



# Impact factor, citation index and circulation

SEMRA CIGER

Professor and Head, Department of Orthodontics, School of Dentistry, Hacettepe University, Ankara, Turkey.

Scientific journals constitute the main tools for the advancement and development of science. Recent advances in orthodontics and applications of techniques are reflected upon the increasing number of international and national journals. Various journals contribute scientifically to our specialty in various ways:

- Continuing education
- Promotion of research
- Stimulation of thinking
- Publication of scientific activities

In general, "the importance" of scientific journals can be defined in several ways including its prestige which may be reflected in its citedness as measured by the impact factor.

## DEFINITION

The Journal Citation Reports (JCR) provides quantitative

tools for ranking, evaluating, categorizing and comparing journals. The impact factor is a measure of the frequency with which the "average article" in a journal has been cited in a particular year or period. The impact factor of a journal is calculated by dividing the number of current year citations to the source items published in that journal during the previous two years.

A- Total Cites in 2000

B- 2000 cites to articles published in 1998 - 1999 (This is a subset of A)

C- Number of articles published in 1998-1999

D-  $B/C=2000$  Impact Factor

Impact Factor rankings exist for almost 8000 journals citing 12.000.000 references per year. In general, the majority of impact factor scores range from 0.5 to 3.000, although lower values as well as high values in excess of 40 may be found.

Table 1. Top ranked biomedical journals with respect to the 2000 impact factor scores.

Rank	Abbreviated Journal Title (linked to full journal information)	ISSN	2000 Total Cites	Impact Factor	2000 Articles
1	ANNU REV IMMUNOL	0732-0582	12584	50.340	31
2	ANNU REV BIOCHEM	0066-4154	16436	43.429	31
3	CELL	0092-8674	153747	32.440	345
4	NAT GENET	1061-4036	38840	30.910	153
5	NEW ENGL J MED	0028-4793	135613	29.512	379
6	NAT MED	1078-8956	25436	27.905	171
7	PHYSIOL REV	0031-9333	11675	27.677	34
8	ANNU REV NEUROSCI	0147-006X	6708	26.676	25
9	ANNU REV CELL DEV BIOL	1081-0706	6335	26.300	23
10	NATURE	0028-0836	306184	25.814	1315
11	PHARMACOL REV	0031-6997	6377	25.381	22
12	J PHARMACEUT BIOMED	0731-7085	2288	1.013	278



Table 2. Dental journals with respect to the 2000 impact factor scores

Rank	Abbreviated Journal Title (linked to full journal information)	ISSN	2000 Total Cites	Impact Factor	2000 Articles
1	J DENT RES	0022-0345	7980	4.438	122
2	CRIT REV ORAL BIOL M	1045-4411	936	3.148	13
3	EUR J ORAL SCI	0909-8836	825	1.808	77
4	CARIES RES	0008-6568	1670	1.708	66
5	ORAL ONCOL	0964-1955	895	1.690	84
6	CLIN ORAL IMPLAN RES	0905-7161	1092	1.680	79
7	J DENT	0300-5712	1129	1.594	78
8	JORAL PATHOL MED	0904-2512	1867	1.457	74
9	AM J DENT	0894-8275	965	1.452	65
10	J CLIN PERIODONTOL	0303-6979	3421	1.426	137
11	ORAL MICROBIOL IMMUN	0902-0055	1157	1.419	64
12	OPER DENT	0361-7734	672	1.411	77
13	PERIODONTOL 2000	0906-6713	508	1.391	39
14	COMMUNITY DENT ORAL	0301-5661	1349	1.350	58
15	INT J ORAL MAX IMPL	0882-2786	2077	1.316	84
16	J OROFAC PAIN	1064-6655	330	1.288	27
17	J PERIODONTOL	0022-3492	4668	1.215	39
18	INT J PROSTHODONT	0893-2174	763	1.182	69
19	DENT MATER	0109-5641	1257	1.016	63
20	J PERIODONTAL RES	0022-3484	1981	0.946	45

## APPLICATIONS

The most common application of impact factor relates to gross evaluation of the prestige of journals. This is a parameter useful to librarians, editors, publishers and researchers.

