A bibliometric analysis of the *Farmacia Hospitalaria* journal (2001-2006)

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Resumen

Objetivo: Análisis bibliométrico de la revista *Farmacia Hospitalaria* en el periodo 2001-2006.

Método: Análisis retrospectivo de todos los artículos publicados en *Farmacia Hospitalaria* durante el periodo 2001-2006 y cálculo de los principales indicadores bibliométricos de producción, circulación, dispersión y consumo.

Resultados: Se analizan 416 artículos firmados por 1.515 autores. Predominan los originales con un crecimiento del 30%. El número de autores por artículo fue de 4,6 ± 2,3. Las comunidades autónomas con mayor producción fueron la Comunidad Valenciana, Cataluña, Madrid y Andalucía. Cuatro autores tienen un índice de productividad > 1, destacando un grupo de 15 autores que lo tienen > 0,75. Sólo el 14% de los artículos procedían de presentaciones a congresos y el 17% tenía financiación. Las áreas temáticas con mayor producción son farmacoterapia y seguridad. La demora en la publicación se mantiene constante. El índice de circulación en Medline fue de 0,74.

Conclusiones: *Farmacia Hospitalaria* ha mantenido o mejorado sus indicadores bibliométricos entre los años 2001 y 2006. Se detecta un aumento en la publicación de originales y cartas al director en los últimos años de acuerdo con las estrategias de la revista, así como una disminución de las revisiones literarias. Se detecta una cierta renovación generacional en los autores aunque se mantienen los mismos grandes productores. Las áreas temáticas y la procedencia geográfica de los autores se corresponden con las de mayor desarrollo de la especialidad en España.

Palabras clave: Análisis bibliométrico. Bibliometría. *Farmacia Hospitalaria.* Productividad. Circulación.

Summary

Objective: To carry out a bibliometric analysis of the *Farmacia Hospitalaria* journal from 2001 to 2006.

Method: A retrospective analysis of all of the articles published in *Farmacia Hospitalaria* from 2001-2006 was performed and the main bibliometric indicators for production, circulation, distribution and sales were calculated.

Results: 416 articles by 1,515 authors were analysed. Original articles were the most predominant with a growth of 30%. There were 4.6 ± 2.3 authors per article. The Community of Valencia, Catalonia, Madrid and Andalusia were the autonomous communities with the highest levels of production. Four authors had a productivity index of > 1, with one group of 15 authors having an index of > 0.75. Only 14% of articles were included in presentations to congresses and 17% had funding. The subject matters of drug treatment and safety had the highest production levels. The publication delay remained constant. There was a circulation index of 0.74 in Medline.

Conclusions: *Farmacia Hospitalaria* maintained or improved their bibliometric indicators between 2001 and 2006. There has been an increase in the publication of original articles and letters to the editor over recent years and this increase was in line with the journal's strategies. There has also been a decrease in literature reviews. There were some generational changes among the authors although the main authors remained the same. The subject matters and geographical origin of the authors corresponded to areas with the largest development of the specialty in Spain.

Key words: Bibliometric analysis (MeSH). Bibliometrics (MeSH). *Farmacia Hospitalaria* journal. Productivity. Circulation.

INTRODUCTION

The exponential increase of biomedical research has had a significant influence on scientific journals which are the main method of transmitting this knowledge. In Spain, significant changes have occurred in various bio-health specialty journals, and these have been in line with the effort to achieve an increase in production, visibility and impact, and with editorial strategies which attempt to improve the relative position of each of these aspects in a setting of increased competitivity[1].

Therefore, journals must carry out a bibliometric analysis in order to assess their internal situation, their relative position with respect to competition and the temporal evolution of the indicators as the result of the editorial strategies implemented.

The *Farmacia Hospitalaria* journal also deals with the changes that have taken place in the editorial setting with respect to the pharmacology and pharmacy areas. Throughout the history of the journal, editorial changes have been carried out in order to adapt to the setting. In addition, the corresponding bibliometric analyses have been performed. In 2005, an extensive bibliometric analysis was carried out covering the period from 1977 (the establishment of the journal) until 2000[2]. No other bibliometric evaluation has been published since this work, and therefore it was necessary to analyse the evolution of the journal since that date. Furthermore, following the changes to the editorial team in 2004, and the series of initiatives backed by the SEFH, other editorial changes have occurred which must be evaluated.

The aim of this study is to analyse the quality of the *Farmacia Hospitalaria* journal by analysing various bibliometric indicators for the period 2001-2006.

METHOD

A retrospective analysis of all of the articles published in the *Farmacia Hospitalaria* journal from January 2001 to December 2006 was carried out. The special editions (one per year) which include the scientific papers presented at the Annual Congress of the Spanish Society of Hospital Pharmacists (SEFH) were not included. A special supplement in the December 2004 journal (the only one in the study period) was included in the analysis. The hard copy of the journal was used as the information source to carry out this work.

