

Citation analysis of Iranian Journal of Nuclear Medicine: Comparison of SCOPUS and Google Scholar

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ABSTRACT

Introduction: Citation tracking is a bibliometrics method to analyze the scientific impact of journal articles which can be done through Scopus (SC), Google Scholar (GS), or ISI web of knowledge (WOS). In the current study, we analyzed the citations to 2006-2012 articles of Iranian Journal of Nuclear Medicine (IJNM) in the SC and GS.

Methods: We retrieved the relevant data from SC and GS official websites. The search was done on 10/2012. Total number of citations, their overlap and unique citations of SC and GS were evaluated in detail.

Results: SC and GS covered 100% and 99% of articles and identified 53 and 62 citations to IJNM articles respectively with the overlap of 44 citations. Original articles were the main types of cited articles followed by review articles.

Conclusion: Despite considerable overlap between GS and SC, they provide important unique citations to IJNM articles. Due to differences between citation analysis information in each database, authors should consider all the indexing databases when evaluating the scientific impact of the individual journal. Editors should consider original and review articles to increase long term visibility and hopefully impact factor of IJNM in the future.

Key words: Scopus; Citation tracking; Google scholar; SCImago Journal Rank Indicator; Iranian Journal of Nuclear Medicine

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INTRODUCTION

Bibliometrics includes different statistical methods for evaluation of scientific literature and has been of interest for decades in examining the dominant literature, and researchers of different scientific fields. Citation tracking of published articles is a strong bibliometric evaluative method which can show the scientific impact of each journal of different disciplines by analyzing the journal citations models and counts. Citation analysis data can be retrieved from different citation sources. Web of Science (WOS) from ISI has been the first citation database for years. Scopus (SC) from Elsevier and Google scholar (GS) from Google are two alternative sources to WOS introduced in 2004 and present citation information for published literatures. These three major databases have their specific features with some qualitative and quantitative differences in their coverage as well as in citation analyzing which were discussed in several previous studies [1, 2]. Iranian Journal of Nuclear Medicine (IJNM) is a peer-reviewed biannual journal published by the Research Institute for Nuclear Medicine, Tehran University of Medical Sciences which publishes original articles, systematic reviews, meta-analyses, general reviews, mini-reviews, short communications, editorials, case reports and letters to the editor in basic and clinical nuclear medicine sciences. Full texts of the articles are indexed in different sources like SC, and GS Scholar.

In this project, we studied the citation analysis of the IJNM, not only the citation count but also the differences of citation indexing databases in presenting citation information of the published articles. Since the journal is not indexed in ISI, we didn't evaluate the Web of Science citation analysis.

METHODS

All articles of IJNM published before 2012 and indexed in SC were evaluated. Citations referred to each article were retrieved from each scientific database and considered separately. Differences about the citation count and coverage of each database were evaluated and compared. The reasons of discordance between the two scientific sources regarding the citation counts and type of citing items were evaluated in depth.

Citations to the articles in the SC were retrieved from the Scopus official website (www.scopus.com) using the "cited by" application. Citations to the articles in the GS were retrieved from the Google scholar official website (www.scholar.google.com) using the "cited by" links of each article. The information was retrieved on 20/10/2012.

RESULTS

In total, 100 articles were published in Iranian Journal of Nuclear Medicine in the time period of 2006-2011. All the published items were indexed in SC (100% coverage). The coverage of GS was 99% since one item was not included in the GS. Thirty-three articles were cited at least once in GS or SC [3-35] (Table 1). Twenty one of these articles were original reports, 8 were review articles, and the remaining 4 were case reports. Figure 1 shows the citation analysis of the Iranian Journal of Nuclear Medicine by GS and SC. SC had 9 and GS had 18 unique citations. GS and SC had 44 overlapping citations. Table 1 shows the details about citation analysis of IJNM articles both in SC and GS. Table 2 shows the time distribution of citation counts in SC. Table 3 shows the journals citing IJNM articles in SC, their Impact Factors (IF), and SCImago journal rank indicator (SJR). IF and SJR are journal quality measures published by ISI web of knowledge and SC respectively [36, 37].