Perhaps the most important and recent use of impact is in the process of academic evaluation. The Impact Factor should be used with informed peer review.

## IMPACT OF REVIEW ARTICLES

Review articles generally are cited more frequently than typical research articles, because they often serve as surrogates for earlier literature. Especially in journals that discourage extensive bibliographies. Top ranked biomedical journals with respect to the 2000 impact factor scores are shown in Table 1. Review journals do not report original research but

play an important integrative role. They are well cited, their impact - the average number of citations per article - is comparatively much higher. For example the impact factor for Annual Review of Immunology is 50.340. However as it can be seen in Table 2 the impact factor of the top ranked journal in Dentistry, Journal of Dental Research, is 4.000.

## METHODS ARTICLES

It is widely believed that methods articles attract more citations than other types of articles. However, this is not in fact true. Many journals devoted entirely to methods, do not achieve unusual impact. But it is true among the most cited articles in the literature. There are some super classics that give this overall impression. Occasionally a hot paper might affect the current impact of a journal over the years.



Table 3. Orthodontic journals with respect to the 2000 impact factor scores.

Rank	Abbreviated Journal Title	ISSN	2000 Total Cites	Impact Factor	2000 Articles
1	AM J ORTHOD DENTOFAC ORTHOP	0889-5406	3617	0.757	154
2	ANGLE ORTHOD	003-3219	1052	0.704	59
3	EUR J ORTHOD	014-4587	851	0.593	66

## EFFECT OF JOURNAL SIZE ON IMPACT FACTOR

Scores may not be affected by the size of the journal because the rankings are expressed as ratios.

## SCIENTIFIC DISCIPLINE

Different specialties exhibit different ranges of peak impact. In this way, journals may be viewed in the context of their specific field. More references are usually cited in review or method papers. On the other hand case reports may decrease the mean number of references per article because most case reports provide very few references.

The ranking of three orthodontic journals listed in the 2000 journal citation index is provided in Table 3.

The Impact Factor will help us to evaluate a journal's relative importance, especially when we compare it to others in the same field.

A number of orthodontic journals' readership consists of clinical practitioners. These journals include feature reviews, case reports and technical notes. This may explain why they achieve impact factor scores ranking below 1.000. It should be pointed out that a significant number of research papers related to orthodontic topics are published in various dental, non-orthodontic journals; (for example: Journal of Dental Research, Dental Materials, Journal of Oral Maxillofacial Surgery, Cleft Palate - Craniofacial Journal). These journals present higher impact factor scores than the 3 orthodontic journals listed (Table 4). The impact factor is a very useful tool for evaluation of journals, but it must be used wisely. Considerations include the number of reviews, letters, comments or other types of material published in a journal. There are variations between disciplines and item by item impact.

## CIRCULATION

Scientific journals' recognition and acclamation as indicated by its circulation alone will not increase research impact because only a fraction of practitioners are engaged in research. It appears that most of the "clinical" journals that have high circulations among practicing clinicians present low impact factor, because researchers may prefer for prestige reasons, not to publish in these. This tendency may characterize some orthodontic journals which have a high circulation rate but lack impact factor.

## SCIENCE CITATION INDEX

It is the list of dental journals ranked by total citations. The citation for the top ranked Journal of Dental Research is approximately 8000. However the citation for American Journal of Orthodontics is about 3600. The same basic group of journals is cited more, year by year. A few may gradually decline or disappear as editors and audiences change. The Science Citation Index is multidisciplinary, covering all scientific disciplines and specialties. The Science Citation Index is also comprehensive, providing complete coverage of all types of published source items - not just research articles, reviews and technical notes but also letters, corrections and retractions, editorials, and so on.

## CITATION DATA FOR JOURNAL EVALUATION

The number of authors and journals vary greatly between and within disciplines, as do their citation levels and rates, smaller fields like botany or mathematics do not generate as many articles or citations as say biotechnology or genetics. Also in



Table 4. Non-orthodontic journals in which research papers related to orthodontic topics are published, present higher impact factor scores than the three orthodontic journals listed.