Scientific publications were analysed using the total count method in which each document was integrally assigned to each of the named institutions and authors. In order to create a list of the most productive authors, a filtering and standardisation process was carried out to establish authors with six or more works, linking this author to their work centres in order to avoid errors when transcribing authors' names.

The following variables were considered: year of publication, number of authors, volume/issue of the journal, type of article, prior presentation at congresses, authors' names, hospital, department and origin, date of publication, date of receiving the article, date of accepting the article, subject matter of the article, funding, number of references, number of references within the previous five years, distribution of references according to type of article, and the number of references to *Farmacia Hospitalaria*.

A classification of the areas of knowledge of the authors was performed in order to establish the subject matters of the works. All of the works were assigned to an area of knowledge of one of the authors according to this list.

The town/city indicated in the main author's contact information was considered when establishing the autonomous community from which the work originated.

The publication delay of an article was defined as the period between receiving the article and its publication in the journal. This is considered as the total period of time between receipt of the article and its final acceptance (acceptance delay) and the time between its acceptance and publication (publication delay).

Each article was codified and registered by means of a Microsoft Access 2002® database application.

The bibliometric indicators analysed were classified according to the following categories:

1. *Bibliometric indicators of production*. Number of articles published, number of authors per article, productivity index according to autonomous community (logarithm of the number of articles published by an autonomous community within a period of time), subject matters of the articles, type of article, number of references per article, publication delay and average accumulated growth in the study period by means of the following equation: $T = (Y_k/Y_i)^{1/k-1} \cdot 100$; where Y_i and Y_k, correspond to the number of articles published in the first and last year of the study period respectively.

2. *Circulation indicators*. Number of circulating articles, circulating productivity index (logarithm of the number of circulating works in the databases) and circulation index (quotient between the number of circulating articles and the number of articles published). These parameters were obtained from the Spanish Medical Index (IME) and Medline databases. The consultations were carried out during the week of 2 to 6 April 2007.

3. *Distribution and sales indicators*. Price Index (percentage of references within the previous five years), isolation index (percentage of Spanish references), self-citation percentage, type of references and distribution.

RESULTS

A total of 416 articles from 37 issues (69.5 ± 10.0 articles/year, 11.7 ± 1.5 articles/issue) by 1,515 authors

were analysed. The journal is published every two months. The articles were divided into 8 categories: originals (39%), editorials (16%), letters to the editor (13%), reviews (10%), brief originals (7%), special articles (6%), and others (8%). Figure 1 shows the evolution during the study period. The annual number of works published as letters has increased by 633% between 2001 and 2006. Original works corresponded to 30% and editorials to 20%. The average percentage growth rate of scientific production during this period was 5.4%. This rate remained stable during the years 2000 to 2003, with a mean number of 60.3 ± 0.6 articles per year, From 2004, there was a significant increase ($p < 0.05$) with an inter-period variation index of 22.8% (78.7 ± 0.6 articles per year).

There were 4.6 2.3 authors per article, and no significant differences were observed during the study period. 87% of the works were carried out by six or fewer authors. Editorial articles and those classified as "other" were excluded from this analysis since these were articles drafted at the request of the editor or editorial committee of the journal. The articles classified as "other" include articles published under the heading "drug safety" which were part of a fixed section of the journal. Original articles had the highest number of authors (5.2 ± 2.4), followed by brief originals (4.9 ± 1.7), reviews (4.3 ± 2.1), special articles (3.4 ± 2.0) and letters to the editor (3.2 ± 1.6). Ten articles were produced by work groups.

Figure 2 shows productivity per autonomous community during the six years of the study in addition to the productivity index and contribution percentage. Eleven articles originate from South America (6 from Argentina, 4 from Brazil and 1 from Colombia).

With respect to productivity per author, one group of 15 authors stands out. However, only 4 main authors were identified (productivity index ≥ 1), excluding editorials and "other" articles from this analysis (Table I). The transitivity index was 38%. Some 580 authors only collaborated in a single publication.

Table II shows the distribution according to subject matter of the various types of articles published in the *Farmacia Hospitalaria* journal. 7% of the articles were carried out with public (3%) or private (4%) funding. Furthermore, 57 articles (14%) originated from previous papers presented at congresses. During 2001-2003, this percentage remained constant (12%), and increased over the following years to 15, 14 and 17%, respectively.

Figure 3 shows the publication delay of the articles according to year and type of article. The greatest delay occurred with brief originals (244 ± 96 days) and original articles (226 ± 125 days). However, differences in the publication delay according to type of article are not significant.

