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Macedonian Medical Journals Have Very Limited Scientific Influence

Mirko Spiroski[1], Jean Gogusev[2]

[1]Institute of Immunobiology and Human Genetics, Faculty of Medicine, University "Ss Kiril and Metodij", Skopje, Republic of Macedonia; [2]INSERM U507, Hôpital Necker-Enfants Malades, Paris, France

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Correspondence:
Mirko Spiroski, MD, PhD
Institute of Immunobiology and Human Genetics, Faculty of Medicine, University "Ss. Kiril and Metodij",
1109 Skopje, PO Box 60,
Republic of Macedonia
Tel.: +389-2-3110556
Fax: +389-2-3110558
e-mail: mspiroski@yahoo.com

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Abstract

Aim. The aim of this report was to evaluate the Macedonian medical journals for their scientific influence according to the internationally recognized citation metrics indexes.

Material and methods. Macedonian medical journals were analyzed, and eight of them fulfilled criteria for more detailed study of their scientific influence. Citation metrics indexes *h-index, g-index, hc-index, hI-index,* and *hI, norm* were performed using *Publish or Perish*, a software that retrieves and analyses academic citations. Macedonian medical journals were then compared to the *Croat Med J*.

Results. Only three Macedonian medical journals were indexed in Medline/PubMed (*Maked Med Pregl, God zb Med fak Skopje*, and *Prilozi*) and only one is indexed in Index Copernicus (*Maced J Med Sci*). Most of Macedonian medical journals are not members of the international organizations and do not follow international standards for scientific publications. All Macedonian medical journals have 5 to 10 times smaller citation metrics indexes (*h-index, g-index, hc-index, hI-index,* and *hI, norm*) if compared with *Croat Med J*. There are not big differences in citation metrics indexes between Macedonian medical journals.

Conclusion. Macedonian medical journals have very limited scientific influence and their Editorial Boards are obliged to improve quality of their published manuscripts, and to adhere to international standards for scientific journals, which will result in their greater visibility and scientific influence.

Introduction

Scientific influence of the medical journals can be measured by traditional bibliometric indicators or by citation metrics. The traditional bibliometric indicators of research performance, such as total number of papers or total number of citations have some problems. The most commonly used source of bibliometric data is Thomson ISI Web of Knowledge, in particular the (Social) Science Citation Index and the Journal Citation Reports (JCR). For journals, the most commonly used metric is the Journal Impact Factor as calculated in the Journal Citation Reports, whilst for individual academics it is the number of citations as reported in the Thomson ISI (Social) Science Citation Index (1, 2). The indexes used in this paper were originally used by natural scientists to measure research prolificacy of scientists with alternative source of data (Google Scholar, GS) and are believed to overcome some of these problems (3, 4).

The **h-index**, also defined as Hirsch index or Hirsch number, the h-index simultaneously measures the quality and sustainability of an academic's research output, and to some extent, the diversity of his/her research. If a scholar has published five papers with at least five citations each, he/she is said to have an index of five. The index is better than simpler measures such as the total number of citations or publications, because it distinguish scholars who are influential from those who publish many papers but are not influential. In addition, single papers receiving many citations (5, 6) do not affect h-index.

To overcome the shortcomings of the h-index, Egghe, 2006 proposed **g-index** to measure research productivity of scientists based on their publications. The g-index also uses the distribution of citations received by a given researcher's publications as the basis of calculations, but it gives more weight to highly cited papers (7).

The **hc-index** is contemporary h-index that adds an age-related weighting to each cited article of a researcher by giving relatively less parametrized weight to his/her earlier publications. The weighting is parametrized - the *Publish or Perish* implementation uses *gamma*=4 and *delta*=1. This means that citations received by an article published during the current year accounts four times while the citations received by an article published 4 years ago accounts only one time (citations received by an article published 6 years ago, accounts only 0.67 (i.e., 4/6) times, and so on) (8).

