Original Article

Altmetric Analysis of Contemporary Iranian Medical Journals

Jafar Kolahi, Saber Khazaei[1], Elham Bidram[2], Roya Kelishadi[3]

Independent Research Scientist, Founder and Associate Editor of Dental Hypotheses, Isfahan, Iran, [1]Department of Endodontics and Dental Research Center, School of Dentistry, Isfahan University of Medical Sciences, Isfahan, Iran, [2]Faculty of Advanced Sciences and Technologies, University of Isfahan, Isfahan, Iran, [3]Department of Pediatrics, Child Growth and Development Research Center, Research Institute for Primordial Prevention of Non-Communicable Disease, Isfahan University of Medical Sciences, Isfahan, Iran

Abstract

Background: Altmetrics is a newly emerging scholarly tool measuring online attention surrounding scientific research outputs. With respect to increasing demand of disseminating research findings on the World Wide Web, this study aims to analyze the altmetric statues of Iranian medical journals. **Methods:** On February 27, 2019, the list of Iranian medical journals extracted from http://journals.research.ac.ir/ and consequently altmetric data token out from Altmetric database (Altmetric LLP, London, UK). The science mapping done via keyword co-occurrence, co-citation and co-authorship, network analysis using the VOSviewer. The Pearson coefficient was then employed for the correlation analysis using R. **Results:** Among a total of 104 journals, 7518 articles were mentioned in Altmetric data resources (Mean: 72.28, Confidence Level (95.0%): 16.8), total mentions were 27577 (Mean: 265.16, Confidence Level (95.0%): 79.9). Considering the total mentions of articles, *International Journal of Preventive Medicine* achieved the first rank, followed by *Journal of Research in Medical Sciences* and *Iranian Journal of Public Health*. Notably, Twitter was the most popular altmetric resource followed by Facebook and news outlets. Tweets were generally from the United States and United Kingdom. Among top 5% popular Iranian medical articles multiple sclerosis, cancer, and anxiety was hot topics. **Conclusions:** Iranian biomedical journal editors and research scientists needs to be more dynamic in World Wide Web using social media, post-publication peer review tools, Stack Exchange (Q and A) sites, research highlight tools, Wikipedia, and etc. In spite, more attention to the concept of evidence-based policymaking, by Iranian government along with the health policymakers seems necessary.

Keywords: *Altmetrics, Facebook, Iran, medical journal, social media, Twitter*

Introduction

Impact factor or h-index are the famous traditional citation-based metrics for the research scientists. However, altmetrics is a newly emerging scholarly tool, acts as a compliment to traditional citation-based bibliometrics, measuring online attention surrounding scientific research outputs.[1-3] Different data resources for altmetrics includes Twitter, Facebook, scientific blogs, news outlets, Google+, policy documents, post-publication peer reviews, F1000 prime, Wikipedia, Weibo, Reddit, Pinterest, patents, Video (e.g. YouTube), sites running Stack Exchange (Q and A) and others.[4] In contrast with slowly-progressive traditional citation-based metrics, altmetrics acts very fast, in which the majority of altmetric resources up-dated on a daily basis. In contrast, less than 50% of articles were cited before 3 years after publication.[5]

Among general and internal medical journals, the number of Twitter followers is strongly associated with impact factor and number of citations.[6] The number of Twitter mentions potentially forecast the highly cited articles, within the first 3 days of their publication.[7]

Of more interest, well-known medical research funders and charities, e.g. the Welcome Trust, attracted to altmetrics creating greater public engagement toward the research.[8] The altmetric status of neurosurgery journals,[9] radiology journals,[10] dental journals,[11-15] emergency medicine,[16] etc., has previously been analyzed.

Nevertheless, Iran experienced a great development in knowledge creation during the last decade.[17-20] Polynomial trendline analysis of PubMed search results with the term of "Iran[Affiliation]" revealed the fast growing of the number of Iranian articles ($y = 41.625x^2\text{-}166263x + 2E + 08$, $R^2 = 0.9632$).

