

ARCHIVOS DE BRONCONEUMOLOGÍA: Among the 3 Spanish Medical Journals With the Highest National Impact Factors

R. Aleixandre Benavent,^a J.C. Valderrama Zurián,^a M. Castellano Gómez,^b R. Simó Meléndez,^a and C. Navarro Molina^a

^aInstituto de Historia de la Ciencia y Documentación López Piñero, Consejo Superior de Investigaciones Científicas, Universidad de Valencia, Valencia, Spain.

^bConselleria de Sanitat, Generalitat Valenciana, Valencia, Spain.

OBJECTIVE: Citation analysis elucidates patterns of information consumption within professional communities. The aim of this study was to analyze the citations of 87 Spanish medical journals by calculating their impact factors and immediacy indices for 2001, and to estimate the importance of ARCHIVOS DE BRONCONEUMOLOGÍA within the framework of Spanish medicine.

MATERIAL AND METHOD: Eighty-seven Spanish medical journals were included. All were listed in the Spanish Medical Index (*Índice Médico Español*) and in at least one of the following databases: MEDLINE, BIOSIS, EMBASE, or Science Citation Index. References to articles from 1999 through 2001 in citable articles from 2001 were analyzed. Using the method of the Institute for Scientific Information, we calculated the national impact factor and immediacy index for each journal.

RESULTS: The journals with the highest national impact factors were *Revista Española de Quimioterapia* (0.894), *Medicina Clínica* (0.89), and ARCHIVOS DE BRONCONEUMOLOGÍA (0.732). The self-citation percentage of ARCHIVOS DE BRONCONEUMOLOGÍA was 18.3% and the immediacy index was 0.033.

CONCLUSIONS: The impact factor obtained by ARCHIVOS DE BRONCONEUMOLOGÍA confirms its importance in Spanish medicine and validates its inclusion as a source journal in Science Citation Index and Journal Citation Report.

Key words: *Scientific journals. Bibliometrics. Impact factor. Immediacy index.*

ARCHIVOS DE BRONCONEUMOLOGÍA: una de las 3 revistas médicas españolas con mayor factor de impacto nacional

OBJETIVO: El análisis de citas permite conocer los patrones de consumo de información de los colectivos profesionales. El objetivo de este trabajo es presentar el resultado del análisis de citas de 87 revistas médicas españolas, de las que se han calculado el factor de impacto e índice de inmediatez en 2001, y estimar la relevancia de ARCHIVOS DE BRONCONEUMOLOGÍA en el marco de la medicina española.

MATERIAL Y MÉTODO: Se seleccionaron 87 revistas médicas españolas incluidas en la base de datos Índice Médico Español y que circulaban al menos en una de las siguientes bases de datos: MEDLINE, BIOSIS, EMBASE, Science Citation Index. Se analizaron las referencias bibliográficas de 1999 a 2001 incluidas en los artículos citables de 2001. Se calcularon, de acuerdo con la metodología del Institute for Scientific Information, el factor de impacto y el índice de inmediatez nacionales.

RESULTADOS: Las revistas que obtuvieron un mayor factor de impacto nacional fueron *Revista Española de Quimioterapia* (0,894), *Medicina Clínica* (0,89) y ARCHIVOS DE BRONCONEUMOLOGÍA (0,732); el porcentaje de autocitas de esta última fue del 18,3% y su índice de inmediatez de 0,033.

CONCLUSIONES: El factor de impacto obtenido por ARCHIVOS DE BRONCONEUMOLOGÍA confirma su importancia en la medicina española y avala su inclusión como revista fuente en el Science Citation Index y Journal Citation Reports.

This study was undertaken with a grant from the Program for Studies and Analyses (Programa de Estudios y Análisis, 2003) awarded by the Spanish Ministry of Education, Culture, and Sports, division for universities.

Correspondence: Prof. R. Aleixandre Benavent.
Instituto de Historia de la Ciencia y Documentación López Piñero.
Facultad de Medicina de Valencia.
Avda. Blasco Ibáñez, 15. 46010 Valencia, España.
E-mail: aleixand@uv.es

Manuscript received February 17, 2004. Accepted for publication March 30, 2004.