The **hI, norm index** is a modification of the h-index described above formulated by developers of the *Publish or Perish* software. To calculate this index, the number of citations for each paper is first normalized by dividing the number of citations received by a paper by the number of authors for that paper. The *hI, norm* is than calculated as the h-index of the normalized citation counts. The approach more accurately accounts for any co-authorship affects that might be present in the index. It is better approximation of the per-author impact, which is what the original h-index set out to provide (9).

Age-weighted citation rate (**AWCR, AWCRpA**) and **AW-index** were inspired by Bihui Jin's note (10). The *AWCR* measures the number of citations to an entire body of work, adjusted for the age of each individual paper. It is an age-weighted citation rate, where the number of citations to a given paper is divided by the age of that paper. Jin defines the *AR-index* as the square root of the sum of all age-weighted citation counts over all papers that contribute to the h-index. However, in the *Publish or Perish* implementation it is sum over all papers instead, because this represents the impact of the total body of work more accurately. (In particular, it allows younger and yet less cited papers to contribute to the AWCR, even though they may not yet contribute to the h-index.) The AW-index is defined as the square root of the AWCR to allow comparison with the h-index; it approximates the h-index if the (average) citation rate remains more or less constant over the years. The per-author age-weighted citation rate (*AWCRpA*) is similar to the plain AWCR, but is normalized to the number of authors for each paper.

The aim of this report was to analyze Macedonian medical journals, to assess their scientific influence and to compare them with the *Croat Med J.*

Material and Methods

Selection of Macedonian medical journals

There are 12 medical journals in Macedonia. We analyzed them all and we chose eight of them (Table 1) for futher investigation of their scientific influence based on the following criteria: national periodical publication; quality of the professional and/or scientific content; consistent editorial policy; regular peer review of the submitted papers; and high level of bibliographic and printing standards.

Makedon Med Pregl or *Mak Med Pregled* is the longest-standing journal in the field of medicine in Macedonia. *Makedon Med Pregl* was established by the Macedonian Medical Association, later Federation of Medical Associations, and today is again the organ of the Macedonian Medical Association. *God Zb Med Fak Skopje* is worthy of credit for its affirmation of the Medical Faculty in Skopje the quality of the scientific staff and its teaching activity. Since 1977, it has been re-named into *Mac J Med*. *Prilozi* is the official journal of Macedonian Academy of Sciences and Arts (section of biological and medical sciences). In 2001 appeared the journal *Acta Chir Maced*, as an official journal of the Association of Macedonian Surgeons with an international influence. *Acta Morphol* is a publication of the Association of Macedonian Anatomists and Morphologists (11). *Physioacta* is a publication of the Society for Physiology and Anthropology. The youngest journal in the field of medicine in Macedonia is *Maced J Med Sci* published by the Institute of Immunobiology and Human Genetics at the Faculty

of Medicine in Skopje.

Croat Med J is an international peer reviewed journal open to scientists from all fields of medicine and related research, published by the Universities of Zagreb, Osijek, Rijeka and Split, Croatia (12, 13).

Regional or international medical publications issued in Republic of Macedonia are *Balkan Journal of Medical Genetics* and *BANTAO Journal* which are not included in this report. Macedonian medical journals that not fulfil the inclusion criteria are *Paediatrics:Review, Epilepsy, Acta Orthopedica et Traumatologica Macedonica, Vox Medici,* and *Medicus. The* biomedical journals from related fields such as *Makedonski Stomatoloshki Pregled, Macedonian Pharmaceutical Bulletin, Revista Stomatologjike Apolonia [Journal of Dentistry Apolonia],* and *Journal of Special Education and Rehabilitation* are not included in this report.