Table III shows the circulation indicators obtained from the Spanish Medical Index (IME) and Medline databases.
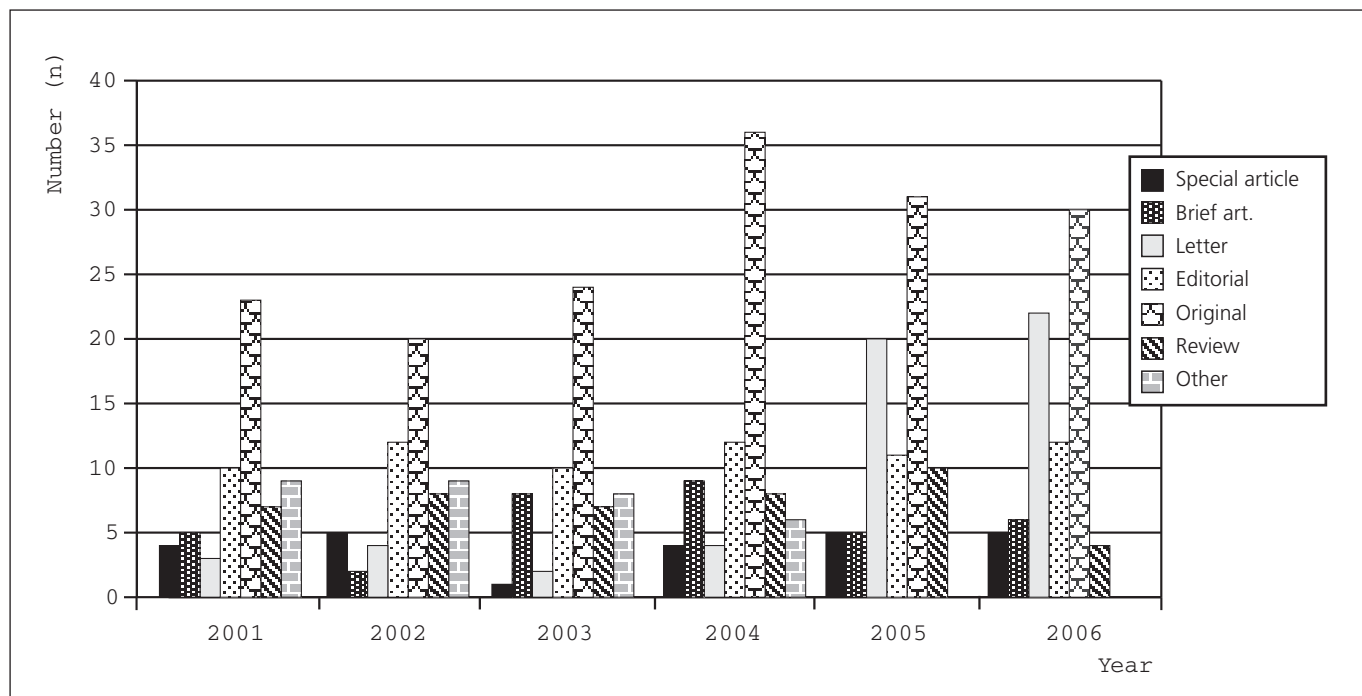

