

PUBLICATION TRENDS IN AUDIOLOGY RESEARCH: A SCIENTOMETRIC ANALYSIS

Nandeeshha B

Asst. Library & Information Officer
All India Institute of Speech and Hearing
Manasagangothri, Mysuru-570 006.
nandeeshha.b@gmail.com

Khaiser Jahan Begum

Professor
Department of Library and Information Science
University of Mysore
Manasagangothri, Mysore-570 006.
khaiser.nikam6@gmail.com

ABSTRACT

The paper reports on scientometric study of 1382 publications on Audiology research conducted over the years 1989 to 2016. The study analyses literature growth trends, which shows an initiation of potential growth of research in the field of Audiology since 1989. Its main objective of the study is to determine different forms of documents; author productivity; country-wise productivity, language breakup, institution-wise productivity, year-wise growth of literature, ranking of journals etc. along with review of related areas of scientometrics research. The results indicate that journal papers account for 1180 (85.38%), with the journal 'International Journal of Audiology' being the top ranking, scoring 135 (9.77%) papers. USA has authored maximum number of 507 (36.69%) papers. 'University of Pretoria' contributed 32 (2.32%) papers. The highest number (144; 10.42%) of papers published and maximum citations scored 1739 in the year 2016.

Keywords: Audiology; Research Publication; Ranking of Periodical, Productivity of Author Production; Universities

1.0 Introduction

Audiology is a science and branch of medicine that is predominately concerned with hearing loss. Audiology also takes into account the study of balance, which is linked with the ear and hearing. As a healthcare profession, Audiology looks at people of all ages, from children to the elderly, and the assessment and therapeutic rehabilitation of those with hearing problems, issues with balance or those suffer from tinnitus, which is the medical term for "phantom" noises in the ears that occur without an external sound source.

Audiology is a clinical specialty, allied to medicine that combines science and state-of-the-art technology to help improve the quality of life of people with hearing or balance problems, as well as their families. Audiologists mostly work on the "frontline" of healthcare, working with people every day in a variety of settings. It seems to be exciting, challenging, and rewarding.

Scientometric study of any medical topic allows the researchers to acquire more knowledge about research trends in a subject, gives an insight into contributions in a field under examination. The main aim of the study is to analyze research output in the discipline of "Audiology" using scientometrics, taking the data indexed in *Web of Science*.

2.0 Review of Literature

There are many studies on scientometrics in general, but a very studies are there on health, wellness and related subjects like speech and hearing and its branches. Some of the studies which are relevant for this paper are listed here. Biglu, Eskandari & Asgharzadeh (2011) have analyzed and visualized the trends in the growth of research output in the field of nanotechnology. Elango, Rajendran and Bornmann (2013) have assessed the citation impact on nanotechnology research output at global level using scientometric tools. Arik (2014) has used scientometrics to investigate the scientific research output in the field of sign language. Ramin, Gharebaghi, and Heidary (2015) analyzed the scientific research output on Diabetic Retinopathy (DR) to draw overall roadmap of future research strategic planning in the field. Nikam and Hydarali (2016) examine the mosaic of the literature in the field of graphite. Bernabo et al., (2016) have carried out a scientometrics research analysis in the field of Reproductive Medicine (RM), which is a rapidly evolving branch of Medicine.

3.0 Objectives

- To identify bibliographic forms of documents and author productivity
- To identify country-wise productivity; language breakup and subject distribution
- To examine ranking of core periodicals and institutional-wise research productivity
- To ranking the core journals and identify year-wise growth of literature
- To identify contributions of funding agencies

4.0 Materials and Methods

The present study is based on Web of Science database, from 1989 to 2016. The data on was downloaded from WoS in the field of Audiology for a period of 27 years. As of 19th August 2017 a total 1382 records were available. Scientometrics research tool is used to identify the characteristics of research output in the field of Audiology.

5.0 Results

The following tables indicate the results and discussion and the interpretation of scientific research output in the field of Audiology.

5.1 Document Types

The form wise distribution of documents is shown in table-1. Scientists communicate their research results in several printed and electronic forms of documents like journals, books, patents, standards, thesis and dissertations etc. Of all these forms, journal articles are the main source of primary communication medium among scholars in the field of Audiology accounting for 1180 (85.38%); this is followed by conference proceedings accounting for 93 (6.73%); reviews rank third with a score of 78 (5.64%).

