ARCHIVOS DE BRONCONEUMOLOGIA

www.archbronconeumol.org

Original Article

Scientific Literature Among Smoking and Respiratory System: Repercussion and Collaboration[☆]

José Ignacio de Granda-Orive,[a,][*] Adolfo Alonso-Arroyo,[b] Francisco García-Río,[c] Santiago Villanueva-Serrano,[d] Andrés Pandiella,[e] Rafael Aleixandre-Benavent[f]

[a] Servicio de Neumología, Hospital Universitario 12 de Octubre, Madrid, Spain
[b] Departamento de Historia de la Ciencia y Documentación, Facultad de Medicina y Odontología, Universidad de Valencia, Valencia, Spain
[c] Servicio de Neumología, Hospital Universitario La Paz, IdiPAZ, Madrid, Spain
[d] Unidad de Cuidados Intensivos, Hospital Comarcal de Melilla, Melilla, Spain
[e] Facultad de Medicina, Universidad Autónoma de Madrid, Madrid, Spain
[f] Unidad de Información e Investigación Social y Sanitaria-UISYS (CSIC-Universidad de Valencia), Instituto de Historia de la Medicina y de la Ciencia (IHMC) López Piñero, Valencia, Spain

ARTICLE INFO

ABSTRACT

Aim: To analyze the distribution of the production, repercussion and co-authorship of articles on smoking in the "respiratory system" category through the Science Citation Index Expanded (SCI-E) and their inclusion in the first quartile of the Journal Citation Report (JCR).

Methods: The literature search was performed in the SCI-E. Articles were selected for 2001–2010 for "respiratory system" using the descriptors "smok*" and "tobac*".

Results: We found 1858 articles (ignoring collaboration) on the topic of smoking. The median number of published articles by five-year period was higher for the 2006–2010 period vs the 2001–2005 period; in contrast, the number of citations and the citation index was higher for documents published in the first five-year period. Some 40.47% (ignoring collaboration) of the articles (752 documents, ignoring collaboration) were published in first quartile journals. We found very well established and cohesive co-authorship networks.

Conclusions: Articles on smoking in the area of respiratory medicine increased in this time period, with 40% of the total documents in journals in the first quartile of the JCR. The citation rate was high, with the EU-27 countries having higher impact and repercussion. We found very well established and cohesive co-authorship networks.

© 2013 SEPAR. Published by Elsevier España, S.L. All rights reserved.

Literatura científica en el ámbito del tabaquismo y el sistema respiratorio: repercusión y colaboración

RESUMEN

Objetivo: Analizar la distribución de la producción, la repercusión y la colaboración mundial en tabaquismo en el área del aparato respiratorio a través del *Science Citation Index-Expanded* (SCI-E) en el periodo 2001-2010 y su inclusión en el primer cuartil del *Journal Citation Report* (JCR).

Métodos: La búsqueda bibliográfica fue realizada en el SCI-E. La estrategia de búsqueda empleada fue «smok*» OR «tobac*», delimitándose la investigación al periodo 2001-2010, documentos «articles» para el área del aparato respiratorio.

Resultados: A nivel mundial, en el área del aparato respiratorio y para el periodo analizado se encontraron un total de 1.858 artículos (ignorando la colaboración) sobre tabaquismo. La media del número de artículos publicados por quinquenio fue superior para el periodo 2006-2010 que para el 2001-2005; sin

embargo, el número de citas recibidas fue superior para los documentos publicados en el primer quinquenio comparado con el segundo y, como consecuencia, el índice de citación también resultó superior en el primer quinquenio con respecto al segundo. El 40,47% de los artículos (752 documentos; ignorando la colaboración) estaban publicados en revistas del primer cuartil. Hemos encontrado una red de colaboración entre países bien establecida y cohesionada.

Conclusiones: La producción en tabaquismo en el área de respiratorio aumentó a lo largo del periodo analizado, hallándose el 40% de dicha producción en las revistas situadas en el primer cuartil del JCR. Encontramos una alta citación, siendo la Unión Europea de los 27 la que presenta una mayor repercusión e impacto. La red de colaboración se encuentra activa, bien consolidada y cohesionada.

Introduction

The importance of smoking, a growing, multidisciplinary area, and the respiratory system has increased in recent years, with a clear upward trend in production, impact and co-authorship in both.[1–4]

Bibliometrics is concerned with the analysis of written communication, and is aimed at the treatment and study of quantitative data from the scientific literature, and its social structure.[5]

Bibliographical databases are the main source of information used in bibliometric studies. The Web of Science [(WoS) ISI, Thomson Reuters] is an international, multidisciplinary tool, available for access to literature on science, technology, biomedicine and other disciplines. Its best known products, the *Science Citation Index-Expanded* (SCI-E), *Social Science Citation Index* (SSCI), and *Arts & Humanities Citation Index* (A&HCI), contain a large number of source journals. *Journal Citation Report* (JCR, in its two editions, JCR Science Edition and JCR Social Science Edition) is constructed from these databases; it includes journals from the SCI-E and SSCI as citable journals, and is where the famous journal "impact factor" is published. JCR offers a systematic, objective means to critically evaluate the world's leading journals, based on citation data. Much of the statistical information available for individual journals is also available for subject specialties, according to pooled data within each specialty from 1997; this provides an overview of coverage, performance and lists of citations in a single specialty (http://ip-science.thomsonreuters.com/es/productos/jcr/).