Introduction

Scientific activity culminates when researchers provide access to their findings, usually through the publication of journal articles, books, or congress presentations.¹ In addition, the currently established practice that requires scientists to cite the publications serving as the basis for their work^{2,3} lets us form an impression of the influence a cited publication has on

later research. Bibliometric analysis based on counting the number of times a publication is cited is used to identify key studies read by investigators and provides an indication of the repercussion or impact those studies have had.^{2,4}

The Science Citation Index (SCI), calculated by the Institute for Scientific Information (ISI), quantifies impact by analyzing citations appearing in over 3000 journals covering the main fields of knowledge.⁵ The impact factor has been used as a measure of a study's repercussion, and by extension, of its quality.^{6,7} Widespread application of the impact factor has come to modify the publication and citation behaviors of many researchers, who want to see themselves reflected in the SCI as a way of receiving credit for their efforts.^{8,9} Numerous experts have called attention to this situation and have warned of the peculiarities and limitations of SCI indicators and of the distortions arising from indiscriminate use of the impact factor as a measure of quality.¹⁰⁻¹⁴

One of the most striking characteristics of the SCI is its bias in favor of journals published in countries where English is the medium of communication. For example, the 2001 issue of Journal Citation Reports (JCR) included 2220 journals from the United States of America, 1171 from Great Britain, and 59 from Australia. In contrast, those from France and Italy—examples of countries of undoubted scientific importance whose language is not English—numbered 148 and 69, respectively. Of the 26 Spanish journals included, only 13 were biomedical publications. Such biased coverage places limitations on the use of SCI analysis as a tool for studying the real impact of research performed outside English-speaking contexts and has led to the use of complementary analyses targeting specific journals or knowledge areas.¹⁵⁻³¹

The present study had 2 objectives. One was to present the results of analyzing citation in 87 Spanish scientific medical journals, whose impact factors and immediacy indices were calculated for 2001. The second was to assess the importance of ARCHIVOS DE BRONCONEUMOLOGÍA within Spanish medicine.

Material and Method

The criteria for selecting journals whose references would be analyzed were that they be included in the Spanish Medical Index (*Índice Médico Español*) and additionally in one of the following international databases: MEDLINE, Excerpta Medica, SCI, or BIOSIS. The Spanish Medical Index can be considered the main Spanish bibliographic database. Since 1970 it has been gathering, analyzing, and disseminating information about most Spanish scientific medical journals in all knowledge areas, whether related to basic, experimental, or clinical research.³² In turn, the aforementioned international databases are considered those of greatest importance in the life sciences and health care.³³⁻³⁵ These criteria have been adopted because the inclusion of a journal in international databases is considered one of the most valid and reliable bibliometric indicators,³⁶ given that

they require the journals they follow to meet certain formal and quality-control criteria.³⁷⁻⁴⁰

Eighty-seven journals met these criteria and were analyzed as source or citing journals. Citable articles published in 2001 selected from each journal, in accordance with ISI methods, were original research articles, review articles, and case reports. Excluded, therefore, were editorials, letters to the editor, and reports of conference and other presentations. In those articles, references to publications from 1999 and 2000 were identified to calculate the impact factor. References to publications from 2001 were identified to calculate the immediacy index. The information was managed by creating a database of references in Microsoft Access. Information about the number of citations received and articles published in the 13 Spanish medical journals included in the 2001 JCR were extracted directly from the ISI Web of Knowledge, the gateway to ISI information, which encompasses the SCI and JCR databases, among others. This was not possible for ARCHIVOS DE BRONCONEUMOLOGÍA, which although included as a source journal for SCI analysis in 2001, would not have an impact factor published in the JCR until the second semester of 2004, for 2003.

The national impact factor for each journal in 2001 was calculated by establishing the ratio of citations received by the journal in 1999 and 2000 and the citable articles published in those years. The national immediacy index, which measures the promptness with which a journal's articles are cited, was calculated by establishing the ratio of citations received in 2001 to articles published in the same year. The information for journals included in the JCR was taken directly from that database.

Results

Of the 20 193 citations in the 74 source or citing journals not included in the JCR, 86.71% were references to journal articles and 7.06% were references to books and book chapters (Table 1).

Table 2 shows the impact factors and immediacy indices of the journals identified, along with the data needed to calculate those indices (citations received and articles published). The journals that were most often cited in the 3 years covered by the study for calculating impact factor were *Medicina Clínica* (627), *Revista de Neurología* (319), and *Revista Española de Cardiología* (306). Only 7 journals received more than 100 citations each, and at the opposite end of the spectrum, 34 journals were cited fewer than 10 times and 4 journals were never cited.

TABLE 1
Citations, by Document Type

Document Type	1999	2000	2001	Total	Percentage
Articles	9526	6671	1313	17510	86.71
Books	398	256	49	703	3.48
Book chapters	397	273	52	722	3.58
Conference papers	226	229	35	490	2.43
Doctoral dissertations/theses	24	19	8	51	0.25
Other*	258	12	147	717	3.55
Total	10829	7760	1604	20193	100

*Including newspapers, courses, speeches, seminars, official publications, web pages, handbooks, and reports.