DISCUSSION

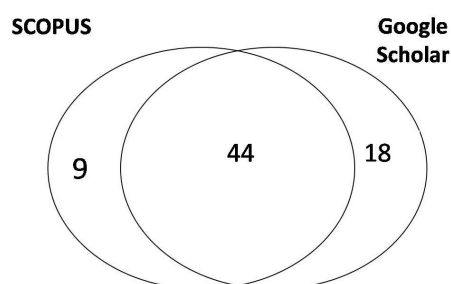
Citation analysis as a major bibliometric method evaluates connections between publications, databases, and journals by considering the count, model, and distribution of citing items for each publication [38, 39]. WOS, SC, and (GS) are three major resources for retrieving citation analyzing data[40]. Citation tracking data vary according to the studied disciplines and citation source. GS is a free scholarly literature source which records articles through websites by matching algorithm not in guided manner and covers conference papers, doctoral and master's thesis, books and book chapters and articles which are not indexed in ISI and SC. In our study, citations by items not indexed in SC (such as books and meeting abstracts) were not considered in SC citation search. Two citations from books and one from a meeting abstract were counted by GS but not SC for three articles of IJNM [24, 31, 33]. There are some uncertain information about GS regarding the number of included journals and date of its citation coverage. GS as an extensive search engine includes most of citations to journal articles and has different journal coverage and upgrading half life compared to SC. For example, two of the IJNM articles were cited in GS by articles not included in SC at the time of our study information retrieval, although their source journals were SC indexed. This was due to different updating policies of SC and GS which needs be considered in all citation tracking investigation.

Table 1. Citation tracking of the IJNM articles cited at least once in Scopus (SC) or Google scholar (GS).

Article title	Year	Type of article	SC citation	GS citation	Overlap	Comments
Production, quality control and biological evaluation of ¹⁵³ Sm-EDTMP in wild-type rodents	2009	Original	5	6	4	One of the discordant citing articles was a Persian article not indexed in SCOPUS. Another one was published in 2012 and probably not included in SCOPUS yet
The need for skin pen marking for sentinel lymph node biopsy: A comparative study	2008	Original	5	5	5	-
Evidence based medicine in nuclear medicine practice; Part II: Appraising and applying the evidence	2009	Review	4	5	4	The discordant article was a duplicate from two sources
Synthesis and evaluation of a new radiolabeled bombesin analogue for diagnosis of GRP receptor expressing tumors	2009	Original	4	4	4	-
Evidence based medicine in nuclear medicine practice; part I: Introduction, asking answerable questions and searching for the best evidence	2009	Review	4	Could not be retrieved	N/A	The study was grouped as one article with the 3 rd article above
New peptide based freeze-dried kit [^{99m} Tc-HYNIC]-UBI 29-41 as a human specific infection imaging agent	2008	Original	4	4	3	The discordant article in GS was a duplicate retrieved from two different sources. SCOPUS discordant article was a journal article
Dipyridamole stress and rest gated ^{99m} Tc-sestamibi myocardial perfusion spect: Left ventricular function indices and myocardial perfusion findings	2007	Original	3	3	3	-
Performance comparison of four commercial GE discovery PET/CT scanners: A Monte Carlo study using GATE	2009	Original	2	3	2	Discordant article was a Chinese article
Evaluation of the role of system matrix in SPECT images reconstructed by OSEM technique	2008	Original	2	1	1	Discordant article was a journal of article
Computed tomography based attenuation correction in PET/CT: Principles, instrumentation, protocols, artifacts and future trends	2007	Review	2	3	2	Discordant article was a journal article
Detection of soft tissue tumors on bone scintigraphy: report of four cases	2007	Case report	2	2	2	-
PET vs. SPECT: In the context of ongoing developments (Review article)	2006	Review	2	4	2	The two discordant citing articles: one was book and another one was a journal article
Sentinel lymph node biopsy in melanoma patients: An experience with Tc-99m antimony sulfide colloid	2010	Original	1	1	1	-
Development of Sm-153 chitosan for radiosynovectomy	2010	Original	1	1	1	-
Sensitivity of Gallium scintigraphy for evaluation of recurrent lymphoma: Comparison of planar and SPECT imaging	2010	Original	1	0	0	Discordant article was a journal article
Preliminary imaging studies of [⁶¹ Cu]diacetyl-bis (N 4-methylthiosemicarbazone) in normal and hypoxic tumor models	2010	Original	1	1	1	-
The application of unconventional PET tracers in nuclear medicine	2009	Review	1	1	1	-
Normal values of left ventricular functional indices in gated ^{99m} Tc-MIBI myocardial perfusion SPECT	2008	Original	1	1	1	-
Evaluation of attenuation correction process in cardiac SPECT images	2008	Review	1	1	1	-
Monte Carlo simulation of two ¹⁰⁶ Ru eye plaques in a new mathematical human eye model	2008	Original	1	1	1	-