The aim of this study was to analyze the distribution of the production, repercussion and worldwide co-authorship of articles on smoking in the "respiratory system" category through the SCI-E in the period 2001–2010 and their inclusion in the first quartile of the JCR.

Materials and Methods

Literature Search

The literature search was performed in SCI Expanded (SCI-E) through the ISI Web of Knowledge platform (Thomson Reuters) on 2 November 2011. The search strategy used was "smok*" OR "tobac*". The search was performed in the "title" field to avoid retrieving non-pertinent entries. The research was limited to the period 2001–2010; the documents selected were "articles" for the *respiratory system* (RS) in the Journal Citation Report (JCR 2009). All records retrieved were examined manually by two of the group researchers to ensure their relevance.

Data Collection and Variables Analyzed

The following variables were recorded for each article retrieved: year of publication, title, authors, institutional affiliation, country, specialty of the authors, journal, journal language, co-authorship and number of citations received.

Standardization of Headings

The resulting database was processed using Microsoft Access® 2003 (Microsoft, Redman, Washington, USA). Headings that designated the different institutions and authors in the SCI-E were manually filtered and standardized, in order to prevent a single institution or author from appearing with two or more versions.

Bibliometric Indicators

The following were measured as bibliometric indicators: productivity by year, country, published journal, type of document, author specialty and institution, and number of scientific agents (distribution of authors according to number of papers, first author, productivity of authors by year and by inclusion in the first quartile of the JCR).

Impact: Number of citations received by year, citation analysis (total number of citations received, percentage of total citations received, number of citations per document, number of citations per author, number of citations per institution and citations/article index). *Co-authorship*: Once the database had been filtered and standardized, collaboration articles between different countries, related to smoking, were selected. One-mode symmetric co-occurrence matrices were calculated on the data obtained, linked to the corresponding attribute matrices, with the relationship between countries being defined as "collaboration or co-authorship in the same scientific article". Bibliometric maps were drawn that allowed the networks to be visualized. The strength of the links between institutions and authors was quantified in order to consider only established relationships. The networks show the degree of linkage between countries using numbers (collaborative documents) that link the nodes. The Pajek network analysis and visualization program (http://pajek.imfm.si/doku.php) was used for the graphical representations.

Statistical Analysis

Data are presented as mean ± standard deviation or percentage, as applicable. The Chi-squared test for qualitative variables for independent data was used for comparison of proportions. The Student's *t* test was used to compare the means of two groups for a continuous quantitative variable, after checking the fit to the normal distribution using the Kolmogorov–Smirnov test. The significance level was considered as a *P* value <.05. The analysis was performed using the Statistical Package for the Social Sciences (SPSS, Inc., Chicago, IL, USA), version 15.0.

Results

Production and Total Impact

Worldwide, in the *respiratory system* category and for the period analyzed, a total of 1858 articles were found on smoking (ignoring collaboration, i.e. including each article only once). In the 27-state

Table 1
Worldwide Production and Impact in Smoking Through the Respiratory Category in the Period 2001–2010. Worldwide Production and Impact in Smoking Through the Respiratory Category in Journals Published in the First Quartile of the JCR (2009).

Countries	Resp. area	No. citations	Cit./Art. index	1 quartile	Citations 1 quartile	Mean cit./art.
General data	1858	32,014	17.23	752	19,279	25.64
Austria	10	271	27.10	3	86	28.67
Belgium	29	596	20.55	23	477	20.74
Bulgaria	2	66	33.00	1	59	59.00
Cyprus	0	0	0.00	0	0	0.00
Czech Republic	6	151	25.17	4	97	24.25
Denmark	32	476	14.88	17	314	18.47
Estonia	5	137	27.40	4	134	33.50
Finland	29	473	16.31	17	390	22.94
France	112	990	8.84	32	526	16.44
Germany	51	1200	23.53	27	846	31.33
Greece	17	240	14.12	9	122	13.56
Hungary	6	177	29.50	4	92	23.00
Ireland	12	400	33.33	7	177	25.29
Italy	86	1807	21.01	53	1552	29.28
Letonia	1	8	8.00	1	8	8.00
Lithuania	7	45	6.43	2	31	15.50
Luxemburg	0	0	0.00	0	0	0.00
Malta	0	0	0.00	0	0	0.00
Holland	74	1645	22.23	49	1275	26.02
Poland	14	371	26.50	9	275	30.56
Portugal	2	15	7.50	0	0	0.00
Romania	0	0	0.00	0	0	0.00
Slovakia	2	109	54.50	1	59	59.00
Slovenia	0	0	0.00	0	0	0.00
Spain	85	1342	15.79	21	803	38.24
Sweden	79	1865	23.61	41	989	24.12
United Kingdom	225	5892	26.19	99	3405	34.39
EU-27 total	717	14,107	19.68	320	8982	28.07
Rest of the world						
Australia	146	2681	18.36	31	680	21.94
Brazil	16	259	16.19	6	133	22.17
Canada	170	4152	24.42	76	2639	34.72
India	9	126	14.00	2	61	30.50
Japan	95	1730	18.21	68	1496	22.00
Mexico	24	308	12.83	12	237	19.75
New Zealand	26	355	13.65	3	106	35.33
China	82	719	8.77	31	417	13.45
Russia	5	50	10.00	3	48	16.00
USA	814	14,946	18.36	321	8358	26.04

