

Measuring Specialization of Authors Using Kumaravel's Prepotency Index – A case study of Fibromyalgia

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Abstract:

The purpose of this study is to conduct scientometric analysis of the research literature output on Fibromyalgia. The data for this analysis were downloaded from Medline database. The total records in this discipline yielded 4607 research articles published during 1946-2011. These records were undergone scientometric analysis. These records are taken up to check the validity of Bradford's Law of Scattering, Pareto's Principle. (80/20 Rule), authorship pattern and author specialization is examined by application of Kumaravel's prepotency Index. The study showed a progressive research trend in the subject. It also states that the number of researchers in medical science is also in progressive way. Though team research is the trend of the day, the optimum team members in a collaborative publication is two to five.

Key words: Kumaravel's Prepotency Index, scientometric analysis, Fibromyalgia studies, single authorship, multiple authorship

Introduction:

Scientometrics has become a necessary tool to measure the various aspects of the published literature. It provides a key opportunity to the researcher to communicate their new strategies, new methods to fellow researchers. The scientometric analysis on the subject Fibromyalgia helps the researchers in this discipline by shedding more light on the trend of research in this subject and gives a better understanding of information resources which can ultimately be effectively used.

Fibromyalgia is a medical disorder characterized by chronic widespread pain and allodynia. The symptoms of fibromyalgia include deliberating fatigue, sleep disturbance, joint stiffness, numbness and tingling etc. It is frequently comorbid with psychiatrics stress related disorders. Approximately one in 50 Americans are estimated to have fibromyalgia, or between 3 and 6 million people in the U.S. Fibromyalgia is estimated to affect 2-4% of the population with female to male incidence ratio of approximately 9:1. No one knows the causes fibromyalgia. Anyone can get it, but it is most common in women. There is no permanent cure for this disease but medicine can help to manage the symptoms.

Previous studies:

Luis Antonio Merayo Alonso analysed 3201 article references covering a period from 1998 to 2003. Basic bibliometric tools were used and found that there is considerable growth in research in Fibrogamia. Peritz, and Bar-Ilan examined the extent to which the field of bibliometrics and scientometrics makes use of sources outside the field. The research was carried out by examining the references of articles published in *Scientometrics* in the course of two calendar years, 1990, 2000. The results show that in 2000, 56.9% (and 47.3% in 1990)

of the references originated from three fields: scientometrics and bibliometrics; library and information science; and the sociology, history and philosophy of science.

Methods:

The present investigation is a pioneering attempt to analyze the research literature of Fibromyalgia covered in PubMed database for the period 1946-2011. The data downloaded in the text format are converted into database format in MS Access and the individual authors are separated by a program written in Visual Basic. Totally 4607 articles are taken for validating the law of scattering, 80/20 rule, and author productivity is measured by Kumaravel's prepotency Index which is supported by Dr. Ranganathan's canon of prepotence.

Discussion:

It is observed that research in this discipline has gained momentum only from 1996. From 1996 onwards there is gradual increase in the research productivity and it is maximum in the year 2011 (see table 1). The disease is getting severe from decade to decade and the research will be a continuous process up to the eradication of the disease. The total number of articles (4607) are divided into three zones, each with about equal number of (one-third) of all articles. It is found that Bradford's law is not applicable for the discipline fibromyalgia (Table 2). The reason may be the mushrooming growth of periodicals in various disciplines.

The analysis of the scattering of articles in the journals shows that it falls in line with Parato's Distribution (80 x 20 rule). Among 943 journals that have produced 4957 research papers, 188 (20%) journals have produced 3794 papers which is nearly 80 percent of the total output. Hence the present study confines with Parato's Principle.

Table 3 shows the pattern of authorship in 4607 articles. Among 4607 articles 1272 articles i.e.27.61% were contributed by single authors. 2950 articles i.e. 51% of total number of articles were contributed by the authorship pattern of two to five authors. The remaining articles are having the authorship pattern of more than 5 authors. The data clearly shows that while the number of authors increases, the publication count decreases. By analyzing the data we can say that research fellows in the discipline of Fibromyalgia are showing more interest in doing research individually when compared with shared authorship. If it is a shared contribution it will be maximum limit of 5 authors.