Hence, with respect to increasing demand of disseminating research findings on the

How to cite this article: Kolahi J, Khazaei S, Bidram E, Kelishadi R. Altmetric analysis of contemporary Iranian medical journals. Int J Prev Med 2019;10:112.

Address for correspondence:
Dr. Jafar Kolahi, Independent Research Scientist, Founder and Associate Editor of Dental Hypotheses, No. 24, Faree 15, Pardis, Shahin Shahr, Isfahan 83179-18981, Iran.
E-mail: Kolahi_jafar@yahoo.com

Access this article online

Website: www.ijpvmjournal.net/www.ijpm.ir

DOI: 10.4103/ijpvm.IJPVM_134_19

Quick Response Code:

World Wide Web among the scientist, this study aims to analyze the altmetric statues of Iranian medical journals.

Methods

On February 27, 2019, a list of Iranian medical journals was extracted from http://journals.research.ac.ir/, and consequently altmetric data were derived from Altmetric database (Altmetric LLP, London, U.K.). Bibliometric data of Iranian popular medical articles and journals were retrieved from PubMed and Web of Science. The science mapping via keyword co-occurrence, co-citation and co-authorship network analysis was carried out using the VOSviewer 1.6.6 (www.vosviewer.com/, Leiden University Centre for Science and Technology Studies). The Pearson coefficient was also employed for the correlation analysis using Rattle (graphical user interface for data science in R (R Foundation for Statistical Computing, Vienna, Austria. http://www.R-project.org/)). Graphs were drawn by Microsoft Office Excel 2016.

Results

A total of 104 journals were found with Altmetric mentions, in which 7,518 articles were mentioned among Altmetric data resources (Mean: 72.28, Confidence Level (95.0%): 16.8), total mentions were 27577 (Mean: 265.16, Confidence Level (95.0%): 79.9) [Figure 1 and Table 1]. Among top 5% (469 articles) popular articles, h-index was 25 and the average citations was 12.3 per item according to Web of Science.

With respect to the total mentions of articles, *International Journal of Preventive Medicine* achieved the first rank, followed by *Journal of Research in Medical Sciences* and *Iranian Journal of Public Health* [Figures 2 and 3].

Twitter was the most popular altmetric resource among Iranian medical journals followed by Facebook and news outlets [Figure 4], with the most Tweets generally from the United States and United Kingdom [Table 2].

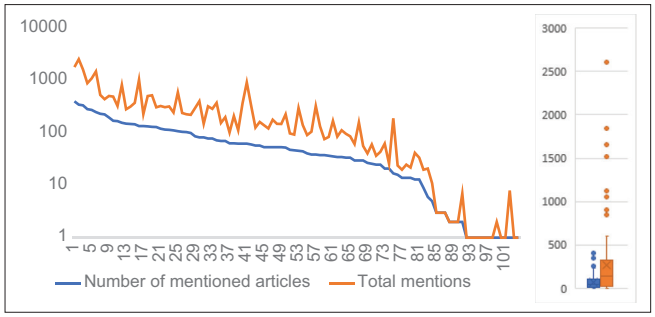

Figure 1: Altmetric data of 104 Iranian medical journals. Please note the logarithmic scale of the left vertical axis. Box and whisker plots of data are shown on the right

Among top 5% Iranian medical articles, multiple sclerosis, cancer, and anxiety listed as the most accruing keywords (hot topics) [Figure 5].

Co-citation network analysis illustrated *American journal of clinical nutrition, Journal of nutrition and New England journal of medicine* as the most affective journals on the network, considering the number of citations [Figure 6].

Co-authorship network analysis displayed Askari G, Ghiasvand R and Khorvash F, had the most influence on the network considering number of articles [Figure 7].

Altmetric score correlated with news mentions (r = 0.85) and did not correlate with citations (r = 0.005); yet Mendeley mentions correlated with citations (r = 0.80) [Figure 8].