European Union (EU-27), a total of 717 articles were published. In Table 1, we can see that the most productive EU-27 countries were the United Kingdom (UK), France, Italy, Spain and Sweden. In the rest of the world, the three most productive were the United States of America (USA), Canada and Australia. We can also observe the number of citations received, and the citations/article index in total and by country; the evolution over time of the number of documents and number of citations by country can likewise be observed. We found countries with lower production but with a higher citations/article index than more productive countries [the citations/article index for Ireland, Hungary, Slovakia and Bulgaria were 33.33 (6 articles), 29.50 (6 articles), 54.50 (2 articles) and 33 (2 articles), respectively]. In Table 2, the evolution over time of the number of documents and the number of citations by countries on smoking (countries producing more than 350 articles in all areas) can be observed. If we compare the production of articles by five-year periods, it can be seen that the mean number of articles published per five-year period was higher for the period 2006/10 than for 2001/05, both for USA (91 ± 6 compared to 72 ± 12, $P = .021$) and EU-27 authors (85 ± 13 compared to 59 ± 14, $P = .014$). However, the number of citations received was higher for documents published in the first five-year period than in the second, in both the USA (1994 ± 368 compared to 995 ± 742, $P = .037$) and the EU-27 (1630 ± 264 compared to 1191 ± 1074, $P = .042$). As a result, the citation index was also higher in the first five-year period than in the second in some geographical areas.

Production and Impact of Articles Included in the First Quarter of the Journal Citation Report

Around 40.47% of the articles (752 documents; ignoring collaboration) were published in Q1 journals. A total of 21 EU-27 countries published articles in Q1 journals in the *respiratory system* category; the five most productive were the UK, Italy, Holland, Sweden and France (Spain was ranked in 8th place). Of the rest of the world, 10 countries published articles in Q1; the three most productive were the USA, Canada and Japan (Table 1). In Table 3, the evolution over time of the number of documents published in the first quartile of the JCR in the most productive countries (>350 papers on smoking in all areas) and the number of citations received by these countries can be observed. Likewise, the citations/article index corresponded to countries with lower production: Slovakia (59 citations/article), Bulgaria (59 citations/article) and Spain (38.24 citations/article). We found that the percentage of Q1 articles on the *respiratory system* with respect to the total number of articles in the area was higher in the EU-27 than in the USA (46.2% compared to 39.7%, $P = .008$). Fig. 1 shows the data from Tables 2 and 3 in graph form.

Co-authorship

Fig. 2 shows the co-authorship network in the *respiratory system* category and the relationship between countries (we computed

Table 2
Evolution Over Time of the Number of Documents and Number of Citations by Country in Smoking Through the Respiratory Category in the Period 2001–2010.

Countries	Resp. area											Citations area											Cit/Art index
350 articles or more[a]	Total doc. resp. area	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total citations resp. area	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
Germany	51	6	4	2	6	8	9	6	3	4	3	1200	137	89	56	201	240	279	104	46	32	16	23.53
Denmark	32	3	5	–	3	–	2	3	7	5	4	476	88	125	–	54	–	29	80	57	35	8	14.88
Spain	85	9	7	10	11	9	8	11	5	9	6	1342	309	131	123	129	166	179	170	70	57	8	15.79
Finland	29	2	1	4	7	2	3	2	4	2	2	473	82	45	39	153	18	71	27	29	7	2	16.31
France	112	4	4	5	12	12	18	17	17	11	12	990	4	65	47	192	161	173	136	158	38	16	8.84
Italy	86	9	4	5	9	8	7	12	6	16	10	1807	374	348	213	219	182	134	181	31	98	27	21.01
Holland	74	1	2	–	5	10	12	12	5	14	13	1645	90	22	–	92	366	503	361	50	116	45	22.23
United Kingdom	225	19	15	11	24	16	39	23	19	33	26	5892	809	737	504	685	371	1.709	443	284	261	89	26.19
Sweden	79	11	5	9	4	10	12	8	10	6	4	1865	348	95	420	72	244	301	223	85	59	18	23.61
Australia	146	3	4	27	17	9	25	14	17	10	20	2681	78	111	518	302	239	944	192	187	42	68	18.36
Brazil	16	–	2	–	3	1	5	1	2	1	1	259	–	29	–	44	9	142	17	13	4	1	16.19
Canada	170	9	16	13	11	9	29	14	23	22	24	4152	375	853	395	523	277	1.157	260	123	142	47	24.42
China	82	2	1	4	4	5	6	12	8	13	27	719	87	20	65	96	79	53	130	62	64	63	8.77
United States	814	62	69	68	93	68	98	84	85	90	97	14,946	2351	2210	1654	2251	1503	2181	1169	766	627	234	18.36
India	9	1	2	–	–	1	1	–	2	–	2	126	9	97	–	–	9	5	–	2	–	4	14.00
Japan	95	11	4	12	5	8	10	7	14	13	11	1730	478	161	271	133	115	234	63	148	95	32	18.21
EU-27 Total	717	60	44	46	75	68	97	94	67	91	75	14,107	2058	1506	1351	1653	1582	2880	1609	658	590	220	19.68