Table-1: Document Types

| S/N | Document Types | No of Publications | % |
|-----|------------------------|--------------------|--------|
| 1 | Article | 1180 | 85.38% |
| 2 | Conference Proceedings | 93 | 6.73% |
| 3 | Review | 78 | 5.64% |
| 4 | Others | 31 | 2.24% |

5.2 Author Productivity

The list of top ten authors who have contributed more than ten publications is given in table-2. It is observed that Swanepoel, D., is the most productive authors with 20 (1.45%) publications, occupies first place, followed by Anonymous authors (18; 1.30%) and Hickson, L., (14; 1.01%) occupying second and third positions respectively. The least productive authors are Martini, A., and Ptok, M., with 9 (0.65%) papers each.

Table-2: Author Productivity

| S/N | Authors | No. of Publications | % |
|-----|---------------------|---------------------|-------|
| 1 | Swanepoel D | 20 | 1.45% |
| 2 | Anonymous | 18 | 1.30% |
| 3 | Hickson L | 14 | 1.01% |
| 4 | Laplante-Levesque A | 13 | 0.94% |
| 5 | Andersson G | 12 | 0.87% |
| 6 | Eikelboom RH | 12 | 0.87% |
| 7 | Baguley DM | 10 | 0.72% |
| 8 | Schonweiler R | 10 | 0.72% |
| 9 | Martini A | 9 | 0.65% |
| 10 | Ptok M | 9 | 0.65% |

5.3 Countries Publishing Audiology Publications

The top ten highly productive countries in the field of Audiology are shown in Table-3. USA is the topmost productive country with 507 (36.69%) papers and it ranks first, followed by England 185 (13.39%) ranking second, Germany ranks third, with 125 (9.05%) papers, Australia ranks fourth, with 101 (7.31%) papers

and Canada ranks fifth, with 81 (5.86%) papers. The other countries such as Sweden, South Africa, Italy, Brazil and Turkey have also contributed to the research output in the field of Audiology.

Table-3: Countries Publishing Audiology Publications (Top Ten)

| Rank | Countries | Counts | % |
|------|--------------|--------|--------|
| 1 | USA | 507 | 36.69% |
| 2 | England | 185 | 13.39% |
| 3 | Germany | 125 | 9.05% |
| 4 | Australia | 101 | 7.31% |
| 5 | Canada | 81 | 5.86% |
| 6 | Sweden | 72 | 5.21% |
| 7 | South Africa | 55 | 3.98% |
| 8 | Italy | 51 | 3.69% |
| 9 | Brazil | 47 | 3.40% |
| 10 | Turkey | 33 | 2.39% |

5.4 Ranking of Journal Publications

The top ten journals ranked in the order of their productivity is shown in Table-4. 'International Journal of Audiology', ranks first with 135 (9.77%) papers, followed by the 'Journal of the American Academy of Audiology', which ranks second, with 99 (7.16%) papers; the journal 'International Journal of Pediatric Otorhinolaryngology', with 66 (4.78%) papers occupies third rank. However, the last ranking journal is 'Scandinavian Audiology', with 31 (2.24%) papers ranks last.

Table-4: Ranking of Journal Publications

| Rank | Journal Titles | No. of Publications | % |
|------|--|---------------------|-------|
| 1 | International Journal of Audiology | 135 | 9.77% |
| 2 | Journal of The American Academy of Audiology | 99 | 7.16% |
| 3 | International Journal of Pediatric Otorhinolaryngology | 66 | 4.78% |
| 4 | American Journal of Audiology | 61 | 4.41% |
| 5 | HNO | 44 | 3.18% |
| 6 | Ear and Hearing | 41 | 2.97% |
| 7 | Journal of Laryngology and Otology | 39 | 2.82% |
| 8 | British Journal of Audiology | 38 | 2.75% |
| 9 | Otology Neurotology | 35 | 2.53% |
| 10 | Scandinavian Audiology | 31 | 2.24% |

5.5 Language of Publications

Number of research papers published in the field of Audiology in different languages across the globe is shown in Table-5. Of the total 1382 papers, majority of research papers are in English language, with a score of 1284 (92.91%). This is followed by research papers in German language, with 79 (5.72%). The remaining 19 (1.37%) research papers in the field are in other languages like Portuguese, Spanish, Turkish, French and Polish.