Discussion

Number of social media users will increase to 3 billion by 2021 (http://bit.ly/2FsJVh4). Social media is a useful tool for dissemination of medical knowledge.[21] A good example would be Mayo Clinic Twitter account (@MayoClinic) with more than 1.89 million followers and 45600 tweets.[22] "Measles, Mumps, Rubella Vaccination and Autism" published at Annals of Internal Medicine, March 2019, would be a good illustration to show the power of social media.[23] This article experience 10040 tweets from 9256 users, with an upper bound of 21,393,283 followers. Remarkably, 83% of tweets were carried out by members of the public, 8% by scientists, 7% by practitioners (doctors, other healthcare professionals) and 2% by science communicators (journalists, bloggers, editors) (https://annals.altmetric.com/details/56459321).

To the best of our knowledge, this is the first attempt to analyze the altmetric status of Iranian medical journals. Tweets and Facebook posts were the most prevalent altmetric resources, mostly from the United States and the United Kingdom, indicating the international popularity of Iranian journal research outputs. Disappointingly, well-known Iranian journals are not active in Twittersphere. Alongside of legal limitations, lack of knowledge and attitude among Iranian editors, mainly influenced this trend. Previous studies indicated journals with their own Twitter page, received 34 percent more citations and 46 percent more tweets than journals without a Twitter page.[24] Interestingly, highly tweeted articles were tweeted on the day of publication by corresponding journal accounts or accounts with a high number of followers, e.g. an academic society.[25]

Unacceptably, the newly emerging scholarly tools, such as, post-publication peer review (e.g. PubPeer)[26-28] and research highlight (e.g. F1000 Prime),[29] are not popular among Iranian medical journals.

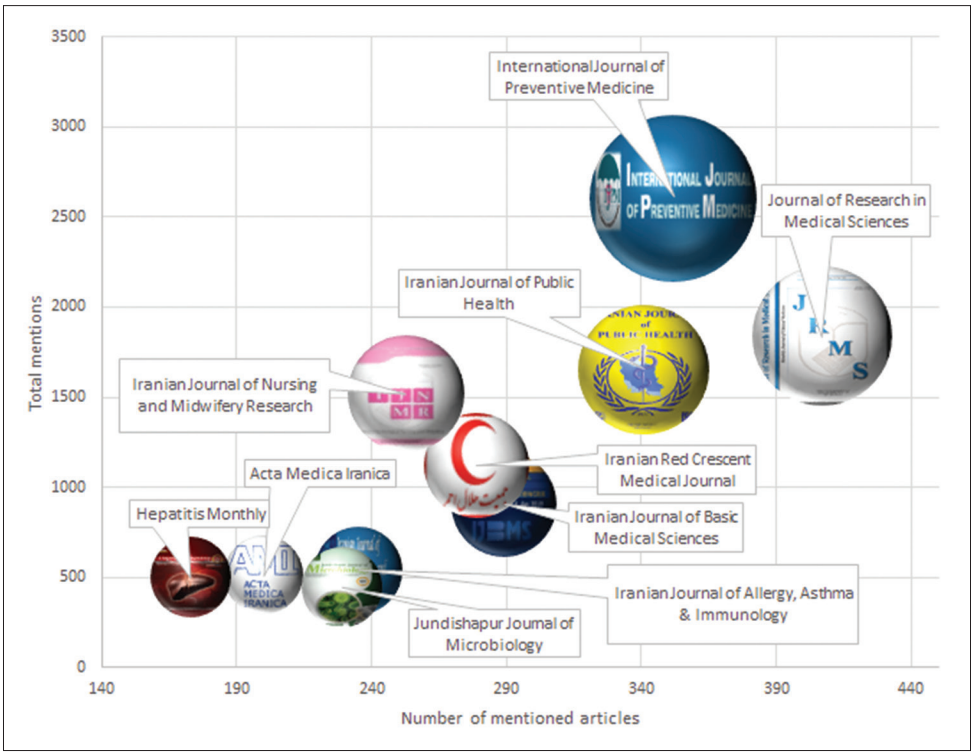

Figure 2: Altmetric data of top ten Iranian medical journals with the most online attention. Bubble sizes correspond to the number of Twitter mentions

