



Pain research in Croatia: Analysis of bibliometric trends

DAMIR SAPUNAR
SANDRA KOSTIĆ
ADRIANA BANOŽIĆ
LEJLA FERHATOVIĆ
LIVIA PULJAK

Laboratory for Pain Research
School of Medicine in Split
Šoltanska 2, 21000 Split, Croatia

Correspondence:

Damir Sapunar
Laboratory for Pain Research
University of Split School of Medicine
Šoltanska 2, 21000 Split, Croatia
E-mail: ds@mefst.hr

Key words: pain research, scientometrics,
science policy, Croatia

Abstract

***Background and Purpose:** The aim of this study was to evaluate number and type of Croatian publications in the field of pain research, and to compare it with peers.*

***Material and Methods:** The raw data were collected during February 2011 from the three Current Contents (CC) database subsets: Life Sciences, Clinical Medicine, and Social & Behavioral Sciences. We combined two data sets: the one with articles published by authors affiliated with Croatian institutions and the one with pain-related keywords. We studied number of publications, their impact factors and type of collaborations. Publications of Croatian authors in the field of pain research were compared with identical dataset comprising articles published by researchers from Graz, Austria, because of its comparable scientific production.*

***Results:** From 1998 to 2011, scientists from Croatian institutions published 194 pain-related articles indexed in CC, compared to 187 articles published by their peers from Graz. The 32% percent of articles were published in the local low-impact journals. The number of Croatian research publications in the field of pain is steadily increasing. However, an average impact factor of journals in our cohort was significantly lower compared to peers from Graz.*

***Conclusion:** Although the number of manuscripts in the field of pain research in Croatia is increasing, the quality of published articles is still low. We propose that Croatian Association for the Treatment of Pain should take actions for enhancing pain research in Croatia, as well as increasing the visibility and impact of Croatian pain-related research that can be transposed to other research fields and transitional countries.*

INTRODUCTION

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage (1). Pain is one of the most common reasons why patients visit a physician, and it is a major symptom in many clinical conditions (2).

Chronic pain is a major unsolved health problem. Recent epidemiological studies indicate that nearly 20% of adults in Europe suffer from one or more chronic pain conditions (3). Unfortunately, current treatment options offer only limited efficacy and have burdensome side effects.

The viewpoint that chronic pain patients have the right to be pain free is the basis for the recent EFIC's (European Federation of IASP Chapters) Europe Against Pain (EAP) initiative that resulted in »Dec-

laration on Pain« (4). This initiative evolved from brief essay that formulated the idea that chronic pain should no longer be considered as a disease symptom, but rather as a disease in its own right (5).

All this raises the awareness of the necessity to understand the mechanisms, treatment option and management of pain. The epidemiological data and organizations focused specifically on pain research and treatment have been the motor, which, in the recent two or three decades, has driven pain research to become a fast-growing field among the medical research disciplines. This attracted more scientists studying pain, more publications, and higher citation rates. Pain research is now a mature and separate discipline within biomedicine (6). A 32-year analysis of research papers published in the Pain journal, the highest-ranked journal in the field of pain research, revealed that the number of papers, authors, references in an article, and citations, has been steadily rising since 1975 (6). Interestingly, this was not accompanied with more funding, more research centers exclusively dedicated to pain research.

The purpose of this study was not solely to evaluate publication trends of Croatian scientists in the field of pain research and to compare it with peers, but also to make recommendations for changing research policy in order to increase output, visibility and impact of Croatian research in the field of pain.

METHODS

Scientometric indicators

The raw data were collected in March 2011 from the three subsets; Life Sciences, Clinical Medicine, and Social & Behavioral Sciences of the Current Contents (CC) database (Institute for Scientific Information – Thomson Scientific, Philadelphia, PA, USA). This database was used because it offers information about journals' impact factors. We assessed the period from 1998 to 2011.

Two data sets were collected. The first included all documents published by authors affiliated with Croatian institutions. Due to a large inconsistency in addresses of research institutions, we opted for name of the country (Croatia) as the search word for retrieval of data. Thus, the CC database search was performed through OVID Web Gateway using the search syntax »Croatia.in.« limited to particular year (example of a full syntax: »Croatia.in.« and »limit 1 to yr 2004«). The same first data set was collected for researchers from Graz, Austria. The comparison with Graz was made due to similar scientific production.

Retrieved set of data (publications by authors affiliated with Croatian or Graz institutions) was combined using operator »AND« with the second data set comprising all documents with at least one of the following keywords (including KeywordPlus search field) comprised within following search syntax »analg* OR pain OR painful OR painless OR painkiller OR nocicept* OR allodyn* OR hyperalg* OR neuralg* OR arthralg* OR

causalg* OR headache OR migraine OR hypoalg* OR fibromyalg* OR radiculalg* OR colic OR cephalalg* OR eudyn* OR maldyn* OR brachialg* OR cervicodyn* OR ophthalmodyn* OR otalg* OR toothache OR sciatic* OR odontalg*« (asterisks replaced characters following the word-stems).