Table 1. Citation tracking of the IJNM articles cited at least once in Scopus (SC) or Google scholar (GS). (Continued)

Article title	Year	Type of article	SC citation	GS citation	Overlap	Comments
Different aspects of transient ischemic dilation	2007	Review	1	1	1	-
An improved synthesis and preliminary biodistribution study of a technetium-99m-labeled 2-amino-2-deoxy(thioacetyl)-D-glucose complex ([^{99m} Tc]-TA-DG) as a tumor imaging agent	2007	Original	1	2	1	The discordant article was a book
Qualitative evaluation of filter function in brain SPECT	2007	Review	1	1	1	-
[^{99m} Tc-DMSA (V)] in detection of metastases of medullary thyroid carcinoma	2006	Original	1	0	0	The discordant article was a journal article
Agreement of two methods of planar and SPECT scintigraphy with ^{99m} Tc- RBC in detection of liver hemangioma	2006	Original	1	1	1	-
Catheter related artifacts on bone scans: Report of two cases	2006	Case report	1	1	1	-
Freeze-Dried Cold Kit for Preparation of ^{99m} Tc-Ciprofloxacin As an Infection Imaging Agent	2010	Original	0	1	0	The citing article is a Journal article published in 2012 not indexed yet in SCOPUS yet
The Bone Scan Pattern in Disseminated BCGitis	2007	Case report	0	1	0	The citing article was polish
The First Experience of Stem Cell Labeling in Iran Using ¹¹¹ In-Oxine	2007	Original	0	1	0	The citing article was book
Reducing The Respiratory Motion Artifacts in PET Cardiology: A Simulation Study	2007	Original	0	1	0	The citing article was Chinese
Persistent Sub-diaphragmatic Activity on the Myocardial Perfusion Scan with ^{99m} Tc-Sestamibi	2008	Case report	0	1	0	The citing article was a meeting abstract
Osteoporosis in postmenopausal diabetic women; prevalence and related factors	2008	Original	0	1	0	The discordant article was a journal article
Determination of absorbed dose of organs (thyroid, sternum, cervical vertebra) in thyroid cancer patients following radioiodine therapy	2009	Original	0	3	0	The discordant articles were journal articles

**Figure 1.** Citation overlap and unique citations to IJNM articles according to Scopus and Google Scholar.**Table 2.** Time distribution of IJNM in Scopus.

2007	2008	2009	2010	2011	2012	Total with self citations	Total without self citations
2	2	6	22	15	6	53	28

Table 3. Journals citing IJNM articles according to Scopus with their Impact Factors (IF) and SCImago Journal Rank Indicators (SJR).