[a] Taking into account those countries that had overall productivity in all areas >350 papers on smoking.

Table 3
Evolution in the Study Period of the Number of Documents Published in the First Quartile of the JCR and the Number of Citations by Country.

Countries	1 quartile											Citations 1 quartile											Cit/Art index
350 articles or more[a]	Total doc. 1 quartile	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total citations 1 quartile	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
Germany	27	1	2	1	3	8	5	3	1	2	1	846	108	52	20	126	240	188	66	18	25	3	31.33
Denmark	17	1	2	–	2	–	1	2	3	5	1	314	21	54	–	54	–	20	78	46	36	5	18.47
Spain	21	3	1	2	2	1	3	2	2	4	1	803	253	95	68	36	27	139	100	47	33	5	38.24
Finland	17	2	1	2	5	1	3	1	1	–	1	390	82	45	26	117	16	72	26	–	5	1	22.94
France	32	–	1	2	4	5	5	–	4	5	6	526	–	28	19	128	96	125	–	96	23	11	16.44
Italy	53	8	4	5	7	4	4	4	1	9	7	1552	366	348	213	197	155	69	90	3	87	24	29.28
Holland	49	1	1	–	3	8	7	8	3	10	8	1275	90	11	–	66	279	343	329	46	80	31	26.02
United Kingdom	99	12	8	5	10	7	14	12	7	12	12	3405	554	457	315	462	233	715	272	215	138	44	34.39
Sweden	41	6	2	5	1	3	6	4	7	3	4	989	213	67	188	37	35	160	179	60	32	18	24.12
Australia	31	2	1	2	3	5	4	3	4	1	6	680	69	32	39	35	184	144	88	56	8	25	21.94
Brazil	6	–	1	–	2	–	1	1	1	–	–	133	–	22	–	43	–	45	17	6	–	–	22.17
Canada	76	4	12	9	8	4	9	7	7	11	5	2639	265	756	300	467	163	319	179	47	117	26	34.72
China	31	2	–	3	2	2	2	5	6	3	6	417	87	–	36	56	36	21	73	57	20	31	13.45
United States	321	24	26	29	36	26	33	31	30	47	39	8358	1332	1217	1062	1205	760	1007	737	494	425	119	26.04
India	2	–	1	–	–	–	–	–	–	–	1	61	–	60	–	–	–	–	–	–	–	1	30.50
Japan	68	10	3	9	4	4	7	4	11	8	8	1496	475	143	214	117	71	202	41	133	78	22	22.00
EU-27 Total	320	31	21	23	33	31	39	34	24	46	38	8982	1555	1054	852	1120	962	1508	996	400	395	140	28.07

[a] Taking into account those countries that had overall productivity in all areas >350 papers on smoking.
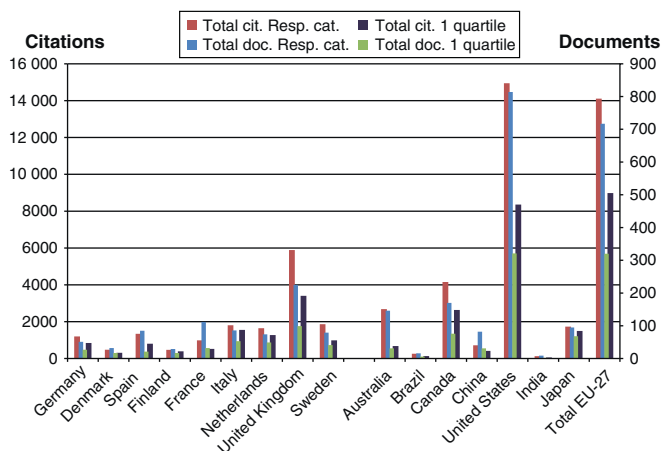
Fig. 1. Relationship between the production of documents by country and the citations received (both total production and in the first quartile).

countries that collaborated on three or more occasions). Fig. 3 shows the co-authorship network between countries for articles on smoking through the *respiratory system* category included in Q1 of the JCR (in this case we did not limit by threshold, but only countries with at least 15 papers in the first quartile were selected).