Table-5: Language of Publications

| S/N | Language | No. of Publications | % |
|-----|------------|---------------------|--------|
| 1 | English | 1284 | 92.91% |
| 2 | German | 79 | 5.72% |
| 3 | Portuguese | 7 | 0.51% |
| 4 | Spanish | 4 | 0.29% |
| 5 | Turkish | 3 | 0.22% |
| 6 | French | 3 | 0.22% |

| | | | |
|---|--------|---|-------|
| 7 | Polish | 2 | 0.15% |
|---|--------|---|-------|

5.6 Institution-Wise Publications

The institution-wise research productivity in the field of Audiology is shown in table-6. Of all the institutions, 'University of Pretoria' ranks first with 32 (2.32%) papers. this is followed by 'Linkoping University' ranks second with 28 (2.03%) papers. The 'University of Queensland' ranks third with 26 (1.88%). The 'Univeristy of Iowa' (22; 1.59%) and 'University of Western Australia' rank fourth and fifth respectively. The 'University of Manchester' and 'University of Carolina' are the least ranking institutions with 18 (1.30%) each.

Table-6: Institution-wise Publications

| Rank | Institutions | No. Publications | % |
|------|----------------------------------|------------------|-------|
| 1 | University of Pretoria | 32 | 2.32% |
| 2 | Linkoping University | 28 | 2.03% |
| 3 | University of Queensland | 26 | 1.88% |
| 4 | University of Iowa | 22 | 1.59% |
| 5 | University of Western Australia | 22 | 1.59% |
| 6 | University of Melbourne | 20 | 1.45% |
| 7 | University of Nottingham | 19 | 1.38% |
| 8 | Oregon Health Science University | 18 | 1.30% |
| 8 | University of Manchester | 18 | 1.30% |
| 8 | University of Carolina | 18 | 1.30% |

5.7 Year-Wise Growth Of Publications

Year-wise growth of publications is shown in table-7. It may be seen from the table that a maximum number of research papers are published are during the year 2016 scoring 144 (10.42%); followed by the papers of the year 2015 scoring 138 (9.99%) and equal number of papers scoring 5 (0.36%) are published in the year 1989 and 1990, the least forming.

Table-7: Year-wise Growth of Publication

| S/N | Year | No. of Publication | % |
|-----|------|--------------------|--------|
| 1 | 2016 | 144 | 10.42% |
| 2 | 2015 | 138 | 9.99% |
| 3 | 2014 | 113 | 8.18% |
| 4 | 2012 | 94 | 6.80% |
| 5 | 2013 | 90 | 6.51% |
| 6 | 2010 | 76 | 5.50% |
| 7 | 2011 | 76 | 5.50% |
| 8 | 2008 | 67 | 4.85% |
| 9 | 2009 | 51 | 3.69% |
| 10 | 2006 | 43 | 3.11% |
| 11 | 1996 | 40 | 2.89% |
| 12 | 1998 | 40 | 2.89% |
| 13 | 2007 | 39 | 2.82% |
| 14 | 1997 | 37 | 2.68% |
| 15 | 2003 | 35 | 2.53% |
| 16 | 1992 | 33 | 2.39% |
| 17 | 2001 | 33 | 2.39% |
| 18 | 2000 | 30 | 2.17% |

| | | | |
|-------|------|------|--------|
| 19 | 1999 | 29 | 2.10% |
| 20 | 2004 | 29 | 2.10% |
| 21 | 2005 | 27 | 1.95% |
| 22 | 1991 | 23 | 1.66% |
| 23 | 1995 | 23 | 1.66% |
| 24 | 2002 | 23 | 1.66% |
| 25 | 1994 | 21 | 1.52% |
| 26 | 1993 | 18 | 1.30% |
| 27 | 1989 | 5 | 0.36% |
| 28 | 1990 | 5 | 0.36% |
| Total | | 1382 | 100.00 |

5.8 Research Areas of Audiology

Distribution of research areas of Audiology is shown in table-8. It is observed that research is more prominent in the area of ‘Otorhinolaryngology’ with a contribution of 815 (61.37%) papers. The next large number of papers are in the branch of ‘Audiology, Speech Language Pathology’ with 410 (30.87%) papers. The third place is claimed by ‘Pediatrics’ accounting for 137 (10.32%) papers. This is followed by the research in ‘Rehabilitation’ with 125 (9.41%) papers and ‘Neurosciences/Neurology’ has 76 (5.72%) papers.