Table 1: Data-bar visualization of the top 10 Iranian medical articles with the highest Altmetric scores

Altmetric Score	Title	Journal	Publication Date	Citations*	Mendeley readers
465	Latent Toxoplasmosis and Human	Iranian Journal of Parasitology	1/1/2012	0	119
379	Methodological Note: Neurofeedback: A Comprehensive Review on System Design, Methodology and Clinical Applications	Basic And Clinical Neuroscience	1/1/2016	46	298
370	Effects of air pollution on human health and practical measures for prevention in Iran	Journal of Research in Medical Sciences	1/1/2016	20	107
318	The effect of magnesium supplementation on primary insomnia in elderly: A double-blind placebo-controlled clinical trial.	Journal of Research in Medical Sciences	12/1/2012	0	239
277	Anti-Oxidative and Anti-Inflammatory Effects of Ginger in Health and Physical Activity: Review of Current Evidence	International Journal of Preventive Medicine	4/1/2013	0	137
262	The Effects of Ginger on Fasting Blood Sugar, Hemoglobin A1c, Apolipoprotein B, Apolipoprotein A-I and Malondialdehyde in Type 2 Diabetic Patients	Iranian Journal of Pharmaceutical Research	1/7/2015	0	8
249	Benign Prostatic Hyperplasia Treatment with New Physiotherapeutic Device.	Urology Journal	1/1/2015	0	15
233	The Mediterranean Diet: A History of Health	Iranian Journal of Public Health	4/30/2013	0	105
217	Camel Milk Has Beneficial Effects on Diabetes Mellitus: A Systematic Review	International Journal of Endocrinology and Metabolism	3/11/2017	4	15
210	Effect of Air Pollutant Markers on Multiple Sclerosis Relapses.	Iranian Journal of Public Health	10/1/2013	0	6

*According to Dimensions database

Stimulus-triggered acquisition of pluripotency, or STAP might be the good examples showing the power of post-publication peer review; In January 2014, scientist from Japan and US published two articles in the *NATURE* stating embryonic-like stem cells could be generate by exposing adult body cells to stress, such as acidic conditions or physical pressure. Shortly critical post-publication peer reviews however, found several problems with STAP stem-cell claims and the articles finally retracted.[30]

Iranian medical journals were rarely cited by patents, showing a gap between Iranian medical research and industry. Entrepreneurship courses, funding practical researches and development of biomedical science and technology parks will be useful tools bridging this old gap.[31-34]

Iranian medical community were not active in Wikipedia and Iranian medical articles rarely cited in Wikipedia. Of more interest, only English-language medical Wikipedia articles received additional to 2.4 billion visits in 2017.[35] Currently, the English Wikipedia develops at a rate 570 new daily articles (https://en.wikipedia.org/wiki/Wikipedia: Statistics). Moreover, the Cochrane and Wikipedia started working together in 2016 to disseminate trusted health information on World Wide Web (http://bit.ly/2Cm0IBB). Therefore, Wikipedia could be considered as a useful tool to publicize trusted medical knowledge by Iranian medical community.[36]

Table 2: Demographic breakdown of top 10 countries with the greatest number of tweets related to Iranian medical articles

COUNTRY	TOTAL TWEETS	UNIQUE TWEETERS
United States	5,153 (26.2%)	2,084 (21.3%)
United Kingdom	1,503 (7.6%)	796 (8.1%)
Canada	615 (3.1%)	392 (4%)
Spain	565 (2.9%)	382 (3.9%)
Australia	341 (1.7%)	197 (2%)
France	303 (1.5%)	122 (1.2%)
Saudi Arabia	233 (1.2%)	221 (2.3%)
India	166 (0.8%)	109 (1.1%)
Japan	126 (0.6%)	78 (0.8%)
Netherlands	123 (0.6%)	94 (1%)