Discussion

The most important finding of our study was that the production on smoking in the respiratory category increased over the period analyzed, with 40% of this production in Q1 of the JCR in prestigious journals, i.e. those with greater impact and importance. There have been numerous bibliometric studies published in recent years on biomedicine,[6] the respiratory system[3,4,7] and smoking.[1,2,8–11] We can summarize the conclusion of all of these in the major growth experienced by science, both overall and if we analyze different and specific subject areas. Smoking is included in almost all areas that have seen an increase in their production in biomedicine and health sciences.[12] In the last decade, the regions with a greater contribution to worldwide scientific production have been Western Europe, the USA and Asia, which contribute more than double the medium production areas (Eastern Europe, Latin America, the Middle East and the Pacific Region); African regions contribute proportionally less to worldwide production. It is known that Asia increased its scientific production by 94% between 1997 and 2009 (27.51% of the total); this is greater than the North American production (23.28% of the total) and almost reaches that of Western Europe (28.63% of the total).[6] As we have seen in our study, Spain published a total of 85 papers on smoking, in the respiratory category, with this production remaining more or less stable over the years, like those published in the first quartile. Spain, at global level, practically doubled scientific production between 2000 and 2009. The percentage of Spanish scientific production in relation to the production in Western Europe and likewise, the participation of Spanish publications with respect to the world total, have grown steadily in the last decade. It has been shown that the annual average growth in scientific production in Spain in the period 1996–2009 was 6.95%, surpassing the Western European average by 2.58 points and the North American average by 4.62 points.[6] The future projection for Spain shows, with respect to overall production, a continuing upward trend until at least 2016, maintaining, at any rate, its current position in the world ranking. Other countries, such as France, Germany and Japan will tend to decrease their production. China was the country with greatest expectations for increasing in their worldwide participation, to the detriment of the USA in particular.[6] As previously mentioned, and again demonstrated in this study in

the respiratory category, production in smoking shows a clearly upward trend, having doubled the number of total and original articles in the last decade; thus it is not yet in a state of saturation, but rather is escalating in knowledge.[1]

As we know, the journals in the JCR are classified into what are called quartiles, which represents a measure of position that summarizes the statistical data into meaningful groups. In the respiratory category, we found a similar total number of articles on smoking in Q1 in the EU-27 and in the USA in the period studied, with the evolution in the years studied very similar and with no defined trend. The evolution over time of the percentage of publications in the leading journals (Q1) in the 30 countries with highest values for time series[6] has been previously analyzed in worldwide scientific production; it was found that the same countries that have more than 60% of their scientific production in Q1 were in the top positions from 2003 to 2009 (Holland, Denmark, Sweden, Israel, Switzerland, USA and UK). Spain, in overall production in biomedicine, was ranked in 21st position, with 49% of the scientific production published in Q1 journals.[6] In our study, the top positions in Q1 for articles on smoking published in the respiratory category were held by (in decreasing order) the USA, UK, Canada, Japan, Italy and Holland. Spain was ranked in 12th position.