TABLE 2
Impact Factors and Immediacy Indices of the Journals Analyzed*

Journals	Citations			Articles			IF	II
	1999	2000	2001	1999	2000	2001		
<i>Acta Ginecológica</i>	1	1	0	46	40	43	0.023	0
<i>Acta Otorrinolaringológica Española</i>	14	11	5	141	145	98	0.087	0.051
<i>Acta Pediátrica Española</i>	15	9	2	79	100	85	0.134	0.023
<i>Actas Dermo-Sifiliográficas</i>	13	8	2	99	106	97	0.102	0.02
<i>Actas Españolas de Psiquiatría (SCI)</i>	21	15	1	51	63	62	0.315	0.016
<i>Actas Urológicas Españolas</i>	41	26	1	145	159	132	0.22	0.007
<i>Actualizaciones en Anestesiología y Reanimación</i>	0	0	0	17	23	17	0	0
<i>Adicciones</i>	14	13	2	37	66	55	0.262	0.036
<i>Allergología et Immunopathologia</i>	4	3	0	41	48	46	0.078	0
<i>Anales de Cirugía Cardíaca y Cirugía Vasculat</i>	0	1	1	20	19	12	0.025	0.083
<i>Anales de Medicina Interna</i>	29	23	2	122	130	115	0.206	0.017
<i>Anales de Psiquiatría</i>	5	10	2	57	47	56	0.144	0.035
<i>Anales del Sistema Sanitario de Navarra</i>	3	7	0	87	81	63	0.059	0
<i>Anales Españoles de Pediatría</i>	78	53	20	201	191	180	0.334	0.111
<i>Angiología</i>	0	1	0	28	25	39	0.018	0
ARCHIVOS DE BRONCONEUMOLOGÍA	89	50	3	98	92	90	0.732	0.033
<i>Archivos de la Sociedad Española de Oftalmología</i>	5	3	0	84	109	93	0.041	0
<i>Archivos de Medicina del Deporte</i>	9	4	0	45	43	33	0.147	0
<i>Archivos Españoles de Urología</i>	29	18	1	155	155	147	0.151	0.006
<i>Atención Farmacéutica</i>	12	4	1	61	58	49	0.134	0.02
<i>Atención Primaria</i>	116	106	23	151	174	150	0.683	0.153
<i>Ciencia Ginecológica</i>	1	3	0	38	28	37	0.06	0
<i>Ciencia y Tecnología Farmacéutica</i>	6	13	6	15	13	17	0.678	0.352
<i>Cirugía Pediátrica</i>	6	2	0	39	42	40	0.098	0
<i>Clínica e Investigación en Ginecología y Obstetricia</i>	8	8	1	78	59	58	0.116	0.017
<i>Endocrinología y Nutrición</i>	6	2	0	47	47	57	0.085	0
<i>Enfermedades Infecciosas y Microbiología Clínica</i>	31	36	13	111	80	89	0.351	0.146
<i>Enfermería Clínica</i>	7	4	4	39	39	38	0.141	0.105
<i>Enfermería Intensiva</i>	2	1	0	18	20	20	0.078	0
<i>European Journal of Psychiatry. The</i>	1	1	0	27	27	25	0.037	0
<i>Farmacia Hospitalaria</i>	6	12	1	49	52	51	0.178	0.019
<i>Fontilles. Revista de Leprología</i>	0	0	0	7	16	16	0	0
<i>Gaceta Sanitaria</i>	32	34	7	58	55	59	0.584	0.118
<i>Gastroenterología y Hepatología</i>	29	37	8	84	91	74	0.377	0.108
<i>Geriátrika. Revista Iberolatinoamericana de Geriatría y Gerontología</i>	4	4	0	63	54	32	0.068	0
<i>Ginecología Clínica y Quirúrgica</i>	0	1	0	0	17	15	0.058	0
<i>Histology and Histopathology (SCI)</i>	22	0	0	134	135	135	0.081	0
<i>Inmunología</i>	0	0	0	20	15	22	0	0
<i>International Journal of Developmental Biology</i>	0	22	0	101	96	162	0.111	0
<i>Investigación Clínica</i>	1	1	0	66	55	56	0.016	0
<i>Journal of Investigational Allergology & Clinical Immunology (SCI)</i>	3	5	0	61	64	34	0.064	0
<i>Journal of Physiology and Biochemistry (SCI)</i>	2	4	0	21	40	21	0.098	0
<i>Medicina Clínica (SCI)</i>	245	268	114	291	285	237	0.89	0.481
<i>Medicina Cutánea Ibero-Latino-Americana</i>	3	0	0	47	46	42	0.032	0

*IF indicates impact factor; II, immediacy index; SCI, Science Citation Index, journals included in the 2001 issue of Journal Citation Reports.

(Continued on the following page)

The journals that obtained the highest national impact factors were *Revista Española de Quimioterapia* (0.894), *Medicina Clínica* (0.89), and ARCHIVOS DE BRONCONEUMOLOGÍA (0.732). Only 9 journals had impact factors over 0.5. Evidently, 4 journals had impact factors of 0, as they had not been cited.