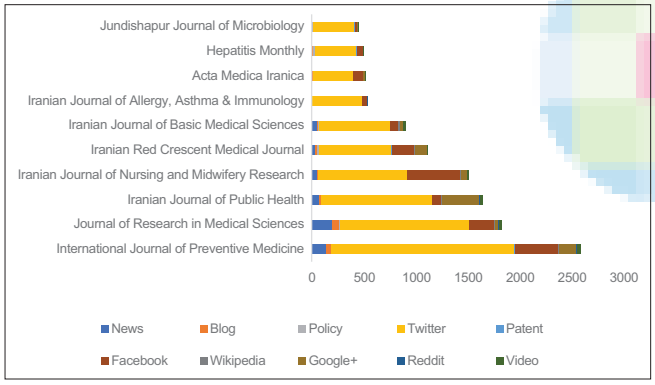

Figure 3: Breakdown of the Altmetric data resources for top ten Iranian medical journals

Considering principles of evidence-based policymaking,[37-39] Iranian medical research findings rarely used for policymaking. These results may involve bias, due to not availability of Iran's policy documents at Altmetric database, which strongly requires the Iranian health policymakers at government and parliaments' attention.[40]

Hot topic analysis illustrated emerging and groundbreaking issues, e.g. genomic medicine, nano-technology, tissue engineering, artificial intelligence, robotic surgery non-common among Iranian medical journals, which needs more consideration.

Based on this study there was no correlation between altmetric score and citation even with high h-index among popular Iranian articles. Same result reported for original research articles, published in specific high-impact general medicine journals,[41] cardiovascular articles,[42] emergency medicine,[16] radiology,[10] etc. Yet, some studies reported significant correlation between altmetrics and citations. In a large-scale study, a significant correlation was found between six altmetric resources (tweets, Facebook wall posts, research highlights, blog mentions, mainstream media mentions and forum posts) and citation counts.[43] A recent study covering six PLOS specialized journals, revealed a significant positive correlation between the normalized altmetric scores and normalized citations.[44]

Limitations of our study should be noted. First, altmetric analysis more fluctuates over time, compared to traditional

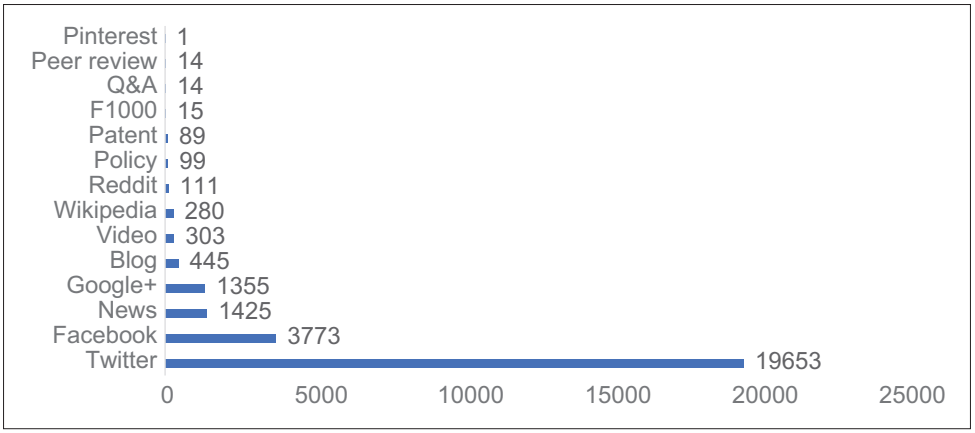

Figure 4: Sum of scores of various Altmetric data resources among Iranian medical journals

