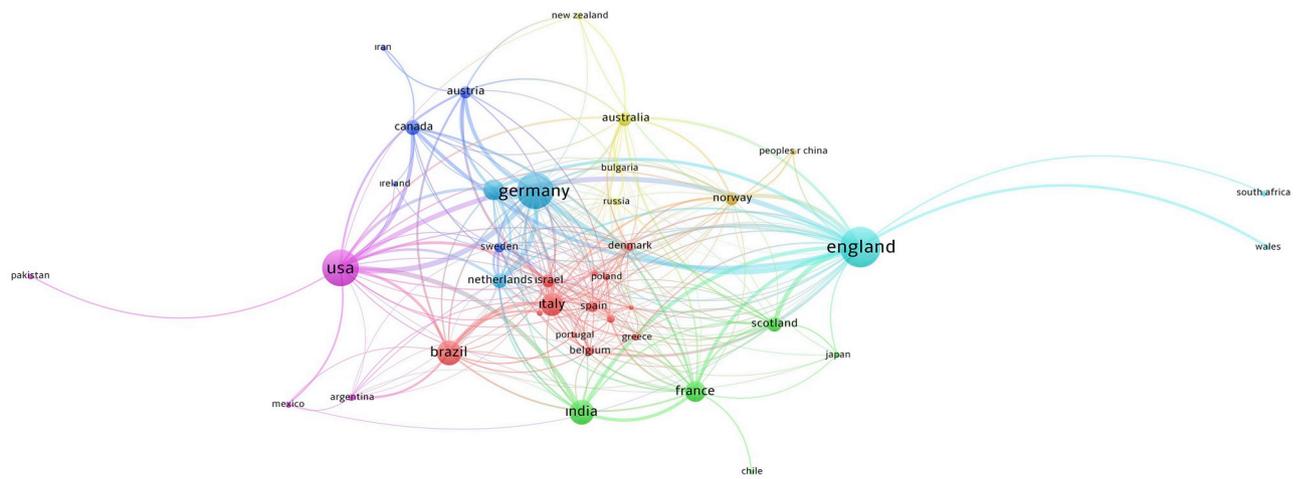


Fig. 7. The network of co-contributing/collaborative countries in homeopathy field. As seen although Switzerland was one of the most contributor countries in homeopathy literature it was not in the most collaborative countries.

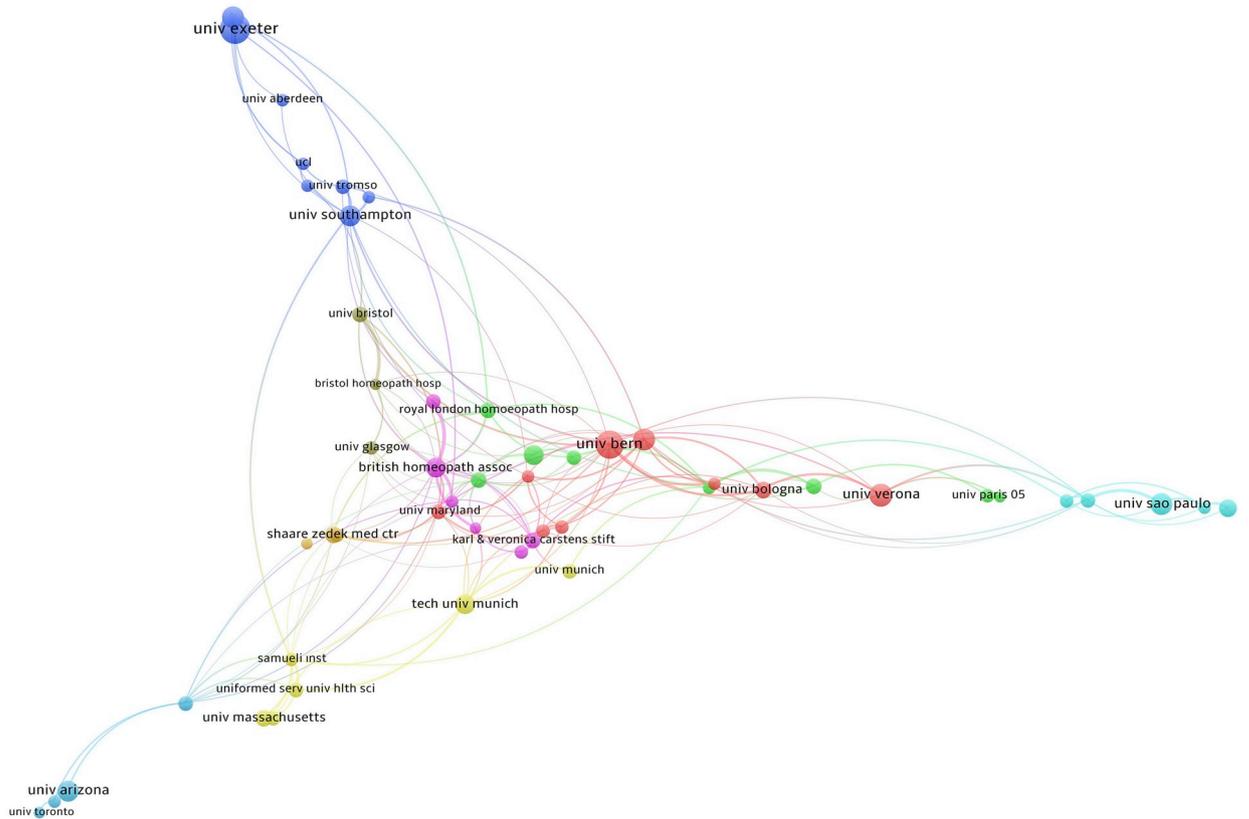


Fig. 8. The network of collaborative institutions in homeopathy field.

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None.

Conflicts of interest

None.

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