Citation metrics of Macedonian medical journals

This research compares the scientific influence of Macedonian medical journals in comparison with *Croat Med J*. Data for the research has been obtained online (September 22, 2008) from the public domain, using the *Publish or Perish* software program that retrieves and analyses academic citations of different academic authors or journals all over the world (3). The software makes use of Google Scholar to obtain the raw citation scores of a journal (4). It then analyses these and presents a large array of statistics such as (i) total number of papers, (ii) total number of citations, (iii) average number of citations per paper, (iv) average number of citations per author, (v) average number of papers per author, (vi) Average number of citations per year, (vii) Hirsch's h-index and related parameters, (viii) Egghe's g-index, (ix) the contemporary hindex, (x) the age-weighted citation rate, (xi) two variations of individual h-indices, and (xii) an analysis of the number of authors per paper (4). Comparisons with results using Thomson's World of Science ISI citations or with Scopus would be worthwhile but access to these systems was not available to the authors.

Results

Characteristics of selected Macedonian medical journals are given in Table 1. The oldest medical journal, first published in 1946, is the Macedonian medical review (*Makedon Med Pregl*). Eight years later, *God Zb Med Fak Skopje* was published whose name was changed into *Maced J Med* in 1999. The medical journal *Prilozi* edited by the Macedonian Academy of Sciences and Arts (section of biological and medical sciences), was published for the first time in 1980. The rest of the medical journals started with publication activity within the last six years (Table 1). Today, most of the Macedonian medical journals are printed in A4 format, except *Prilozi* and *Physioacta*,

Table 1: Characteristics of the selected Macedonian medical journals.

								
	Makedon Med Pregl	God zb Med Fak Skopje	Maced J Med	Prilozi	Acta chir Maced	Acta morphol	Physioacta	Maced J Med Sci
Format	B5/A4	B5/A4	A4	B5	A4	A4	B5	A4
First number	1946	1954	1999	1980	2002	2004	2007	2008
Last number	2007	1998	2007	2008	2004	2008	2008	2008
Papers language	Mac	Mac/ Ser /Eng/ Fra/ Ger	Mac/ Eng	Eng	Mac/ Eng	Mac/ Eng	Mac/ Eng	Eng
Abstracts language	Mac/ Eng	Mac/ Eng	Mac/ Eng	Mac/ Eng	Mac/ Eng	Mac/ Eng	Mac/ Eng	Eng
Frequency	Semi-annual	Annual	Semi-annual	Semi-annual	Semi-annual	Semi-annual	Semi-annual	Quarterly

which are printed in B5 format. At the time of our analysis (September, 2008), the last number of *Acta Chir Maced* was published in 2004 (probably ceased its activity), *Makedon Med Pregl* and *Maced J Med* in 2007 (they are late), and the rest of the journals during 2008 (Table 1).

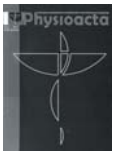
Macedonian medical journals are publishing full papers in one language, either in Macedonian (*Makedon Med Pregl*) or English (*Prilozi* and *Maced J Med Sci*)), bilingually in Macedonian and English (*Maced J Med* and *Acta Chir Maced*), or polylingually (*God Zb Med Fak Skopje* in Macedonian, Serbian, English, French or English; *Acta Morphol* and *Physioacta* in Macedonian or English). Most of the journals published abstracts in Macedonian and English language. The journals are issued semiannually, except *Maced J Med Sci* that is published quarterly (Table 1).

International standards fulfilled by Macedonian medical journals are presented in Table 2. All medical journals has print ISSN, and only *Maced J Med Sci* have online ISSN. Although three medical journals (*Makedon Med Pregl*, *Prilozi*, and *Maced J Med Sci*) have WEB sites, two of them (*Prilozi* and *Maced J Med Sci*) published electronic versions of the papers, and one have electronic submission of manuscripts (*Maced J Med Sci*).