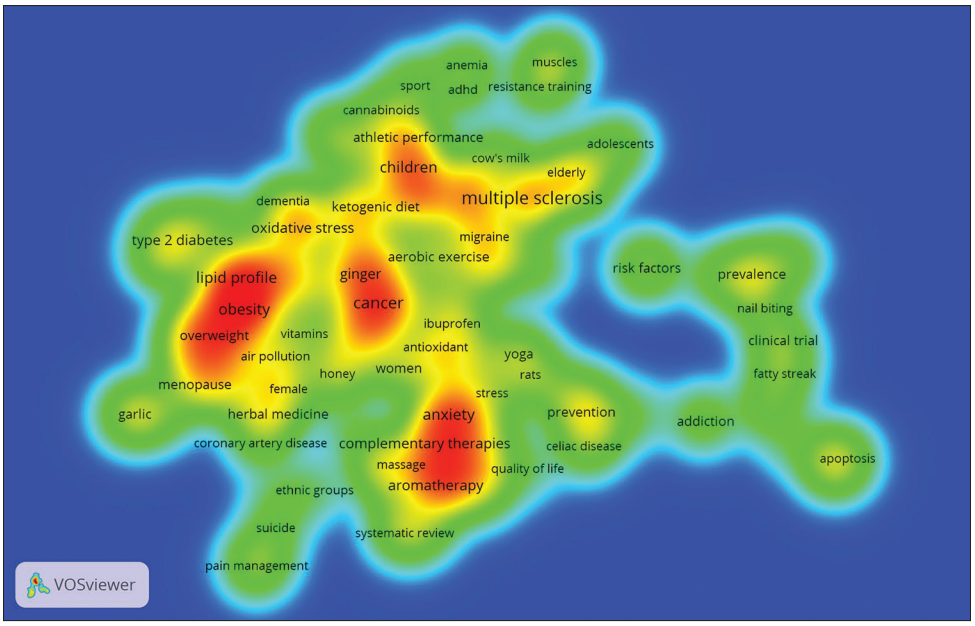

Figure 5: Hot topics among top 5% Iranian medical articles with the highest Altmetric scores. Red–yellow–green–blue color scheme was used; red corresponds to the highest keyword co-occurrence in density, and blue corresponds to the lowest density. The distance-based approach was used to create this map, which means the smaller the distance between two terms, the higher their relatedness

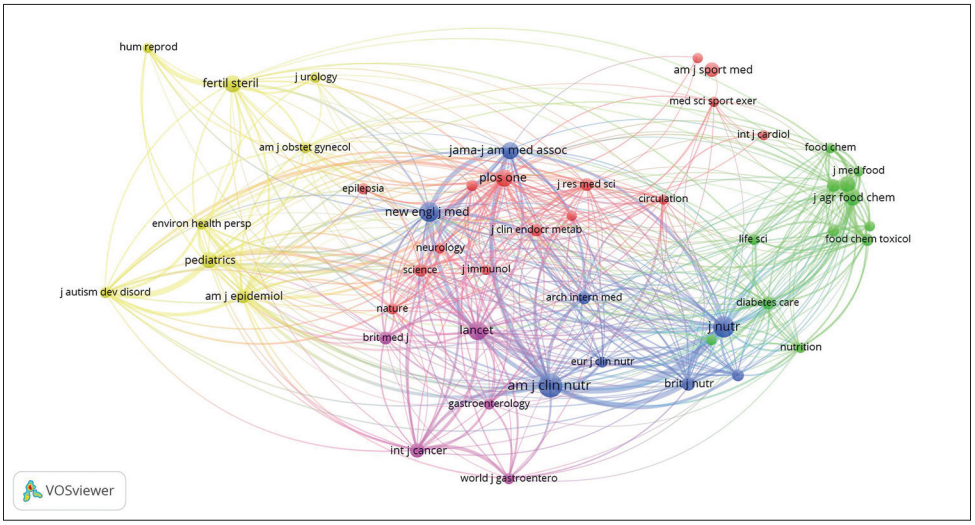

Figure 6: Co-citation network analysis among citation sources of the top 5% Iranian medical articles with the highest Altmetric scores. The network involved 48 nodes and 5 clusters which showed in different colors

indices. Second, the frequency of journal and number of articles in journal were not adjusted. In context, altmetrics might be a useful, complementary measure to evaluate the impact of research reporting in modern medicine and publication enterprise.