Fig. 1. Annual evolution of the number of articles published in the Farmacia Hospitalaria journal (2001-2006) according to the type of article.
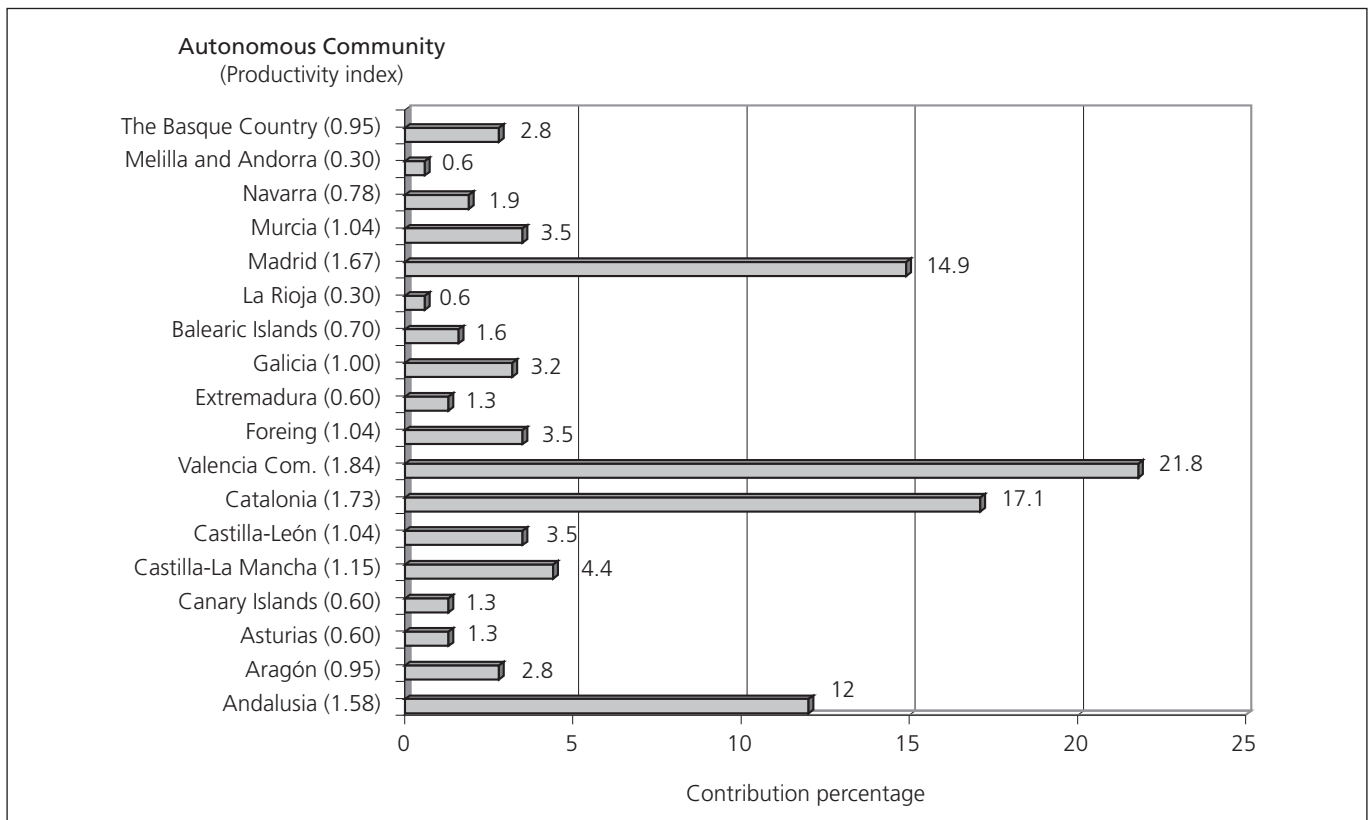
Fig. 2. Productivity indicators according to Autonomous Community for the period 2000-2006. Contribution percentage and productivity index.

Table I. Distribution of the main contributors (authors) of the *Farmacia Hospitalaria (2001-2006)*

Authors	Number of articles	Productivity index
Poveda JL	13	1.11
Alós M	12	1.08
Codina C	12	1.08
Navarro A	10	1.00
Borras J	9	0.95
Ribas J	9	0.95
Jiménez NV	8	0.90
Font I	7	0.84
García C	7	0.84
Martínez MJ	7	0.84
Pérez J	7	0.84
Delgado O	6	0.78
Ferriols R	6	0.78
Herreros A	6	0.78
Valladolid A	6	0.78

Figure 4 shows the main characteristics of the references used by the authors of the articles published in *Farmacia Hospitalaria*. No significant differences were seen among the indicators evaluated. Quotes to periodical biomedical journals were the main bibliographical reference used (68 ± 26%), and there is a growing trend (9%) linked to an annual average variation index during the period

2005-2006 with respect to the initial study period (65 compared to 71%) The same trend can be seen in the Price index, with a variation rate of 8.6%. However, significant differences can be seen in all of these aspects, when analysed according to type of article (Fig. 5).

DISCUSSION

This work attempts to carry out a bibliometric analysis of the *Farmacia Hospitalaria* journal beginning at the point where the extensive analysis by León Villar[2] left off. Thus, it provides a continuous view of the evolution of the *Farmacia Hospitalaria* journal from its establishment in 1977 to date.

Currently, bibliometric or scientific indicators are accepted as a valid indirect indicator of the results of a scientific community's activity[3]. They are extremely useful when used correctly. Bibliometric indicators are characterised as follows: partiality, each indicator displays an aspect of the assessment which is being carried out; convergence, all of the indicators converge to provide overall knowledge of the activity (as a result, the use of a high number of indicators is recommended to avoid having very biased knowledge); relativity, the information sup-