In addition to analyzing productivity, bibliometric analysis includes measurements of the relative quality of the results published. Albeit with recognized limitations, this variable has been evaluated until now by counting the citations received by papers published in other scientific documents, which is used to calibrate the impact or visibility of these in the international community.[13] One of the most widely used indices for determining quality is the IF, an index which has numerous defenders and many critics who have pointed out its abusive and erroneous use.[14,15] Thus, other bibliometric indicators have been proposed to measure the scientific quality of a researcher or group of researchers; one of these is called the citation index, which is defined as the number of citations that an article receives by other authors. Using these data, the mean number of citations per document and percentage of non-citation can be extracted.[14] The scientific productivity of a researcher will be considered of better quality the higher their citation index, the higher the mean number of citations per document and the lower the percentage of non-citations, although the analysis period should be established and normalized.[14] This normalization is necessary, as not all subjects are cited equally, so tools like the *crown indicator* have been proposed (crown indicator: number of citations per document without self-citations/mean rate of citations of all articles from a certain scientific field).[16] In this study, we used the number of citations and the citations/document index as an indicator of quality. As can be observed in our study, it was the EU-27 that reached a higher citations/document index, both in total production and in the production of articles published in the first quartile. In the evolution over time, the oldest articles are those with a higher number of citations. This is a normal indicator trend that has already been reported previously,[1,6,8] since the citations received by publications in a certain period increase over time and opportunities for them to be cited grow, although some differences have been shown between document databases, with citations in Scopus more recent than in the Web of Science.[17] It has been shown that scientific collaboration among countries and among institutions increases the number of citations. Thus, a positive correlation has been observed between the number of countries involved in international collaborative articles and the number of citations that these articles received; papers published in English and with international collaboration were associated with a higher number of citations. It is recognized that the gradual growth of international collaboration in biomedicine and life sciences over recent years is an important factor in attracting citations.[1,2,6,8]
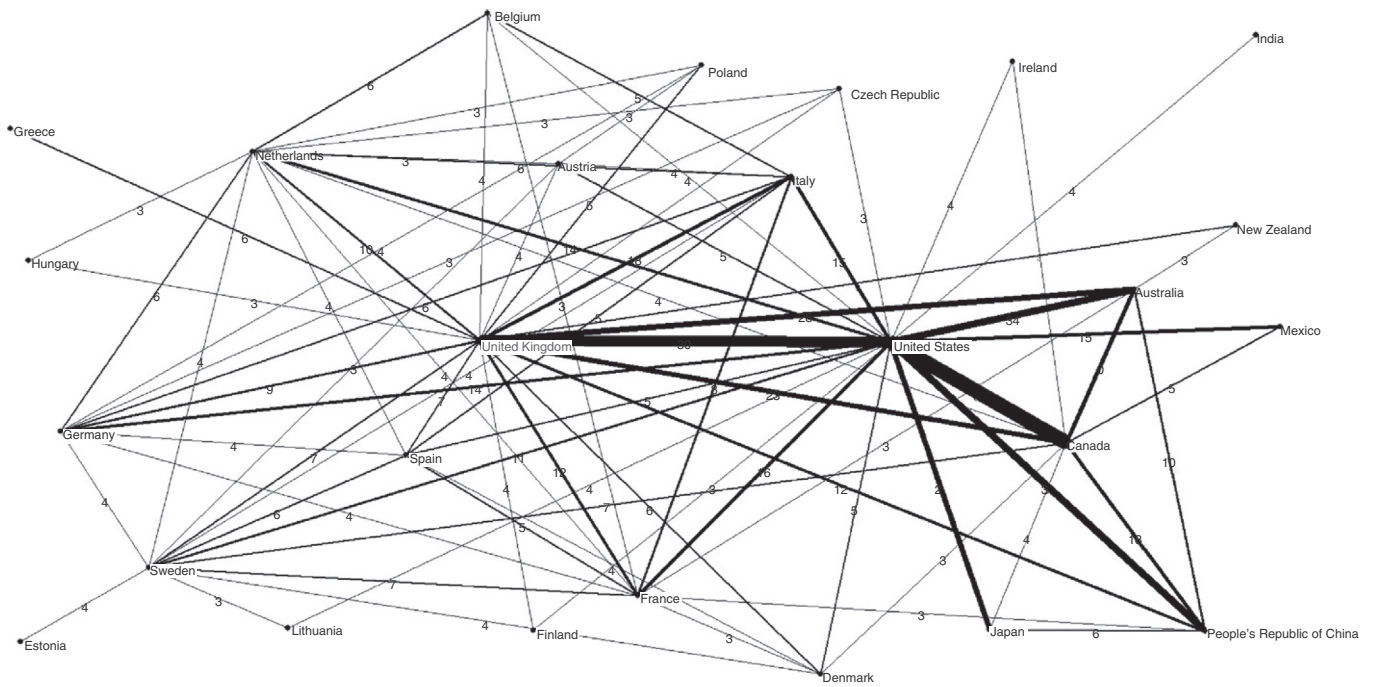
Fig. 2. Co-authorship network between countries of articles on smoking through the respiratory category (≥3 collaborations).

As we can observe in our study, there is a co-authorship net-work among countries in the *respiratory system* category for articles on smoking, which is active, well-established and cohesive. In this study, the most productive countries and with greater visibility in research on smoking are no different to those found in other areas of knowledge[6]: Europe and the USA are the regions of greatest importance, influence and impact, occupying a central position in the network, which indicates that they have collaboration relation-ships with most countries. On the contrary, countries that make up