Table-8: Research Areas of Audiology

| S/N | Subject | No. of Publications | % |
|-----|--|---------------------|--------|
| 1 | Otorhinolaryngology | 815 | 61.37% |
| 2 | Audiology Speech Language Pathology | 410 | 30.87% |
| 3 | Pediatrics | 137 | 10.32% |
| 4 | Rehabilitation | 125 | 9.41% |
| 5 | Neurosciences/Neurology | 76 | 5.72% |
| 6 | General Internal Medicine | 66 | 4.97% |
| 7 | Surgery | 49 | 3.69% |
| 8 | Linguistics | 47 | 3.54% |
| 9 | Public Environmental Occupational Health | 39 | 2.94% |
| 10 | Educational Research | 36 | 2.71% |

5.9 Funding Agencies

The funding agencies contributing for publication growth is shown in table-9. It may be seen from the table that a ‘NIDCD NIH HHS’, has contributed the highest number of publications scoring 23 (1.66%), of the total output taking first rank. This is followed by ‘National Institutes of Health’ ranking second, with 11 (0.80%) papers. ‘Canadian Institutes of Health Research and NIH NIDCD’ have shared third rank with 8 (0.58%) papers each.

Table-9: Funding Agencies

| Ran k | Funding Agencies | No. of Publications | % |
|-------|--|---------------------|-------|
| 1 | NIDCD NIH HHS | 23 | 1.66% |
| 2 | National Institutes of Health | 11 | 0.80% |
| 3 | Canadian Institutes of Health Research | 8 | 0.58% |
| 4 | NIH NIDCD | 8 | 0.58% |
| 5 | Medical Research Council | 7 | 0.51% |
| 6 | Oticon Foundation | 6 | 0.43% |
| 7 | PHS HHS | 6 | 0.43% |
| 8 | Hearing CRC | 5 | 0.36% |
| 9 | NIH | 4 | 0.29% |

| | | | |
|----|--|---|-------|
| 10 | Rehabilitation Research and Development Service Department of Veterans Affairs | 4 | 0.29% |
|----|--|---|-------|

5.10 Year-Wise Citations

Year-wise citations of publication are shown in table-10. This table displays the total number of citations from 1989 to 2016. Highest No. of citations (1739) are in the year 2016, followed by 1457 and 1207 citations ranking second and third in the years 2015 and 2014 respectively.

Table-10: Year-wise Citations

| S/N | Year | No. of Citations |
|-----|------|------------------|
| 1 | 2016 | 1739 |
| 2 | 2015 | 1457 |
| 3 | 2014 | 1207 |
| 4 | 2013 | 1083 |
| 5 | 2012 | 971 |
| 6 | 2011 | 905 |
| 7 | 2010 | 723 |
| 8 | 2009 | 597 |
| 9 | 2008 | 482 |
| 10 | 2007 | 433 |
| 11 | 2006 | 406 |
| 12 | 2005 | 329 |
| 13 | 2004 | 249 |
| 14 | 2003 | 239 |
| 15 | 2002 | 202 |
| 16 | 2001 | 188 |
| 17 | 2000 | 186 |
| 18 | 1999 | 145 |
| 19 | 1998 | 134 |
| 20 | 1996 | 100 |
| 21 | 1997 | 95 |
| 22 | 1995 | 65 |
| 23 | 1993 | 38 |
| 24 | 1994 | 34 |
| 25 | 1992 | 6 |
| 26 | 1991 | 4 |
| 27 | 1990 | 1 |
| 28 | 1989 | 0 |

6.0 Conclusion

The present study is an attempt to find out the research trends in the field of Audiology based on WoS publications from 1986-2016. The results of the study are interesting and revealed the facts about Audiology research literature. A Total of 1382 items were retrieved, which had a total 13,562 citations. The Average citations per items are 9.81. H-index scored 47 in the field of Audiology from 1989 to 2016. This type of study helps in understanding the research contributions of individual authors, universities and the language and subject areas in which Audiology research is highly pronounced. It also indicates the way forward of the research trend in Audiology in future and time to come.