Table II. Thematic analysis according to type of article

Subject matter*	Type of article							
	Special articles	Brief articles	Letter	Editorial	Original	Review	Other	Total n (%)
Drug treatment	3	8	14	18	27	31	12	113 (27.2)
Drug safety	2	12	23	3	23	3	21	87 (20.9)
Pharmacoeconomics	1	0	2	2	21	1	0	27 (6.5)
Pharmacoepidemiology	0	3	0	5	18	1	0	27 (6.5)
Production and control	1	1	4	4	9	3	0	22 (5.3)
Quality control	2	0	1	3	14	0	0	22 (5.3)
Pharmaceutical care in hospitals	3	0	1	3	12	1	0	20 (4.8)
Pharmacokinetics	1	2	4	0	8	1	0	16 (3.8)
Pharmaceutical care outside hospitals	2	1	0	1	11	0	0	15 (3.6)
Management	2	0	0	3	9	0	0	14 (3.4)
Artificial nutrition	0	0	0	2	3	2	0	7 (1.7)
Training	1	0	1	2	2	0	0	6 (1.4)
Other	6	1	5	21	7	0	0	40 (9.6)
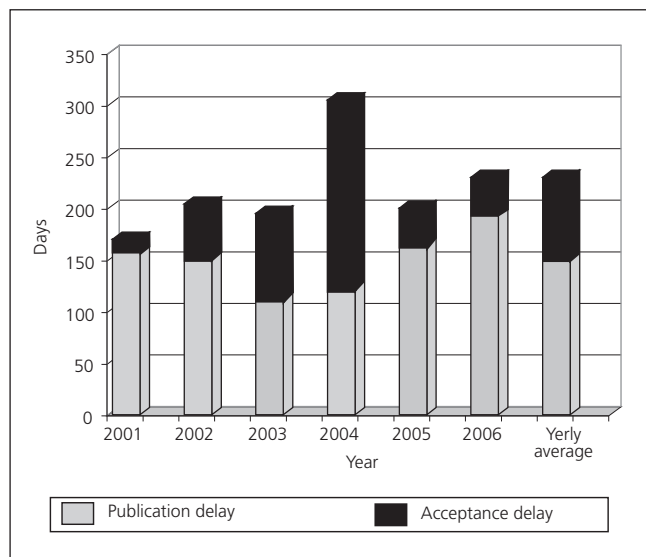
Fig. 3. Publication delay in Farmacia Hospitalaria journal articles.

Table III. National and international circulation indicators for the period 2001-2006, usig the Spanish Medical Index and Medline databases, respectively

	Spanish Medical Index (IME)	Medline*
No of circulating articles	252	308
Circulating productivity index	2.40	2.49
Circulation index	0.61	0.74

*:The first issues of *Farmacia Hospitalaria* indexed in Medline correspond to the September/October 2002 issue.

plied by the indicators is relative to the field analysed, and should not be applied to other fields[4]. Consequently, comparisons should not be made between different subject matters, since the publication and productivity trends of the authors vary according to the area.

This work is focused on the evaluation of the actual journal (not its authors), and on providing knowledge to its readers about how the journal has evolved and about its current position. The number of articles published in *Farmacia Hospitalaria* per year confirm the trend detected in the study of the period 1977-2000[2], which went from 85.6 (1988-1992) to 75.8 (1993-2000) and 69.5 (2001-2006). Nevertheless, over the last three years, there has been a 22% increase in the number of articles published. The scientific publication capacity of any journal consists of the relation between its format structure, i.e. the number of total possible pages in one year (in turn related to the periodicity and the number of pages in each issue), and the maximum word count of the articles specified in the rules for publication. The current format of *Farmacia Hospitalaria* allows for the publication of approximately 70 to 90 articles per year. The editorial team in charge since 2004 have reduced the word count of various types of articles in the rules for publication and are aiming to publish more structured and brief articles. This has made it possible to increase the number of articles published per year since 2004 and it is hoped that there will be a progressive increase over the coming years until this reaches 90 articles per year.