Journal title	Number of articles citing IJNM	2011 SJR	2011 IF
Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment	2	0.8	1.207
Reports of Practical Oncology and Radiotherapy	1	0.17	-
Physical Chemistry Chemical Physics	1	1.43	3.573
Annual Reports in Medicinal Chemistry	1	0.41	1.714
Experimental Oncology	1	-	-
Radiochimica Acta	1	0.61	1.575
Current Medical Imaging Reviews	1	0.18	0.708
IEEE Nuclear Science Symposium Conference Record	1	0.16	-
Turkiye Klinikleri Journal of Medical Sciences	1	0.15	-
Iranian Journal of Medical Physics	2	-	-
Iranian Journal of Nuclear Medicine	20	0.18	-
Radiation Measurements	1	0.56	1.177
International Journal of Biomedical Imaging	1	0.49	-
Mini-Reviews in Medicinal Chemistry	1	0.72	2.528
Journal of Radioanalytical and Nuclear Chemistry	3	0.48	1.52
Cancer Biotherapy and Radiopharmaceuticals	1	0.53	1.787
Iranian Journal of Pediatrics	1	0.15	0.292
Scientia Pharmaceutica	1	0.34	-
Nuclear Medicine Communications	3	0.52	1.404
Iranian Journal of Radiation Research	1	0.21	0.262
Journal of Nuclear Medicine Technology	1	0.33	-
Hellenic Journal of Nuclear Medicine	2	0.21	0.805
Acta Oncologica	1	1.13	3.33
Daru	1	0.27	0.625
Current Pharmaceutical Design	1	1.12	3.87
Bioconjugate Chemistry	1	1.87	4.93
PTB - Mitteilungen Forschen und Prüfen	1	0.11	-

Due to different upgrading half life for GS and SC, at each time point, some citations may be found in GS while not present in SC and vice versa [3, 29]. SC covers large number of journals and reveals citation data from 1996 onward [40, 41]. In our results citation count varied for some of the IJNM articles in GS and SC due to different journal coverage [8, 11, 12, 17, 26].

GS does not have an explicit method of inclusion of journals and articles and this can cause discrepancy in the article coverage of a journal or discipline between GS and SC [36, 42, 43]. For example, Miri et al reported 96% and 87.5% article coverage of "Hepatitis Monthly" in SC and GS respectively [44]. IJNM articles were covered 100% and 99% in SC and GS. The article not covered in GS [5] had a very

similar title to another article published in IJNM [6] and GS assumed this article to be a duplicate. The inaccuracies of GS could also be evident in citation analysis too. For example, one of the IJNM articles was cited 4 times in GS, however in depth evaluation of the citations showed that two of these citations were actually the same and GS retrieved them from two sources. This can cause artificially increased citation counts in GS.

Unlike SC, GS has a wide range of language coverage and can recognize most of the citations from non-English literatures. In our citation analysis study, non-English articles caused different citation counts in each databases. Citations from Chinese and Polish articles were recognized by GS but not SC [10, 30, 32].

According to SC, many of the IJNM citations were from the Iranian journals and self citation considerably contributed to the citations to IJNM. As shown in Table 2, 20 articles (24 citations) of IJNM cited another articles of this journal which amounts to almost third of the citations to this journal. The citations to IJNM show an increasing trend since 2007. In 2007, IJNM was first indexed in SC which increased its visibility considerably and as is shown in Table 2, citations increased sharply from 2 in 2007 and 2008 to 6 in 2009 and 22 in 2010. Our data were retrieved on 10/2012 and we can expect that 2012 citation would increase as more 2012 articles are getting included in SC.

Journals citing IJNM (27 journals in total) encompass a wide range with impact factors as high as 4. It seems that IJNM has attracted a respectable range of readers and already has an acceptable visibility among the nuclear medicine experts.

A short survey of SCImago Journal and Country Rank website shows that IJNM ranks 17th among 55 Iranian medical journals indexed in SC considering 2011 SJR (SCImago Journal Rank Indicator) which is SC powered journal metrics. This shows that IJNM went a long way in gaining visibility among Iranian journal and should continue this path in the future. We can predict that by indexing in Pubmed Central and ISI web of Knowledge, this visibility would be increased and the contribution of self citations would decrease.

CONCLUSION

Although Scopus is a strong scientific database, GS can be a complementary source for retrieving citation analyzing data. Due to differences between citation indexed in each scholarly source, authors should consider all indexing databases when judging scientific impact of the journals.

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