For both data sets (Croatian publications and publications from Graz) impact factors (IF) were analyzed. Thomson Scientific Journal Citation Reports® (JCR) was used to obtain annual impact factors for journals in years during which investigated articles were published. It was not possible to include IF for the year 2010, since it was unavailable at the time of manuscript preparation. Data on IF obtained for Graz were compared to Croatian dataset using t-test (GraphPad Prism 4, La Jolla, CA, USA).

For Croatian data set the percentage of national and international collaboration was additionally analyzed. The authors' addresses were also used to analyze which Croatian institutions are the most productive in the field of pain research.

RESULTS

From 1998 to 2011, the authors from Croatian institutions published 194 pain related research articles in Life Sciences, Clinical medicine and Behavioral sciences subsets of the Current Contents database (Figure 1). Articles indexed in more than one subset were counted only once.

During the observed period the number of publications from Croatian institutions in analyzed categories increased from one to 66 articles per year. During the same period researchers from Graz published 187 articles, but without obvious increasing trend (Figure 1).

When we analyzed the journals in which Croatian authors published their articles we noticed that 32% of all articles were published in local journals (28% in *Collegium Antropologicum* and 4% in *Croatian Medical Journal*). When we made an analysis without local journals, the small advantage of the Croatian researchers in the number of published articles, compared to Graz, was lost.

Most articles were published by authors from Zagreb (109) followed by the authors from Split (31), Rijeka (30)

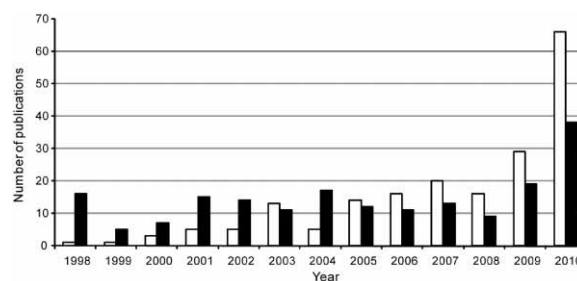


Figure 1. Number of publications of clinical, life and behavioral scientists published in the field of pain research during the period from 1998 to 2011. Open bars – articles from Croatia; black bars – articles from Graz (Austria).

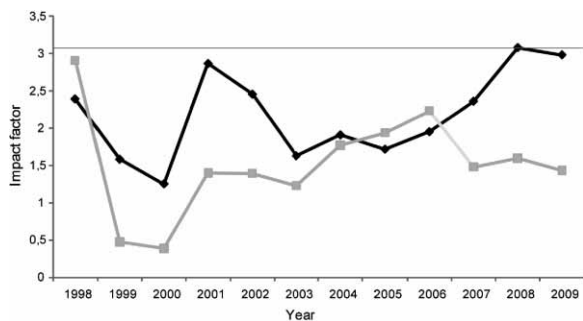


Figure 2. Average annual Journal Citation Report impact factor of journals in which scientists from Croatia and Graz published their pain-related research from 1998 to 2011. Legend: Grey line – Croatia; black line – Graz (Austria).

and Osijek (18), with a very small contribution from other research institutions.

Of all publications 32% were result of collaboration between different research centers, mostly between four major university centers; Zagreb, Split, Rijeka and Osijek. Collaboration with international research centers contributed with 17% of articles. Majority of these international collaborations were with USA (13/33).

The impact of journals in which Croatian authors published their articles during observed period was significantly lower (1.5 ± 0.7 ; range 0.3–12.5) than impact factors of journals where peers from Graz published their research reports on pain (2.2 ± 0.6 ; range 0.13–10.3); $p < 0.0198$) (Figure 2).

Very few articles were published in journals specifically dedicated to pain (journal selection according to (7)). In those journals Croatian authors published only 8% (15/194) and scientist from Graz 10% (20/187) of pain-related articles. Most of the articles published by Croatian scientist were clinical studies, and only small number of articles (10%) were basic research studies dealing with pain. Most of these studies were performed in Laboratory for pain research in Split.

DISCUSSION

There are very few publications dealing with scientometrics and research policy in Croatia (8–10). This type of publications is necessary to develop regulatory policies and to ensure favorable environment for scientist of a particular research field. Science policy should be based on the best available scientific knowledge and these articles can help us to find the ways how small scientific communities can address challenges that we face today. The aim of this article was to evaluate publications of Croatian scientists in the field of pain research and to help create pain research policy in Croatia.

Pain-related research can also be characterized by the journals that publish papers on the specific topic of pain. Currently there are 14 journals specifically dedicated to pain in the Thomson Scientific databases. This high number of journals is indicative of the importance of this

field. Nine out of the 14 pain-focused journals had impact factors >2.0 , thus showing a relatively wide readership community (7).

Our analysis did not focus on journals exclusively devoted to pain research. Instead we opted for overview that encompasses different fields in which researchers are publishing articles dealing with pain. We assumed that all articles containing pain-related keywords dealt directly with pain research. It is possible that different search methodology or selection of journal exclusively devoted to pain would yield different datasets. However, the chosen search strategy was wide enough to retrieve manageable dataset of articles. Although an exhaustive analysis of the pain-related research literature was beyond the scope of this study, we hope that our presentation reflects some of the general characteristics of the Croatian pain-related research.