Original articles are the most frequently published (39%), as is the case in other biomedical journals with percentages ranging between 46 and 55%[5-7]. Furthermore, there has been an increase in absolute value, with a mean of 30 original articles/year, higher than all previous periods, confirming the importance of this type of article in *Farmacia Hospitalaria*. Other significant aspects are the increase in letters to the editor from 2005 and a decrease in the number of reviews, probably due to changes in the editorial policy of the journal with a tendency to include systematic reviews which are published as original articles, while rejecting traditional literary reviews.
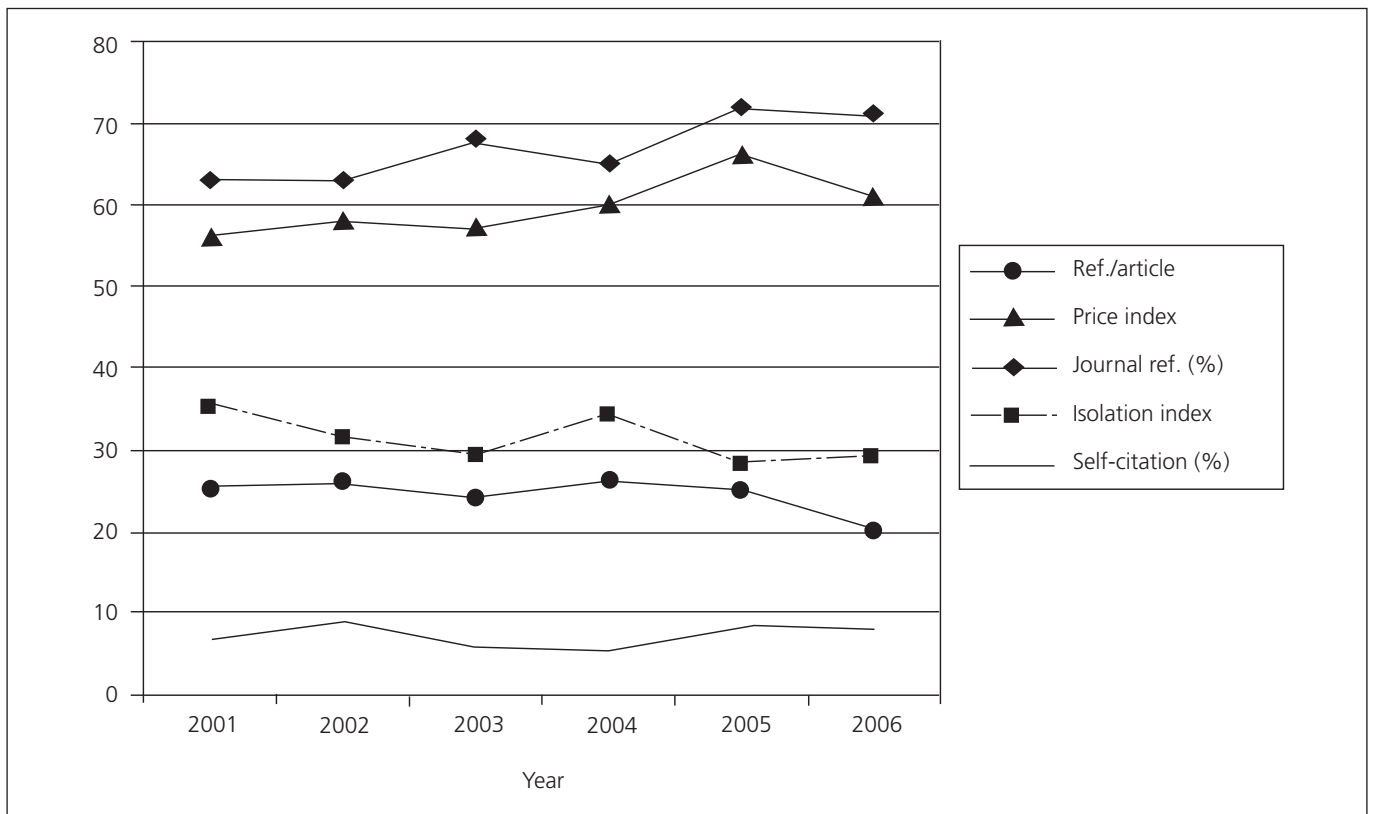
Fig. 4. Analysis of the bibliographical references according to year. Mean number of references per article, Price index, percentage of references per article to periodical scientific journals, isolation index and percentage of self-citations.
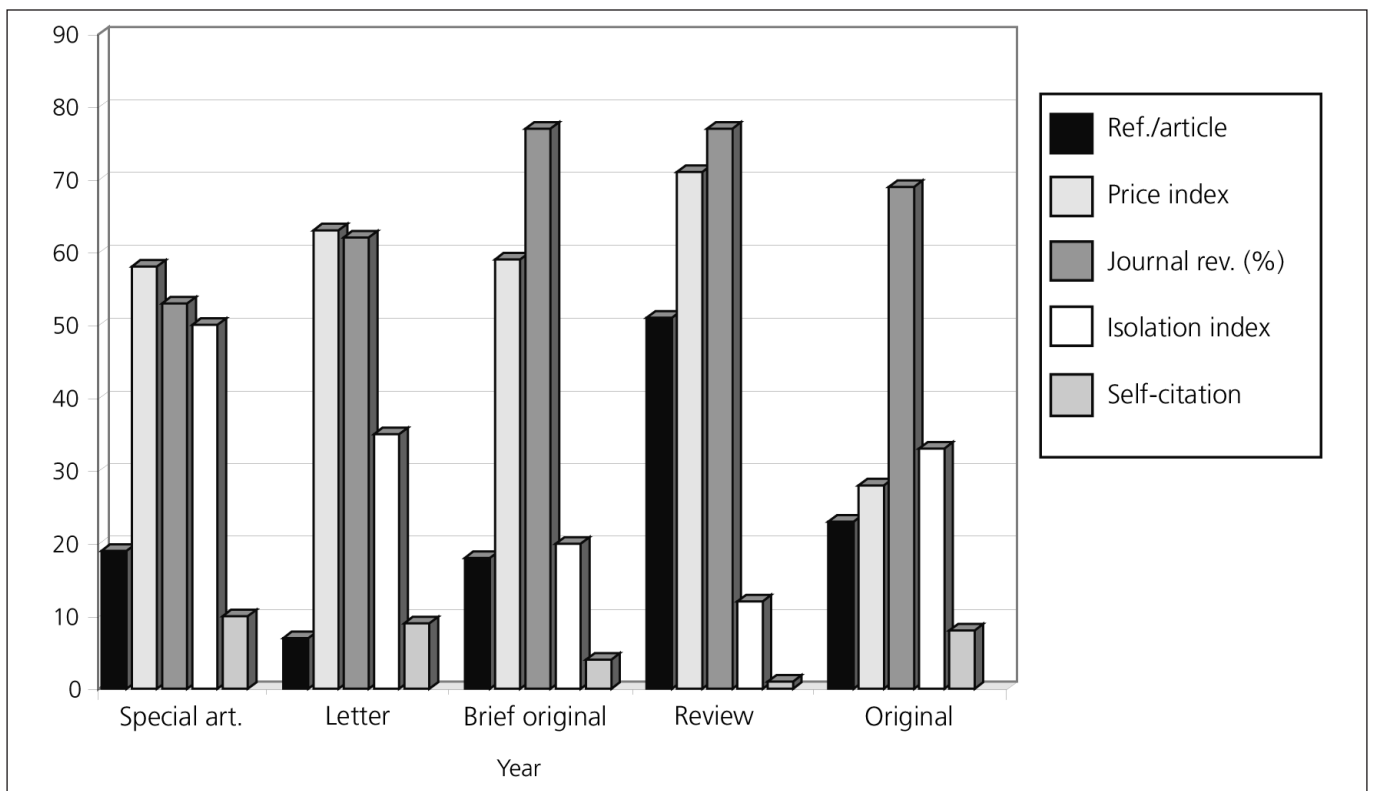