the co-authorship network of articles included in Q1 is lower, with the USA, UK and Holland remaining centralized, indicating their visibility and importance. It is clear that industrialized countries monopolize most impact journals.[18] Various approaches have been used to analyze international collaboration in scientific articles, but none have been able to fully explain its rapid growth. Apply-ing network analysis tools show that the growth of international collaboration may be explained based on the principle of prefer-ential organization of archives (Barabasi-Albert[19] model), which
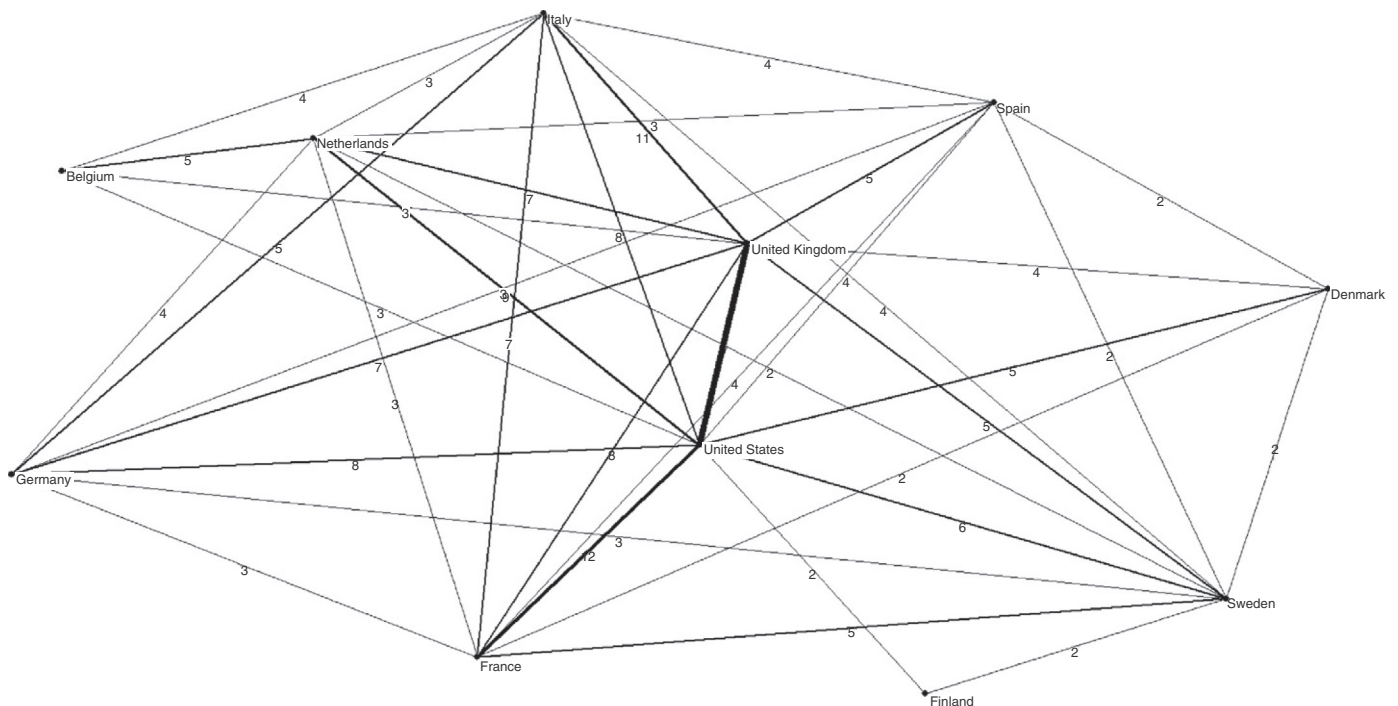

Fig. 3. Co-authorship network between countries of articles on smoking through the respiratory category included in Q1 of the JCR (not limited by threshold, but those countries with at least 15 papers in this first quartile were selected).

　　　　　J.I. de Granda-Orive et al. / Arch Bronconeumol. 2013;**49**(7):282–288

indicates that the nodes of a co-authorship network that already have many connections will be those chosen preferentially by new research groups to initiate a scientific collaboration,[20,21] i.e. a node rich in connections (collaborations) will increase its influence more rapidly due to its role as leader in that field. It is recognized that more citations are generated the higher the number of authors and institutions in a paper and, therefore, those authors who collaborate more and better manage these relationships obtain better final results.[22] It is a challenge therefore to identify researchers with similar interests to formalize contacts and thus extend already existing networks.[23,24] Clearly, scientific collaboration improves and accelerates research, increasing the quality[25,26] (positive collaboration), and therefore is fundamental for scientific progress and advance, as it enables resources to be shared, gaps filled, and to promote synergies to achieve the necessary knowledge.

The main limitation of this study is that we restricted the search to journals included in the *respiratory system* category of the JCR and, logically, this area does not include the entire scientific production on smoking or the *respiratory system*, so the data should be used to determine the situation of smoking in the *respiratory system* area of the JCR, but not to assess all the scientific activity in these areas. Study limitations can also be found in the choice of database, and those arising from its normalization, so thorough quality control of the data was performed; finally there are limitations related to the time period studied, which means that only articles from publications that were sourced in the SCI at that time are visible.

Conclusions

We can conclude that the production of articles on smoking in the respiratory category increased over the period analyzed, with 40% of this production in journals in the first quartile of the JCR. We found a high citation rate, with older articles having more citations, and the EU-27 having higher impact and repercussion. The co-authorship network between countries in the respiratory category for articles on smoking is active, well-established and cohesive.

Conflict of Interests

The authors have not declared any conflict of interests.