As a final point, Iranian medical journal editorial teams and biomedical research scientists, must go beyond boundaries of traditional citation-based metrics being more active in World Wide Web, while paying more attention to newly emerging scholarly tools, e.g. social media, post-publication peer review tools, Stack Exchange (Q and A) sites, research highlight tools, Wikipedia.

Acknowledgments

We would like to thank Altmetric LLP (London, U.K), particularly Mrs. Stacy Konkiel for her valued support and permitting us complete access to Altmetric data.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Received: 15 Mar 19 **Accepted:** 11 Apr 19
Published: 12 Jun 19

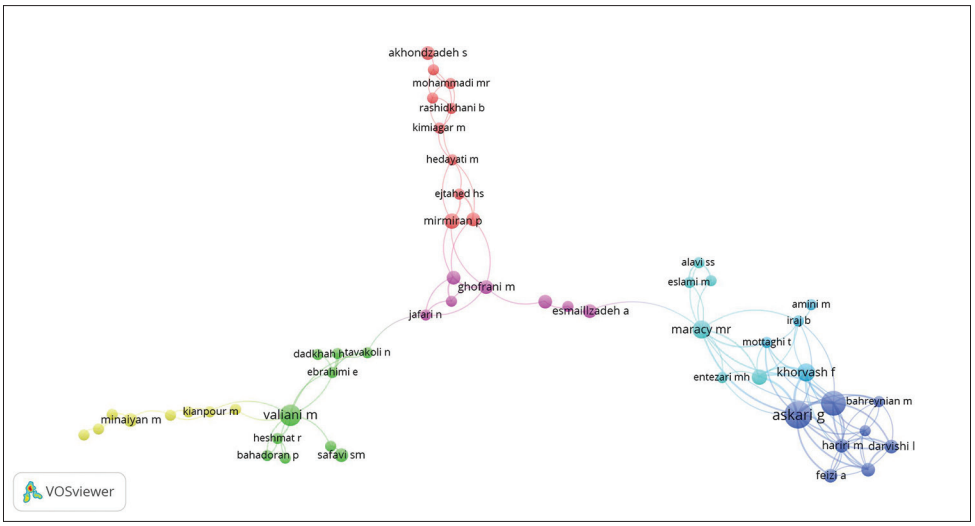

Figure 7: Co-authorship network analysis of the top 5% Iranian medical articles with the highest Altmetric scores. The network involved 53 nodes and 6 clusters which showed in different colors

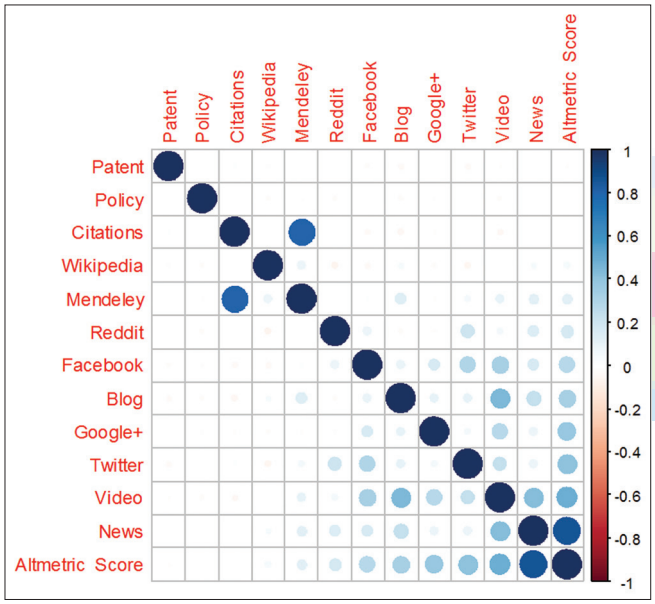

Figure 8: Correlation matrix visualization between Altmetric score, citations, Mendeley readers and the main Altmetric data resources of top 5% Iranian medical articles with the highest Altmetric scores

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