Fig. 5. Analysis of the bibliographical references according to type of article. Mean number of references per article, Price index, percentage of references per article to periodical scientific journals, isolation index and percentage of self-citations.

The analysis of the number of authors per article shows an increase in the index of authors per work compared to the calculations made by León Villar[2]. This value (4.6) contrasts with that obtained in the period 1977-2000 (3.19). This difference is due to that fact that editorials and "other" articles (which have a smaller number of authors per work) were excluded from our analyses. Indeed their inclusion modified this value, with the index of authors per work decreasing (3.9 ± 2.5). In any case, the annual trend continues to grow, although it is somewhat less than the trend forecast by León Villar. The increase in the number of authors per work has been dealt with by other authors, and corresponds to the greater complexity in clinical and scientific research. However, a control process is carried out when attributing authorship. Only authors who have contributed in a significant way to the work and who are able to critically defend any aspect of the work are included in the list of authors. In our study, only 13% of works were carried out by more than six authors; this value is similar to that published in the *Revista Española de Salud Pública* for the study period of 1991-2000[7]. Nevertheless, it is much lower than the value of 31% recorded in the Institute of Scientific Information (ISI)[8] databases with regard to the bibliometric analysis of scientific publications in matters of health sciences and biomedicine in the Community of Valencia, or the value published in the *Revista Española de Quimioterapia* (26%)[6].

With respect to scientific publications per Autonomous Community, four communities contributed 54% of total publications with 154 articles (22 from the Community of Valencia, 17 from Catalonia, 15 from Madrid and 12% from Andalusia). Editorials and "other" articles were excluded from this analysis, since these were usually carried out at the request of the journal editor, and may therefore lead to a bias in the results. The importance of these four communities was already evident in the studies carried out by León Villar[2] and by Ferriols et al. in their analysis of original articles published in *Farmacia Hospitalaria* during 1994-1999[9]. Furthermore, in the study by Camí et al. on Spanish scientific publications in Health Sciences and Biomedicine from 2000-2004, these four autonomous communities were the highest contributors of articles representing 51% of the total Spanish publications[1]. It is possible that this distribution is linked to the populations of each of these autonomous communities within the overall Spanish population, with a greater number of pharmacy hospital specialists based in these areas.

Castilla-La Mancha contributed 4.4% of articles, and this figure represents a significant increase in its presence in *Farmacia Hospitalaria* compared to the period 1977-2000 (when it contributed 1.08% and was positioned in eleventh place). International publications in *Farmacia Hospitalaria* represent 3.4% of the total.

The results obtained show that only two of the authors considered as the main contributors in the period 1977-2000 (Alós M and Jiménez NV) were among the main contributors in the period 2001-2006. A further six authors were among the main contributors in *Farmacia Hospitalaria*. The presence of 7 new authors with a greater number of publications with respect to the period 1977-2000, indicates a certain level of generational changes in the scientific production of *Farmacia Hospitalaria*. Consequently, the transitivity index was 38%, greater than 28.6% for the period 1977-2000. The increase in this index reflects the higher presence of authors who have published one article, which could indicate that a greater number of authors have contributed to *Farmacia Hospitalaria*. This index reaches 63.5% when scientific production is assessed in the ISI databases of the Community of Valencia, which reflects a greater difficulty to get published in these journals[8].