The journals with the highest immediacy indices were *Medicina Clínica* (0.481), *Revista Española de Anestesiología y Reanimación* (0.379), and *Ciencia y Tecnología Farmacéutica* (0.379). For 35 journals the immediacy index was 0, as they received no citations in 2001.

Table 3 displays the journals from the sample that cited articles published in ARCHIVOS DE BRONCONEUMOLOGÍA. Citations came from 13 different publications, and ARCHIVOS DE BRONCONEUMOLOGÍA was the main provider of citations (87), followed by *Atención Primaria* (12) and *Revista Clínica Española* (11).

Journals cited in ARCHIVOS DE BRONCONEUMOLOGÍA are displayed in Table 4. Apart from the 87 self-citations to the journal identified, the 63 citations in *American Journal of Respiratory and Critical Care Medicine* stand out. Other journals providing substantial numbers of citations were *Chest* (39) and *European*

TABLE 2
Impact Factors and Immediacy Indices of the Journals Analyzed (continued)*

Journals	Citations			Articles			IF	II
	1999	2000	2001	1999	2000	2001		
<i>Medicina Intensiva</i>	26	32	3	53	57	42	0.527	0.071
<i>Medicina Oral</i>	1	2	0	27	43	40	0.042	0
<i>Medifam. Revista de Medicina Familiar y Comunitaria</i>	6	3	1	43	63	77	0.084	0.012
<i>Methods and Findings in Experimental and Clinical Pharmacology (SCI)</i>	6	0	0	116	106	73	0.027	0
<i>Nefrología (SCI)</i>	47	25	0	102	95	116	0.365	0
<i>Neurocirugía (SCI)</i>	4	9	0	50	50	40	0.13	0
<i>Neurología</i>	28	21	2	62	72	56	0.365	0.035
<i>Nutrición Clínica</i>	4	3	1	27	22	15	0.142	0.066
<i>Nutrición Hospitalaria</i>	14	7	1	37	48	31	0.247	0.032
<i>Oncología (Barcelona)</i>	7	4	0	50	56	53	0.103	0
<i>ORL Dips</i>	0	1	0	32	35	27	0.014	0
<i>Pediatría Catalana</i>	0	2	2	39	41	38	0.025	0.052
<i>Pediatrika</i>	6	6	1	53	48	48	0.118	0.02
<i>Progresos de Obstetricia y Ginecología</i>	16	10	3	108	92	73	0.13	0.041
<i>Psiquis</i>	6	1	0	35	32	39	0.104	0
<i>Radiología</i>	3	10	2	128	102	102	0.056	0.019
<i>Rehabilitación</i>	8	6	4	41	58	60	0.141	0.066
<i>Revisiones en Cáncer</i>	2	3	0	38	40	33	0.064	0
<i>Revista Clínica Española (SCI)</i>	49	34	10	177	133	123	0.267	0.081
<i>Revista de Diagnóstico Biológico</i>	1	1	0	39	37	26	0.026	0
<i>Revista de la Sociedad Española del Dolor</i>	20	5	0	54	63	67	0.213	0
<i>Revista de Medicina de la Universidad de Navarra</i>	1	0	0	21	20	21	0.024	0
<i>Revista de Neurología (SCI)</i>	169	123	27	482	508	439	0.294	0.061
<i>Revista de Oncología</i>	7	0	0	38	39	54	0.09	0
<i>Revista de Ortopedia y Traumatología</i>	12	2	0	81	83	81	0.085	0
<i>Revista de Psiquiatría de la Facultad de Medicina de Barcelona</i>	0	0	1	16	33	23	0	0.043
<i>Revista de Toxicología</i>	1	2	1	5	24	15	0.103	0.066
<i>Revista Española de Anestesiología y Reanimación</i>	27	22	22	66	58	58	0.395	0.379
<i>Revista Española de Cardiología (SCI)</i>	113	144	49	176	181	169	0.719	0.289
<i>Revista Española de Drogodependencias</i>	8	5	0	20	19	19	0.333	0
<i>Revista Española de Enfermedades Digestivas (SCI)</i>	37	36	17	68	58	56	0.579	0.303
<i>Revista Española de Enfermedades Metabólicas Óseas</i>	8	9	1	32	35	27	0.253	0.037
<i>Revista Española de Geriátría y Gerontología</i>	20	13	0	59	66	47	0.264	0
<i>Revista Española de Medicina Nuclear</i>	10	6	2	56	42	47	0.163	0.042
<i>Revista Española de Pediatría</i>	13	0	7	87	76	66	0.079	0.106
<i>Revista Española de Quimioterapia</i>	16	52	1	40	36	32	0.894	0.031
<i>Revista Española de Reumatología</i>	18	24	2	52	63	43	0.365	0.046
<i>Revista Española de Salud Pública</i>	19	14	1	53	47	52	0.33	0.019
<i>Revista Iberoamericana de Fertilidad y Reproducción Humana</i>	3	3	1	64	34	36	0.061	0.027
<i>Revista Iberoamericana de Micología</i>	7	21	3	52	42	43	0.297	0.069
<i>Revista Latina de Cardiología</i>	0	1	0	26	25	28	0.019	0
<i>SD Revista Médica Internacional sobre el Síndrome de Down</i>	0	0	0	10	11	9	0	0
<i>Toko Ginecología Práctica</i>	1	0	1	48	42	48	0.011	0.02

*IF indicates impact factor; II, immediacy index; SCI, Science Citation Index, journals included in the 2001 issue of Journal Citation Reports.