Three Macedonian medical journals are indexed in Medline/PubMed (*Makedon Med Pregl, God Zb Med Fak Skopje*, and *Prilozi*) and one is indexed in Index Copernicus (*Maced J Med Sci*). Most of Macedonian medical journals are not members of the international journal organizations (ICMJE, WAME, COPE, OASPA) and do not follow international standards for scientific publications. Only *Maced J Med Sci* is full member of all international organizations (Table 2).

The Citation metrics of Macedonian medical journals (September 22, 2008) compared with *Croat Med J* is shown in Table 3. Only three Macedonian medical journals are included in the citation metrics (*God Zb Med Fak Skopje, Prilozi* and *Makedon Med*

Table 2: International standards fulfilled by selected Macedonian medical journals.

								
	Makedon Med Pregl	God zb Med Fak Skopje	Maced J Med	Prilozi	Acta chir Maced	Acta morphol	Physioacta	Maced J Med Sci
Print ISSN	0025-1097	0065-1214	0065-1214	0351-3254	1409-5181	1409-9837	1857-5587	1857-5749
Online ISSN	No	No	No	No	No	No	No	1857-5773
WEB site	Yes	No	No	Yes	No	No	No	Yes
Online Papers	No	No	No	Yes	No	No	No	Yes
Online submission	No	No	No	No	No	No	No	Yes
Medline/ PubMed	Old medline PubMed	Medline v11, 1964-v25, 1979 PubMed v11, 1964-v25, 1979	No	Medline v25n1-2, 2004- PubMed v25n1-2, 2004-	No	No	No	No
Index Copernicus	No	No	No	No	No	No	No	Yes
ICMJE	No	No	No	No	No	No	No	Yes
WAME	No	No	No	No	No	No	No	Yes
COPE	No	No	No	No	No	No	No	Yes
doi>	No	No	No	No	No	No	No	Yes
OASPA	No	No	No	No	No	No	No	Yes

Abbreviations: ISSN, International Standard Serial Number; ICMJE, International Committee of Medical Journal Editors; WAME, World Association of Medical Editors; COPE, Committee on Publication Ethics; doi>, Digital Object Identifier; OASPA, Open Access Scholarly Publishers Association.

Pregl), because the rest of the journals are not cited in Medline and/or Google Scholar.

The highest number of papers are from *God Zb Med Fak Skopje* (914 papers), followed by *Prilozi* (21 paper) and *Maked Med Pregl* (4 papers). During 18 years of citation of *Croat Med J* a total number of 2865 citations were recorded from 986 published papers, compared with only 22 citations for 46 years publication of *God Zb Med Fak Skopje*, only 5 citations of articles published in *Prilozi* and 10 citations of papers from *Makedon Med Pregl*. Other cites (cites/year, cites/paper, cites/author, and papers/author) are 100 to 1000 times smaller in Macedonian medical journals in comparison with *Croat Med J*. Authors/paper is very similar (2.87 to 4.00) in all Macedonian medical journals in comparison with *Croat Med J* (Table 3).

Table 3: Citation metrics of Macedonian medical journals (September 22, 2008) compared with *Croat Med J*.

	Croat Med J	*God Zb Med Fak Skopje*	*Prilozi*	*Makedon Med Pregl*
Papers	986	914	21	4
Citations	2865	22	5	10
Years	18	46	4	20
Cites/year	159.17	0.48	1.25	0.50
Cites/paper	2.91	0.02	0.24	2.50
Cites/author	1319.71	9.55	2.34	3.05
Papers/author	487.93	431.62	8.30	1.15
Authors/paper	3.02	2.87	3.48	4.00
Hirsch (a, m)	6.50, 1.17	5.50, 0.04	1.25, 0.50	2.50, 0.10
Contemporary (ac)	7.75	3.00	1.50	4.00
Cites/paper (mean/median/mode)	2.91/1.0/0	0.02/0.0/0	0.24/0.0/0	2.50/2.5/multi
Authors/paper (mean/median/mode)	3.03/3.0/1	2.87/3.0/3	3.48/4.0/4	4.00/4.5/5
Paper(s) with 1 author(s)	273	199	4	0
Paper(s) with 2 author(s)	157	164	0	1
Paper(s) with 3 author(s)	145	221	3	0
Paper(s) with 4 author(s)	152	219	10	1
Paper(s) with 5 author(s)	213	111	4	2
Paper(s) with 6 author(s)	41	0	0	0
Paper(s) with 7 author(s)	2	0	0	0
Paper(s) with 8 author(s)	3	0	0	0