References

1. Granda Orive JI, Alonso Arroyo A, Villanueva Serrano SJ, Aleixandre R, González Alcaide G, García Río F, et al. Comparación entre dos quinquenios (1998/2002 y 2003/2007) de la producción, repercusión y colaboración en tabaquismo de autores españoles a través del Science Citation Index. Arch Bronconeumol. 2011;47:25–34.
2. Granda Orive JI, Villanueva Serrano S, Aleixandre Benavent R, Valderrama Zurián JC, Alonso Arroyo A, García Río F, et al. Redes de colaboración científica internacional en tabaquismo. Análisis de co-autorías a través del Science Citation Index durante el período 1999–2003. Gaceta Sanitaria. 2009;23:222e34–43.
3. Granda Orive JI, Garcia Rio F, Roig Vázquez F, Aleixandre Benavent R, Valderrama Zurían JC, Martínez Albiach JM, et al. Caracterización de las áreas de sistema respiratorio en España. An Med Interna. 2006;23:513–8.
4. González Alcaide G, Aleixandre Benavent R, Granda Orive JI. Caracterización bibliométrica y temática de los grupos de investigación de Archivos de Bronconeumología (2003–2007). Arch Bronconeumol. 2010;46:78–84.
5. Bordons M, Zulueta MA. Evaluación de la actividad científica a través de indicadores bibliométricos. Rev Esp Cardiol. 1999;52:790–800.
6. Principales indicadores españoles de la actividad científica 2009. FECYT 2011 [accessed 25 Mar 2012]. Available from: http://hdl.handle.net/10760/16733
7. Rippon I, Lewison G, Partridge MR. Research outputs in respiratory medicine. Thorax. 2005;60:6–7.
8. Granda-Orive JI, García Río F, Aleixandre Benavent R, Valderrama Zurián JC, Jiménez Ruiz CA, Solano Reina S, et al. Producción española en tabaquismo a través del Science Citation Index (1999–2003). Situación en el contexto mundial y de la Unión Europea. Arch Bronconeumol. 2007;43: 212–8.
9. Granda Orive JI, Villanueva Serrano S, Aleixandre Benavent R, Valderrama Zurián JC, Alonso Arroyo A, García Río F, et al. World-wide collaboration among medical specialties in smoking research: production, collaboration, visibility and influence. Res Eval. 2009;18:3–12.
10. García López JA. Bibliometric analysis of Spanish scientific publications in tobacco during the period 1970–1996. Eur J Epidemiol. 1999;15:23–8.
11. Qiu H, Chen YF. Bibliometric analysis of nicotine research in China during the period of 1991–2007. Inhal Toxicol. 2009;21:965–71.
12. Camí J, Suñén Piñol E, Méndez Vásquez R. Mapa bibliométrico de España 1994–2002: biomedicina y ciencias de la salud. Med Clin (Barc). 2005;124:93–101.
13. Chinchilla Rodríguez Z, Corera Álvarez E, Moya Anegón F, Sanz Menéndez L. Indicadores bibliométricos de España en el mundo 2008 [accessed 1 July 2012]. Available from: http://www.ipp.csic.es/sites/default/files/IPP/documento_trabajo/pdf/CSIC-IPP-DT-2010-13_Chinchilla_Corera_DeMoya_Sanz.pdf
14. El Blog de Ciril Rozman Índice de citaciones, un parámetro bibliométrico importante [accessed 8 July 2012]. Available from: http://blogderozman.wordpress.com/2010/10/26/indice-de-citaciones-un-parametro-bibliometrico-importante/
15. Camí J. Impactolatría: diagnóstico y tratamiento. Med Clin (Barc). 1997;109:515–24.
16. Van Raan AFJ. Comparisons of the Hirsch-index with standard bibliometric indicators and with peer judgment for 147 chemistry research groups [accessed 8 July 2012]. Available from: http://arxiv.org/ftp/physics/papers/0511/0511206.pdf
17. Granda Orive JI, Alonso Arroyo A, García Río F, Solano Reina S, Jiménez Ruiz CA, Aleixandre Benavent R. Ciertas ventajas de SCOPUS sobre Web of Science en un análisis bibliométrico sobre tabaquismo. Rev Esp Doc Cient. 2013 [in press].
18. Paraje G, Sadana R, Karam G. Increasing international gaps in health-related publications. Science. 2005;308:959–60.
19. Barabási AL, Albert R. Emergente of scaling in random networks. Science. 1999;286:509–11.
20. Scharnhorst A. Complex networks and web: insights from non linear physics. JCMC [electronic journal]. 2003;8. Available from: http://jcmc.indiana.edu/vol8/issue4/scharnhorst.html [accessed el 8 Jul 2012].
21. Wagner CS, Leydesdorff L. Networks structure, self-organization, and the growth of international collaboration in science. Res Policy. 2005;34: 1608–18.
22. Figg WD, Duna L, Liewehr DJ, Steinberg SH, Thurman DW, Barrett JC, et al. Scientific collaboration results in higher citations rates of publisher articles. Pharmacotherapy. 2006;26:759–67.
23. Yu W, Yesupriya A, Wulf A, Qu J, Gwinn M, Khoury MJ. An automatic method to generate domain-specific investigator networks using PubMed abstracts. BMC Med Inform Decis Mak. 2007;7:17.
24. Georghiou L. Global cooperation in research. Res Policy. 1998;27: 611–26.
25. Teasley S, Wolinsky S. Communication. Scientific collaborations at a distance. Science. 2001;292:2254–5.
26. Collins FS, Patrinos A, Jordan E, Chakravarti A, Gesteland R, Walters L. New goals for the US Human Genome Project: 1998–2003. Science. 1998;282: 682–9.