Respiratory Journal (35). Most of the journals cited in ARCHIVOS DE BRONCONEUMOLOGÍA are related to the respiratory system, although some are general medicine publications (such as *New England Journal of Medicine*, *Lancet*, *Medicina Clínica*, *Nature*, *Atención Primaria*, and *British Medical Journal*), allergy and immunology (such as *Journal of Allergy and Clinical Immunology* and *Clinical and Experimental Allergy*), and oncology (*Seminars in Radiation Oncology*).

Discussion

Although much has been written about citation analysis and the calculation of impact factors for Spanish medical journals, authors have always limited themselves to particular journals or to particular specialties. Until the present study, no large sample of Spanish medical journals had been treated as a whole. Thus, the present analysis of indicators of scientific activity—citations

received, impact factors, and immediacy indices—has confirmed the leadership of certain journals and justified their positioning in international databases, particularly in the JCR. This is the case of ARCHIVOS DE BRONCONEUMOLOGÍA, which became a source journal for the SCI in 2001 and whose JCR-calculated impact factor will become available for 2003.⁴¹

The high percentage of citations received by journal articles confirms the important role of medical journals as the means by which Spanish medical research is communicated³² and situates them well above other types of cited documents, such as books, doctoral dissertations, conference presentations, and other even less used sources of information. The percentages we calculated are similar to those reported by other authors who analyzed indices for Spanish medical journals.^{16,20,22,25,31} The low rate of citation of dissertations might be related to difficulty of access to such sources of information—referred to as “gray literature” by documentalists because of their scarce visibility and distribution. Such difficulty of access may also be the reason why conference papers are seldom cited, as only a limited number of conference proceedings volumes are usually distributed to those who attend and there is no system for systematically indexing and distributing information about them.

The impact factors of Spanish journals can generally be considered moderate, given that none exceeded 1. The value we calculated for ARCHIVOS DE BRONCONEUMOLOGÍA is much higher than those estimated previously^{23,27,42}: 0.069 in 1996 but closer to 0.1 between 1997 and 2000. Those were international impact factors, however, calculated by using a specified range of journals or those considered source journals by the SCI.

It is striking that the Spanish journals covered by the SCI that are published in English (*Histology and Histopathology*, *The International Journal of Developmental Biology*, *Journal of Physiology and Biochemistry*, and *Methods and Findings in Experimental and Clinical Pharmacology*) are little-cited by Spanish journals and have low citation indices in spite of their relation to basic sciences, a category in which journals usually receive a large number of citations. Their scarce distribution in Spain and the difficulty many professionals have in reading literature in English might be the reasons for the low impact factors and immediacy indices.

The rate of self-citation in ARCHIVOS DE BRONCONEUMOLOGÍA is 18.3%. Self-citation occurs when authors, groups, or journals cite their own publications. Such citation is currently considered normal in science, given that authors who publish in a journal will cite it, because it publishes on topics related to the same area of knowledge. Self-citation of a journal can also be interpreted as a demonstration of an author's confidence in a journal. The reason for calculating the self-citation rate lies in what it reveals about the validity of the absolute count of all citations as an indicator of impact; moreover, abusing self-

TABLE 3
Spanish Journals in the Sample That Cite
ARCHIVOS DE BRONCONEUMOLOGÍA

Journals	1999	2000	2001	Total
<i>Anales de Medicina Interna</i>	8	0	0	8
<i>Anales del Sistema Sanitario de Navarra</i>	1	0	0	1
<i>Anales Españoles de Pediatría</i>	0	2	0	2
ARCHIVOS DE BRONCONEUMOLOGÍA	50	37	0	87
<i>Atención Farmacéutica</i>	0	3	0	3
<i>Atención Primaria</i>	9	2	1	12
<i>Investigación Clínica</i>	2	1	0	3
<i>Medicina Clínica</i>	4	1	1	6
<i>Medicina Intensiva</i>	1	0	0	1
<i>Medifam. Revista de Medicina Familiar y Comunitaria</i>	3	2	1	6
<i>Pediatría</i>	1	0	0	1
<i>Revista Clínica Española</i>	9	2	0	11
<i>Revista de Oncología</i>	1	0	0	1
Total	89	50	3	142