Citation metrics indexes (*h-index, g-index, hc-index, hI-index*, and *hI, norm*) for *Croat Med J*, *God Zb Med Fak Skopje*, *Prilozi* and *Makedon Med Pregl* are shown in Fig. 1. All Macedonian medical journals have 5 to 10 times lower citation metrics indexes when compared with *Croat Med J*. There are not significant differences in citation metrics indexes between the distinct Macedonian medical journals.

Age-weighted citation rate (*AWCR, AWCRpA*) and *AW-index* for *Croat Med J, God Zb Med Fak Skopje, Prilozi* and *Makedon Med Pregl* are shown in Fig. 2. *AWCR* for Macedonian medical journals is very low (0.58 for *Makedon Med Pregl*, 0.70 for *God Zb Med Fak Skopje*, and 1.50 for *Prilozi*) as compared with *Croat Med J* that indicate an index value of 496.09. The differences for AW-index between *Croat Med J* and Macedonian medical journals are smaller. AWCRpA index is very low for all Macedonian medical journals (0.14 for *Makedon Med Pregl*, 0.31 for *God Zb Med Fak Skopje*, and 0.72 for *Prilozi*) compared with the index value of 215.52 for *Croat Med J.*

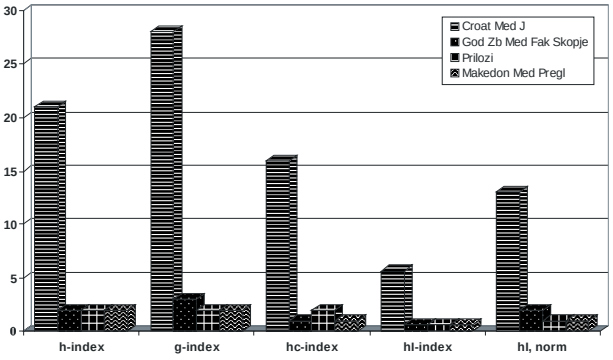


Fig. 1: Citation metrics indexes (h-index, g-index, hc-index, hI-index, and hI, norm) for Croat Med J, God Zb Med Fak Skopje, Prilozi and Makedon Med Pregl.

Discussion

In this paper, we report the characteristics and citation metrics of a series of eight Macedonian medical journals. Two medical journals (*Makedon Med Pregl* and *God Zb Med Fak Skopje*) have very long history, the first number being published in the years 1946 and 1954, respectively. *Prilozi* started in 1980, and the rest of the medical journals started editing between one and six years before 2008. Overall, the Macedonian medical journals do not fulfill international standards for publication, except print ISSN, which is an obligation for registration of periodicals.

Citation metrics of the Macedonian medical journals was compared with *Croat Med J*, as the most successful medical journals from the former Yugoslavia (14). From the eight Macedonian medical journals only three, were compared with *Croat Med J*, because the rest of them are not indexed in PubMed or in the Google Scholar data bases. We found that citations