Author productivity is a measure for ranking the authors according to their publication output. The total number of unique authors who have contributed 4607 articles is 9701. The most common methods for ranking authors are 1. Publication count (Table 4) and 2. Equal share method. In a collaborative publication it is not necessarily that all the co-authors contribute equal effort in the research. In general it is presumed that the author named first might have put maximum effort. As the position of the author name moves from the first to the last position, the effort of the co-authors may decrease. There may be some authors whose names may be included just because of the mantra "Publish or Perish". Hence a new method for ranking of authors namely prepotency index proposed by Kumaravel (2012)¹ is found to be appropriate if each author may be given an ordinal value in the decreasing order according to their position. The prepotency index is calculated as

$$PI = PV/N$$

Where $PV = (n - p + 1) / n\sum$ where $n\sum = 1+2+3+ \dots n$ and $PV \leq 1$

According to Kumaravel, the PI value nearer to 1 indicates the higher involvement of the author in most of his collaborative publications. The PI value nearer to zero indicates that the

author has been involved in majority of his collaborative publications for name sake. Hence the authors are ranked on the basis of weighted share by their position in the author list. (Table 5). The inference is that the top three ranked authors namely Clauw, Daniel J, Buskila, D and Muller, W who have contributed 84, 69 and 59 papers respectively are not said to have more involvement in the research productivity since their potency index is calculated to be 0.27, 0.26 and 0.23 respectively. Hence the ranked list of authors gets an entire change if arranged according to their potency value.

Conclusion:

Today the trend of publishing research articles in journals mainly depends the author's productivity, the specialization of the scholars and their involvement in collaborative research. A remarkable part of this study is specialization of authors based on the Kumaravel's Prepotency index. Another important finding is that, in spite of the fact that research collaboration is the trend of the day, more than one fourth of publications in fibromyalgia research are the results of solo research or research in peril. Also the findings do not corroborate with Bradford's Law. Perhaps, the reason is due to the mushrooming growth of new journals in all disciplines.

Decade	Period	Total Number of Publications	Percent
I	1946-1955	72	1.56
II	1956-1965	97	2.11
III	1966-1975	111	2.41
IV	1976-1985	104	2.26
V	1986-1995	751	16.3
VI	1996-2005	1696	36.81
7Years	2006-2012	1776	38.55

Table1: Trend of Fibromyalgia Research

Zones	No of Journals
Zone 1	13
Zone 2	83
Zone 3	824

Table2: Bradford's law of scattering

No of Authors	Count	Percent
1	1272	27.61
2	742	16.11
3	646	14.02
4	539	11.7
5	440	9.55
6	359	7.79
7	224	4.86
8	141	3.06
9	62	1.35
0	61	1.32
10	41	0.89
11	27	0.59
12	18	0.39
13	13	0.28
24	7	0.15
20	4	0.09
14	3	0.07
15	3	0.07
18	2	0.04
28	1	0.02
16	1	0.02
19	1	0.02
	4607	100

Table 3: Authorship Pattern

Author Name	Total Count
Clauw, Daniel J	84
Buskila, D	61
Muller, W	59
Wolfe, F	51
Goldenberg, D L	44
Arnold, Lesley M	44
Staud, Roland	43
Bennett, R M	42
Buskila, Dan	37
Neumann, L	36
Williams, David A	36
Bennett, Robert M	35
Danneskiold-Samsoe, B	34
Yunus, M B	34
Stratz, T	32
Crofford, Leslie J	30
Hauser, Winfried	29
Russell, I J	28
Hauser, W	27
Gracely, Richard H	26