TABLE 4
Journals Cited in ARCHIVOS DE BRONCONEUMOLOGÍA

Journals	1999	2000	2001	Total
<i>Anales de Medicina Interna</i>	8	0	0	8
<i>American Journal of Respiratory and Critical Care Medicine</i>	38	25	0	63
ARCHIVOS DE BRONCONEUMOLOGÍA	50	37	0	87
<i>Chest</i>	13	26	0	39
<i>European Respiratory Journal</i>	17	16	2	35
<i>New England Journal of Medicine</i>	11	6	0	17
<i>Thorax</i>	9	7	0	16
<i>Journal of Thoracic and Cardiovascular Surgery</i>	12	2	0	14
<i>Annals of Thoracic Surgery</i>	5	5	0	10
<i>Lancet</i>	6	4	0	10
<i>Journal of Allergy and Clinical Immunology</i>	5	4	0	9
<i>Medicina Clínica</i>	7	2	0	9
<i>Seminars in Radiation Oncology</i>	8	0	0	8
<i>Respiratory Medicine</i>	6	0	0	6
<i>The International Journal of Tuberculosis and Lung Disease</i>	2	4	0	6
<i>Nature</i>	1	4	0	5
<i>Prevención del Tabaquismo</i>	0	3	2	5
<i>Clinical and Experimental Allergy</i>	2	2	0	4
<i>American Journal of Medicine</i>	3	0	0	3
<i>Atención Primaria</i>	0	3	0	3
<i>British Medical Journal</i>	1	2	0	3
<i>Clinics in Chest Medicine</i>	3	0	0	3
<i>Critical Care Medicine</i>	3	0	0	3
<i>Drugs</i>	0	3	0	3
<i>European Journal of Cardio-Thoracic Surgery</i>	2	1	0	3
<i>Journal of Antimicrobial Chemotherapy</i>	1	2	0	3
<i>The American Journal of Clinical Nutrition</i>	0	3	0	3
21 journals with 2 citations	27	14	1	42
63 journals with 1 cite	31	32	0	63
Total	263	207	5	475

citation is an indicator of the isolation of a group or community of scientists.^{5,14,36} The percentage of self-citation in ARCHIVOS DE BRONCONEUMOLOGÍA is similar to that of *Atención Primaria* (17.3%),⁴³ but greater than

that of *Medicina Clínica* (11.9%),¹⁶ *Adicciones* (8.5%)³¹, *Anales Españoles de Pediatría* (6.9%),⁴⁴ and *Gastroenterología y Hepatología* (6%).²⁰ Hyland⁴⁵ and Bonzi and Snyder⁴⁶ note that authors' reasons for citing the journal in which they publish articles are extremely complex.

The immediacy index of ARCHIVOS DE BRONCONEUMOLOGÍA places it in an intermediate position in comparison with other source journals. Immediacy, or promptness of citation, depends on a variety of factors, among them periodicity (weekly or biweekly journals are more likely to generate citations within the year than are journals issued monthly or quarterly), the number of articles published per issue, the slowness or speed of peer review and the editorial process, and above all the rapidity with which issues are distributed in the international scientific community.^{47,48} The availability of electronic editions can help to improve a journal's immediacy index, given that distribution is not subject to the delays involved in publishing and distributing paper editions.

A limitation of this study is that the period analyzed was only a single year and the results are likely to change over time as a result of possible shifts in patterns of scientific activity in Spain. Another is that it considered only citations made in Spanish journals (to obtain national impact factors). The findings of this study should be interpreted very cautiously, given that although there is a widespread notion that frequently cited journals and articles are better than those that are cited less often, that impression is only justified in certain cases.^{49,50}

Citation counts provide mainly a measure of the utilization of publications rather than their quality, given that authors do not cite only high quality articles but rather those they find useful to their own ends.²⁸ Citation behavior is influenced by many factors,⁵ some of which are scientific while others are formal or societal. An example is the phenomenon of obliteration by which a scientific work will no longer be explicitly cited once it becomes so widely known within a field of study that it comes to form an integral part of its body of knowledge—a fate shared by many works of great quality.^{4,5,12} Citation is also affected by language barriers and by availability and accessibility to researchers. Additionally, basic science journals tend to be cited more often than journals of applied research.^{5,12,18} Papers that establish a technique in a discipline or subspecialty or that propose experimental methods and applications will be more often cited than those that present theory, even if the latter are of higher quality.⁴⁹ An author's citing of a previously published article, therefore, is only a measure of the cited paper's visibility and its impact, not necessarily of its quality, importance, or usefulness.^{5,14,51}

The present study has contributed to a clearer understanding of how Spanish medical researchers use sources of information and it will serve as a basis for improving the way our scientific and medical publications are evaluated.