The subject matter analysis of *Farmacia Hospitalaria* reflects two subjects of particular interest: pharmacotherapy and drug safety, which correspond to almost 50% of publications. Nevertheless, if original articles are analysed, we can see the high percentage of pharmacoeconomic studies published in this period (13%) in addition to the high number of pharmaceutical care studies both within and outside the hospital setting (14%). The results confirm that letters to the editor are the main form of communication of adverse drug reactions, reporting of adverse drug events and drug safety.

One extremely important aspect for authors of scientific publications is the time that the editorial process of a journal will take to publish a certain article. These delays are inherent in the actual editorial and peer review processes which are carried out in *Farmacia Hospitalaria*. The publication delay in *Farmacia Hospitalaria* seems to have stabilised at 224 ± 115 days during the study period. The increase seen in 2004 (303 ± 74 days) possibly reflects a change in the editorial team of the journal and the lack of an organisational/editorial structure which would prevent these delays at the time of changeover. Nevertheless, these values are similar to those published in other journals[10,11]. Brief originals have the longest publication delay in *Farmacia Hospitalaria*, probably due to two main factors: the limited number of brief originals published in each issue and the fact that some brief originals have been restructured from articles which were initially designed for another format due to recommendations following the review process.

The national circulation index of the journal has increased to 0.61. The lower circulating productivity index (2.40 with respect to 2.63 for the period 1977-2000) is due to the difference in time studied (6 years with respect to 24 years). Despite the fact that the IME did not include any reference to *Farmacia Hospitalaria* during the years 1977-1983, 1990-1992, 1998-2000,

this index reflects the accumulated number of circulating articles in a specific database, showing that the greater the study period, the greater the circulating productivity index. This bias is avoided with the circulation index, which considers the articles included in the database with respect to the number of articles published during a period of time. During all of the years within the study period 2001-2006, the IME included references to *Farmacia Hospitalaria*, but not all of these were as reflected in the circulation index. Consequently the circulation index in Medline is greater than that in the IME. Medline included 100% of the articles published in the database since 2003, making up for the lack of inclusion in 2001 and the inclusion of only 18% of the articles published in 2002. The first articles from *Farmacia Hospitalaria* which appeared in Medline correspond to September 2002. It seems odd that the circulation index in an international database such as Medline is 1 (inclusion of 100% of the articles published) for the period 2003-2006, and yet it went from 0.63 in 2001 to 0.42 in 2006 in the IME.

The number of references per work appearing in biomedical journals is accepted as being around 15, although for originals, the number of references is between 20 and 40[2,9]. The values obtained in our study are within these parameters. Furthermore, during the review process, the maximum number of references according to type of article is assessed and adjusted to the journal's rules for publication. The review articles which do not have limitations in this aspect have a greater number of references per article. Scientific journals are the most regularly consulted bibliographical source, with values close to 70%, similar to those published for other journals such as *Revista OFIL*[12] (66%), *Farmacia Clínica* (73%)[13] or *Atención Primaria* (68.3%)[14]. The differences in the values published by León Villar (80%) may be the result of the exclusion of editorial and "other" articles from this analysis, which usually include a higher percentage of bibliographical references to periodical journals[2].

The isolation index is very high with an average value of 30.8%, close to that described for *Farmacia Clínica* (32%)[13] which is much lower than that for the *Revista OFIL*[11]. Nevertheless, this value contrasts with the value of 17.7%[2] obtained by León Villar in his study, which is nearer to the overall isolation index of Spanish medical journals (13.55% according to López y Terrada)[15]. This difference could be due to the extensive length of the study period (24 years) and that the scientific production authors of *Farmacia Hospitalaria* used more foreign references during the 70-80's, since there were very few Spanish bibliographical references. Consequently, in the study by Ferriols et al. on original articles in *Farmacia Hospitalaria*, the isolation index was around 25%[9]. In any case, this value is very high for a country such as Spain, which has a lower number of scientific publications than other countries such as Germany and France with indexes of 16%[2].

The Price index allows an evaluation of the contemporaneity of the references used. The annual average value obtained (60.5%) is slightly lower than the value of 63.5% corresponding to the period 1977-2000[2], although there appears to be a growing trend during the period 2001-2006. Self-citation has maintained a more or less constant level throughout the period (always below 10%, which represents an appropriate value). Currently, the impact factor as a main bibliometric index is particularly relevant, and as a result some journals have adopted the strategy of directly or indirectly increasing the self-citations in order to increase this factor. This has not been the case for *Farmacia Hospitalaria*.

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