Table4: Author Productivity-Ranking of Authors -Publication Count

Author	Count	Share	Rank
Wolfe, F	51	31.89	4
Clauw, Daniel J	84	28.31	1
Goldenberg, D L	44	27.99	5
Staud, Roland	43	25.99	6
Bennett, R M	42	21.96	7
Muller, W	59	18.36	3
Buskila, D	61	16	2
Yunus, M B	34	15.94	11
Bennett, Robert M	35	15.29	10
Buskila, Dan	37	14.18	8
Romano, T J	14	14	27
Arnold, Lesley M	44	13.65	5
Moldofsky, H	25	12.73	18
Goldenberg, Don L	24	11.22	19
Russell, I J	28	9.83	15
Jacobsen, S	24	9.68	19
Wolfe, Frederick	21	9.62	21
Ehrlich, George E	10	9.5	31
Crofford, Leslie J	30	9.49	13
Williams, David A	36	9.44	9

Table 5: Ranking of authors according to weighted share:

Author	Count	Potency	Rank	Potency
Romano, T J	14	14	27	1
Ehrlich, George E	10	9.33	31	0.93
Reilly, P A	7	5.67	34	0.81
Wallace, D J	10	7.85	31	0.79
Wilke, W S	9	6.5	32	0.72
Holman, Andrew J	11	7.86	30	0.71
Wolfe, F	51	34.85	4	0.68
Staud, Roland	43	28.38	6	0.66
Yunus, Muhammad B	11	7.18	30	0.65
Goldenberg, D L	44	27.84	5	0.63
Eisinger, J	10	6.23	31	0.62
Caro, X J	9	5.23	32	0.58
Bennett, Robert	7	4.05	34	0.58
Smythe, H A	11	6.29	30	0.57
Simms, R W	12	6.85	29	0.57
Cohen, M L	9	5	32	0.56
Forseth, K O	8	4.33	33	0.54
Croft, P	7	3.79	34	0.54
Mengshoel, A M	11	5.9	30	0.54
Moldofsky, H	25	13.2	18	0.53

Table 6: Ranking of authors according to Pre Potency index

BIBLIOGRAPHY:

- Alonso, Luis Antonio Merayo et al. 2007. "Bibliometric Approach to Research Into Fibromyalgia." *Reumatol Clin.* 3(2): 55-62.
- Arunachalam, S., R. Srinivasan, and V. Raman. 1994. "International collaboration in science: Participation by the Asian Giants." *Scientometrics* 30(1): 7-22.
- Egghe, L. 1998. "Methodological aspects of bibliometrics." *Lib.Sci.* 25:179-191
- Kumaravel, J.P.S., A. Manoharan, B. Kanagavel, M. Karthi Rajan and L. Mohamed Idhris. 2012. "Dr. S. R. Ranganathan's Canon of Prepotence applied to Bibliometrics leading to a new indicator - Prepotency index (PI)." Paper presented at 8th International

Conference on *Webometrics, Informetrics and Scientometrics (WIS)* and 13th *COLLNET Meeting* in Seoul, Korea, October 23-26, 2012.

- Luukkonen, T., R. J. W. Tijseen, O. Persson, and G. Sivertsen. 1993. "The measurement of international scientific collaboration." *Scientometrics* 28(1): 15-36.
- Peritz, Bluma C. and Judit Bar-Ilan. 2002. "The sources used by bibliometrics-scientometrics as reflected in references." *Scientometrics* 54(2): 269-284.
- Vin Vinkler, P. 1993. "Research contribution, authorship and team cooperativeness." *Scientometrics* 26(1): 213-230.
- Zuckerman, Harriet A. 1968. "Patterns of name ordering among authors of scientific papers: A study of social symbolism and its ambiguity." *American Journal of Sociology* 74: 276-291.

Web Sources:

- <http://scientific.thompson.com/knowtrend/essays/selectionofmaterial/journalselection/>
- <http://en.wikipedia.org/wiki/fibromyalgia>
- <http://www.iva.dk/bh/Core%20Concepts%20in%20LIS/articles%20a-z/scattering.htm>
- <http://www.nlm.nih.gov/medlineplus/fibromyalgia.html>