REFERENCES

1. Price DJS. Toward a model for science indicators. In: Elkana Y, Lederberg J, Merton RK, editors. Toward a metric of science. The advent of science indicators. New York: Wiley, 1978; p. 69-95.
2. Garfield E. Citation indexing. Its theory and application in science, technology and humanities. New York: Wiley, 1979.
3. López Piñero JM, Terrada ML. Los indicadores bibliométricos y la evaluación de la actividad médico-científica (I). Usos y abusos de la bibliometría. *Med Clin (Barc)* 1992;98:64-8.
4. López Piñero JM, Terrada ML. Los indicadores bibliométricos y la evaluación de la actividad médico-científica (II). La comunicación científica en las distintas áreas de las ciencias médicas. *Med Clin (Barc)* 1992;98:101-6.
5. Alexandre Benavent R, Porcel Torrens A. El factor de impacto de las revistas científicas. *Trastornos Adictivos* 2000;1:264-71.
6. Solari A, Magri MH. A new approach to the SCI Journal Citation Reports, a system for evaluating scientific journals. *Scientometrics* 2000;47:605-25.
7. Egghe LR, Rousseau R. A proposal to define a core of a scientific subject: a definition using concentration and fuzzy sets. *Scientometrics* 2002;54:51-62.
8. Buena-Casal G. La evaluación de la investigación científica: el criterio de la opinión de la mayoría, el factor de impacto, el factor de prestigio y "Los Diez Mandamientos" para incrementar las citas. *Anal Modific Conducta* 2002;28:455-76.
9. López Piñero JM, Terrada ML. Los indicadores bibliométricos y evaluación de la actividad médico-científica. IV. La aplicación de los indicadores. *Med Clin (Barc)* 1992;98:384-8.
10. Carpenter MP, Narin F. The adequacy of the Science Citation Index (SCI) as an indicator of international scientific activity. *J Am Soc Inf Sci* 1981;32:430-9.
11. Camí J. Impactología: diagnóstico y tratamiento. *Med Clin (Barc)* 1997;109:515-24.
12. Bordons M, Zulueta MA. Evaluación de la actividad científica a través de indicadores bibliométricos. *Rev Esp Cardiol* 1999;52:790-800.
13. West R, McIlwaine A. What do citation counts count for in the field of addiction? An empirical evaluation of citation counts and their link with peer ratings of quality. *Addiction* 2002;97:501-4.
14. de Granda Orive JJ. Algunas reflexiones y consideraciones sobre el factor de impacto. *Arch Bronconeumol* 2003;39:409-17.
15. Ortega Serrano M, Martínez León J, Sala Palau C. Autoboicot científico entre los cirujanos españoles; ¿por qué no nos citamos? *Cir Esp* 1992;51:3-7.
16. Alexandre R, Giménez Sánchez JV, Terrada ML, López Piñero JM. Análisis del consumo de información en la revista *Medicina Clínica*. *Med Clin (Barc)* 1994;103:246-51.
17. Baños JF, Casanovas L, Guardiola E, Bosch F. Análisis de las revistas biomédicas españolas mediante el factor de impacto. *Med Clin (Barc)* 1992;99:96-9.
18. Álvarez Sala JL, Prados C, Álvarez Sala R. El impacto de nuestras revistas. *Arch Bronconeumol* 1995;31:403-6.
19. Culebras JM, García de Lorenzo A. El factor de impacto de *Nutrición Hospitalaria*. *Nutr Hosp* 1995;10:189-91.
20. Alexandre Benavent R, Giménez Sánchez JV, Terrada Ferrandis ML, López Piñero JM. Análisis del consumo de información en la revista *Gastroenterología y Hepatología*. *Gastroenterol Hepatol* 1995;18:437-43.
21. González de Dios J, Mateos Hernández MA, González Casado I. Factor de impacto internacional, nacional y por especialidades: en busca del mejor indicador bibliométrico. *Rev Esp Pediatr* 1998;54:430-6.
22. Alexandre R, Navarrete M, Santamaría C, Benlloch Y, Cantos J, Terrada ML. Análisis de citas de las revistas morfológicas españolas (1997). *Arch Esp Morfol* 1998;3:119-32.
23. García Río F, Serrano F, Álvaro D, Ruiz Manzano J, Dorgham A, Xaubet A, et al. Estimación de los indicadores bibliométricos de repercusión de *Archivos de Bronconeumología*. *Arch Bronconeumol* 1998;34:531-5.
24. Amorós Rodríguez P, García Gutiérrez JF, Perea-Milla López E. Factor de impacto de las publicaciones biomédicas españolas incluidas en Medline. *Aten Primaria* 1999;24:492-4.
25. Porcel A, Alexandre R. ¿Tenemos lo que merecemos? Análisis de las citas españolas en la revista *Psiquiatría Biológica* (1994-1999). *Psiqiatr Biol* 2000;7:242-8.