Rank	Abbreviated Journal Title (linked to full journal information)	ISSN	2000 Total Cites	Impact Factor	2000 Articles
1	ORAL SURG ORAL MED ORAL PATHOL	1079-2104	5447	0.865	237
2	J PERIODONTOL	0022-3492	4668	1.215	39
3	J PROSTHET DENT	0022-3913	4315	0.787	212
4	J ORAL MAXIL SURG	0278-2391	4029	0.773	247
5	AM J ORTHOD DENTOFAC ORTHOP	0889-5406	3617	0.757	154
6	J CLIN PERIODONTOL	0303-6979	3421	1.426	137
7	ARCH ORAL BIOL	0003-9969	3329	0.845	126
8	J AM DENT ASSOC	0002-8177	2983	0.854	143
9	BRIT DENT J	0007-0610	2176	0.822	154
10	J ENDODONT	0099-2399	2150	0.668	161
11	INT J ORAL MAX IMPL	0882-2786	2077	1.316	84
12	J PERIODONTAL RES	0022-3484	1981	0.946	45
13	J ORAL PATHOL MED	0904-2512	1867	1.457	74
14	CARIES RES	0008-6568	1670	1.708	66
15	INT J ORAL MAX SURG	0901-5027	1600	0.932	87
16	ACTA ODONTOL SCAND	0001-6357	1378	0.761	49
17	COMMUNITY DENT ORAL	0301-5661	1349	1.350	58
18	J ORAL REHABIL	0305-182X	1298	0.565	143
19	CLEFT PALATE-CRANIOFAC J	1055-6656	1277	0.718	89

certain fields it may take ten or more years for an article to attract a meaningful number of citations, while in other research areas citations can typically peak after only a few years. These differences should be kept in mind. Citation rankings may be influenced by the size of a journal - that is, journals that publish a very large number of articles might have a greater chance of being cited more frequently than comparatively smaller journals.

#### **CITED IMPACT OF TURKISH VERSUS INTEGRATED CITATION FILE (ICF) ARTICLES**

The cited impact factor for Turkish articles remained fairly stable throughout the 1980. The Impact Factor of Turkish articles was about half of the Integrated Citation File (ICF) articles. In comparison the cited

impact of articles from all nations in the ICF file nations are nominated by "Science Superpowers" of the world. These nations have a substantial financial support for research from the government and private corporations. They have the most advanced laboratory instruments and equipment. They have extensive and well endowed systems for higher education that attract the best scientific minds from their own country and from abroad.

Regarding the Impact Comparisons of Middle East Science, Turkey is the leader in terms of the impact of its scientific publications, whereas Saudi Arabia shows the most significant increase in impact.

Number of Publications generated by researches based on the largest cities in Turkey  
Table 5 shows the distribution of publications whose authors come from universities based in the largest



**Table 5. The distribution of publications whose authors come from universities based in the largest three cities of Turkey.**

• City/University No of Publications Share (%)		
<i>Ankara</i>		
Hacettepe	11718	23.1
Ankara	773	10.4
Gazi	450	6.1
Gata	240	3.2
ODTU	135	1.8
Baskent	51	0.7
Bilkent	5	0.1
Fatin	1	0.0
<b>Total</b>	<b>3373</b>	<b>45.4</b>
<i>Istanbul</i>		
Istanbul	946	12.7
Marmara	394	5.3
Bogazici	39	0.5
YTU	3	0.0
<b>Total</b>	<b>1391</b>	<b>18.6</b>
<i>Izmir</i>		
Ege	507	6.8
9 Eylul Izmir YTE	261	3.5
<b>Total</b>	<b>770</b>	<b>10.4</b>
<i>Other Provinces</i>		
<b>Total</b>	<b>1893</b>	<b>25.5</b>
<b>GRAND TOTAL</b>	<b>7427</b>	<b>100.0</b>

three cities of Turkey; Ankara, Istanbul and Izmir. Hacettepe University has the greatest number of publications among other universities. Researchers based in Ankara Universities have the largest number of publications. Almost half of the published journals in Turkey are submitted by the Universities in Ankara.

## CONCLUSION

It is obvious that the system should change as it encourages poor research. We need less research, better research, and research done for the right reasons, abandoning the use of the number of publications as a measure of scientific ability.