7.0 References

- Alhaider, I., Mueen Ahmed, K. K. & Gupta, B. M. (2015). Pharmaceutical research in the Kingdom of Saudi Arabia: A scientometric analysis during 2001-2010. *Saudi Pharm Journal*, 23(3), 215-222.

2. Anuradha, K. T. & Ramya, S. K. (2008). Scientific collaboration in academic institutions: A case study with Indian institute of Science Publications. *SRELS Journal of Information Management*, 45 (2), 181-196.
3. Arik, Engin. (2014). Sign language research in web of science, *Journal of Scientometric Research*, 3(3), 143-149.
4. Asgary, S. [et al.] (2013). Twenty years of research on mineral trioxide aggregate: a scientometric report. *Iranian Endodontic Journal*, 8(1), 1-5.
5. Bala, A. & Gupta, B. M. (2010). Mapping of Indian neuroscience research: a scientometric analysis of research output during 1999-2008. *Neurol India*, 58(1), 35-41.
6. Barbosa, F. G., Schneck, F. & Melo, A. S. (2012). Use of ecological niche models to predict the distribution of invasive species: a scientometric analysis. *Brazilian Journal of Biology*, 72(4), 821-829.
7. Begum, Khaiser Jahan & Sami, Lalitha K. (1986). Trends in Indian agricultural research: an analytical study. *Annals of Library Science and Documentation*, 33(4), 163-172.
8. Begum, Khaiser Jahan & Sami, Lalitha, K. (1988). Research collaboration in agricultural science. *International Library Review*, 20, 57-63.
9. Begum, Khaiser Jahan & Shalaja, T. S. (1985). Characteristics of the literature used by the nutritionists: a citation study. *Annals of Library Science and Documentation*, 32(3-4), 122-128.
10. Bencetic Klaić, Z. & Klaić, B. (1997). Scientometric analysis of anthropology in the Republic of Croatia for the period of 1980-1996. *Collegium Antropologicum*, 21(1), 301-318.
11. Bernabò, N., [et al.] (2016) A scientometric analysis of reproductive medicine. *Scientometrics* (2016) 109(1), 103-120. doi:10.1007/s11192-016-1969-3
12. Biglu, M. H., Eskandari, F. & Asgharzadeh, A. (2011). Scientometric Analysis of Nanotechnology in MEDLINE. *Bioimpacts*, 1(3), 193-198.
13. Carl, J. [et al.] (2014). Curare--a curative poison: a scientometric analysis. *PLoS One*, 9(11), e112026.
14. Chen, C. [et al.] (2012). Emerging trends in regenerative medicine: a scientometric analysis in CiteSpace. *Expert Opinion on Biological Therapy*, 12(5), 593-608.
15. Chen, C., Dubin, R. and Kim, M. C. (2014). Emerging trends and new developments in regenerative medicine: a scientometric update (2000 - 2014). *Expert Opinion on Biological Therapy*, 14(19), 1295-1317.
16. Dutt, Bharvi & Nikam, Khaiser (2013). Solar cell research in India: a scientometric profile. *Annals of Library Science and Documentation*, 60(2), 115-127.
17. Dutt, Bharvi & Nikam, Khaiser (2014). Scientometrics of collaboration pattern in solar cell research in India. *Annals of Library Science and Documentation*, 61(1), 65-73.
18. Elango, B., Rajendran, P. and Bornmann, L. (2013). Global nanotribology research output (1996-2010): a scientometric analysis. *PLoS One*, 8(12), e81094.
19. Fazekas, T. and Varró, V. (2001). Scientometrics and publishing in Hungarian medical science. Ethical and technical issues. *Orv Hetil*, 142(45), 2493-2499.
20. Meadows, A. J. (1974) *Communication in Science*. Butterworth: Longman.
21. Price, Derek J de Solla. (1963) *Little science, big science—and beyond*. New York: Columbia University Press.
22. Ramin, S. Gharebaghi, R. and Heidary, F. (2015). Scientometric Analysis and Mapping of Scientific Articles on Diabetic Retinopathy. *Med Hypothesis Discov Innov Ophthalmol*, 4(3), 81-100.
23. Retrieved from <http://www.hiddenhearing.co.uk/hearing-health/356/what-is-audiology/>
24. Retrieved from <http://www.southampton.ac.uk/audiology/whatisaudiology/index.page>