26. Figueredo E, Villalonga A. Factor de impacto de la *Revista Española de Anestesiología y Reanimación* de los años 1997 y 1998. *Rev Esp Anesthesiol Reanim* 2000;47:393-9.
27. García Río F, Mayoralas S, Dorgham A, Granda JI, Perpiñá M, Casán P, et al. Análisis de la repercusión de *Archivos de Bronconeumología* a través del Science Citation Index. *Arch Bronconeumol* 2001;37:465-70.
28. Forriol Campos. El impacto (y su factor) de la *Cirugía Ortopédica*. *Rev Ortop Traumatol* 1999;2:81-3.
29. Orts Cortés MI, Eichart Martínez M, Cabrero García J. Factor de impacto en las revistas de enfermería. *Enferm Clin* 2002;12:266-72.
30. Granda Orive JI, García Río F, Gutiérrez T, Jiménez Ruiz CA, Solano Reina S, Sáez Valls R. Análisis y evolución de los indicadores bibliométricos de producción y consumo del área de tabaquismo a través de *Archivos de Bronconeumología* (período 1970-2000). Comparación con otras áreas neumológicas. *Arch Bronconeumol* 2002;38:523-9.
31. Porcel Torrens A, Castellano Gómez M, Valderrama Zurián JC, Aleixandre R, Choren S. Análisis de citas en la revista *Adicciones*. *Adicciones* 2003;15:309-19.
32. de la Cueva A, Aleixandre R, Rodríguez Gairín JM. *Fonts d'informació en ciències de la salut*. València: Universitat de València, 2001.
33. Morton L, Godbolt S, editors. *Information sources in the medical sciences*. London: Bowker-Saur, 1992.
34. Roper FW, Borkman JA, editors. *Introduction to reference sources in the health sciences*. Metuchen: Medical Library Association, 1994.
35. Tilley C. Medical databases and health information systems. *Ann Rev Inf Sci Technol* 1990;25:313-82.
36. López Piñero JM, Terrada ML. Los indicadores bibliométricos y la evaluación de la actividad médico-científica (III). Los indicadores de producción, circulación y dispersión, consumo de la información y repercusión. *Med Clin (Barc)* 1992;98:142-8.
37. Pulido M. Recomendaciones para la inclusión de una revista en el Index Medicus/MEDLINE. *Rev Esp Reumatol* 1996;23:130-5.
38. Aleixandre R. Procedimiento de selección de revistas en la base de datos IME/Índice Médico Español. *Rev Traumatol Dep* 2003; 1:93-4.
39. Information for publishers. Start-up process and requirements for new PubMed Central Journals [accessed 21/12/2003]. Available at: <http://www.pubmedcentral.nih.gov/about/pubinfo.html>
40. Testa J. The ISI database: the journal selection process. The ISI essays [accessed 26/09/2003]. Available at: <http://www.isinet.com/isi/hot/essays/selectionofmaterialforcoverage/199701.htm>
41. Perpiñá Tordera M, Casan Clarà P, García Río F, Sánchez de León M, Xaubet Mir A. Empieza el año del primer factor de impacto de *Archivos de Bronconeumología*. *Arch Bronconeumol* 2003;39:1.
42. Granda Orive JI. Análisis bibliométrico y caracterización de sus principales áreas temáticas (1970-2000) [tesis doctoral]. Valladolid: Facultad de Medicina, 2002.
43. Aleixandre R, Giménez Sánchez JV, Terrada Ferrandis ML, López Piñero JM. Análisis del consumo de información en la revista *Atención Primaria*. *Aten Primaria* 1996;17:321-5.
44. Aleixandre R, Giménez Sánchez JV, Terrada ML, López Piñero JM. Análisis del consumo de información en la revista *Anales Españoles de Pediatría*. *An Esp Pediatr* 1995;43:399-406.
45. Hyland K. Self-citation and self-reference: credibility and promotion in academic publication. *J Am Soc Inf Sci Technol* 2003;54: 251-9.
46. Bonzi S, Snyder H. Motivations for citation: a comparison of self-citation and citation to others. *Scientometrics* 1991;21:245-54.
47. Sittig DF, Kaalaassittig J. A quantitative ranking of the biomedical informatics serials. *Methods Inf Med* 1995;34:397-410.
48. Gupta BM. Analysis of distribution of the age of citations in theoretical population genetics. *Scientometrics* 1997;40:139-62.
49. Seglen PO. Citation frequency and journal impact: valid indicator of scientific quality? *J Intern Med* 1991;229:109-11.
50. Kostoff RN. The use and misuse of citation analysis in research evaluation. *Scientometrics* 1998;43:27-43.
51. White HD, McCain K. Bibliometrics. *Ann Rev Inf Sci Technol* 1989;24:119-86.