Furthermore, we found that Croatian research output in the field of pain research in the whole Croatia is just slightly higher than that of Graz, Austria. Population of Graz is about 290,000, and population of Croatia is 4.2 million. This is a significant difference in the size of population of these two geographical settings, and yet research output in the field of pain of only one city in Austria was similar to that of whole Croatia, judging from the number of publications.

The finding that 32% of the analyzed articles were published in local journals shows the importance of these journals for local community. Although this can be regarded as a drawback since local journals have a low impact factor. As much as 90% of the articles in our local dataset were published on clinical subjects, which may indicate lack of basic scientists in the pain research field in Croatia. A recent study of the Pain journal revealed that although 30% of all studies represent intervention studies in human subjects, the percentage of these studies is declining precipitously with times, as they are being replaced largely by studies in animals featuring behavioral pharmacology (6). This is in contrast with the situation in Croatia, where clinical studies are still more numerous than basic research studies in this field.

The mean impact factor (IF) of the world literature on pain is 3.11 (7). Both Croatian and Graz scientist are producing articles published in journals with lower IF. However, the IF of journals in which Croatian authors published their articles during observed period is significantly lower than those of their peers from Graz.

The most productive groups were located in Zagreb, Croatian capital, which is expected given its size, number of research institutions and tradition. Also, these research groups produced most of collaborative articles. International collaborations comprised 17% of all published articles, while the percentage of national collaborations were lower, leaving an area for improvement. As expected, the most important collaborations were with researchers from USA.

The fact that the number of articles and their quality are increasing is encouraging, given the meager invest-

ments in science by the Croatian government, but it is still low, when compared to a single university town in Austria. Based on these results, we would like to suggest recommendations for increasing the output, visibility and impact of Croatian pain related research that can be transposed to other research fields and transitional countries.

We propose that Croatian Association for the Treatment of Pain should make recommendations for enhancing pain research in Croatia, as well as increasing the output, visibility and impact of Croatian pain-related research that can be transposed to other research fields and transitional countries. These actions can be directed towards devising means for funding research project not only through government funding but through professional associations and collaboration with pharmaceutical industry. Funds that pharmaceutical industry is spending on financing travel expenses for physicians attending different conferences can be a source of modest start up grants for young researchers, as well as stipends for education in foreign clinics and laboratories.

Secondly, professional associations and government agencies involved in grant funding should promote national collaboration, basic research and publications in higher impact journals. Thirdly, professional organizations should be open to other specialties, and the first step is to open the membership to other professions, which would help to increase interprofessional collaboration. And last, but not least, professional organizations may try to influence National council for Science, and other decision-makers, to include pain research into future national calls for research funding.

In conclusion, the number of manuscripts in the field of pain research in Croatia is increasing but the quality of

published articles is still low. Very few of these articles are basic research studies. Since pain is a major public health issue, pain research in Croatia needs to be facilitated, and we propose that Croatian Association for the Treatment of Pain should take the initiative and become a major driver of change in Croatian pain research field.

REFERENCES

1. TAXONOMY ITFO 1994 Pain Terms, A Current List with Definitions and Notes on Usage – Classification of Chronic Pain Second Edition Merskey H, Bogduk N, (eds) Seattle, IASP Press.
2. MANTYSELKA P, KUMPUSALO E, AHONEN R, KUMPUSALO A, KAUKANEN J, VIINAMAKI H *et al.* 2001 Pain as a reason to visit the doctor: a study in Finnish primary health care. *Pain* 89(2–3): 175–80
3. BREIVIK H, COLLETT B, VENTAFRIDDA V, COHEN R, GALLACHER D 2006 Survey of chronic pain in Europe: prevalence, impact on daily life, and treatment. *Eur J Pain* 10(4): 287–33
4. NIV D, DEVOR M 2004 Chronic pain as a disease in its own right. *Pain Pract* 4(3): 179–81
5. NIV D, DEVOR M 2007 Position paper of the European Federation of IASP Chapters (EFIC) on the subject of pain management. *Eur J Pain* 11(5): 487–9
6. MOGIL JS, SIMMONDS K, SIMMONDS M J 2009 Pain research from 1975 to 2007: a categorical and bibliometric meta-trend analysis of every Research Paper published in the journal, *Pain*. *Pain* 142(1–2): 48–58
7. ROBERT C, WILSON C S, DONNADIEU S, GAUDY J F, ARRETO C D 2008 Bibliometric analysis of the scientific literature on pain research: a 2006 study. *Pain* 138(2): 250–4
8. SAPUNAR D, MARUSIC M 1999 [The curriculum plan for the Split University Medical School—a modern concept for a new school]. *Lijec Vjesn* 121(6): 208–12
9. PULJAK L, SAPUNAR D 2008 Turning Croatian science into policy. *Croat Med J* 49(2): 155–7
10. PULJAK L, VUKOJEVIC K, LOVRIC KOJUNDZIC S, SAPUNAR D 2008 Assessing clinical and life sciences performance of research institutions in Split, Croatia, 2000–2006. *Croat Med J* 49(2): 164–74