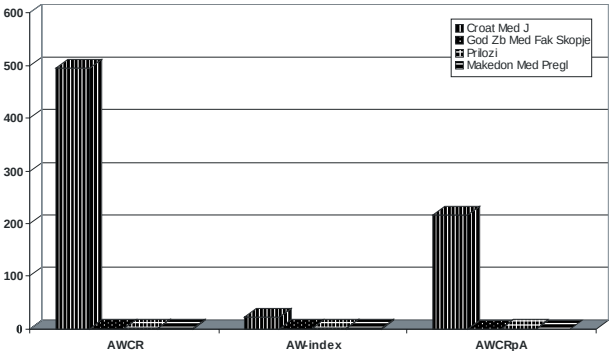


Fig. 2: Age-weighted citation rate (AWCR, AWCRpA) and AW-index for Croat Med J, God Zb Med Fak Skopje, Prilozi and Makedon Med Pregl.

according to several citation metrics indexes (*h-index, g-index, hc-index, hI-index*, and *hI, norm*), age-weighted citation rate (*AWCR, AWCRpA*), and *AW-index* for Macedonian medical journals are very low in comparison with *Croat Med J* which exhibit values 10, 100 or even 1000 times higher for some of the citation parameters. At present, only *Prilozi* is indexed in PubMed, because *God Zb Med Fak Skopje* and *Makedon Med Pregl* are not longer cited since 1979, which means that only one medical journal has some scientific influence in the Republic of Macedonia.

There are not reports of medical journals and their metric analysis with the software *Publish or Perish*, but mainstream international business journals have h-index from 10 to 40, and g-index from 16 to 67 (15). The values of citation metrics indexes (*h-index, g-index, hc-index, hI-index*, and *hI, norm*) have shown high quality of the *Croat Med J* in contrast to the Macedonian medical journals which have an unacceptable low citation metrics indexes (around 2 for both *h-index* and *g-index*).

Limitations reported in the literature are centred on the problems associated with the data sources used, especially *Web of Science* the standard and most widely used tool for generating citation data for research assessment purposes (16). In this regard, the critics note that *Web of Science*: (1) cover mainly English-language journal articles published in the United States, United Kingdom, and Canada; (2) is limited to citations from journals and papers indexed in the ISI database; (3) provide different coverages between research fields; (4) do not count citations from books and other non-ISI sources; and (5) have citing errors e.g., homonyms, synonyms, and inconsistency in the use of initials and in the spelling of non-English names (17).

It was shown that other practical methods and sources, such as Scopus and *Google Scholar*, can be used to locate citations not covered by ISI. Interestingly, this study showed that: (1) *Web of Science* should not be used alone for locating citations of an author or title; (2) *Scopus* and *Google Scholar* can help identify a considerable number of valuable citations not found in *Web of Science*; (3) *Scopus* and *Google Scholar* can help identify a considerable number of citations in document types not covered by ISI citation databases; (4) *Scopus* and *Google Scholar* may assist in providing a more comprehensive picture of the extent of international and interdisciplinary nature of scholarly communication of and among researchers; and (5) *Google Scholar* has several technical problems that users should be aware of in order to accurately and effectively locate citations (18).

We were not able to perform detailed analysis of citation metrics analysis of Macedonian medical journals at present, because there is only one journal (*Prilozi*) currently indexed in PubMed and Google Scholar. Many efforts should be accomplished by Editorial Boards of all Macedonian medical journals included in this study (*Makedon Med Pregl, God Zb Med Fak Skopje, Prilozi, Acta Chir Maced, Acta Morphol, Physioacta* and *Maced J Med Sci*) to reach a higher impact level in the international scientific setting. They should understand how to manage the journals, how to educate the authors, how to stimulate reviewers, and how to present papers in order to increase the journals' scientific influence. Editorial Boards of Macedonian medical journals not included in this study (*Paediatrics:Review, Epilepsy, Acta Orthopedica et Traumatologica Macedonica, Vox Medici,* and *Medicus*) should increase the quality of the journals to become eligible for publishing a valuable articles and contribute to the academic development of the medical community in the Republic of Macedonia.

In summary, Macedonian medical journals have very limited scientific influence and their Editorial Boards are obliged to improve quality of their published manuscripts, and to adhere to international standards for scientific journals, which will result in their greater visibility and scientific influence.

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