

*International Journal of Information Science and Management*  
Vol. 19, No. 1, 2021, 15-26

*Original Research*

## **Iranian Articles in Medical Ethics: An Altmetrics Approach on Social Media Vs. a Bibliometric Study in Scopus Database**

**Shohreh SeyyedHosseini**

Ph.D. Department of Medical library and Information Science, School of Paramedicine, Bushehr University of Medical Sciences, Bushehr, Iran [tanin64@gmail.com](mailto:tanin64@gmail.com).  
ORCID iD: <https://org/0000-0002-9281-7936>

**Reza BasirianJahromi**

Assistant Prof., Department of Medical library and Information Science, School of Paramedicine, Bushehr University of Medical Sciences, Bushehr, Iran  
Corresponding Author: [rezabsrn@gmail.com](mailto:rezabsrn@gmail.com)  
ORCID iD: <https://org/0000-0002-8170-5728>

Received: 01 October 2020  
Accepted: 29 November 2020

### **Abstract**

Traditional citation analysis has been greatly criticized because the process of citation accumulation requires considerable time after publication. So, the term “altmetrics” was proposed in 2010 to measure the scientific and social impact of a paper. According to the deficiencies of traditional citation analysis, we performed a comprehensive search for medical ethics publications using the altmetrics approach from the beginning until 2019. In this descriptive-analytical study, we retrieved the articles discussing any topics relating to medical ethics that published in the Scopus database from the beginning till 2019 using related medical ethics keywords. A total number of 455 articles with altmetrics scores and citations, included in this study. Altmetrics data were extracted via an altmetrics bookmarklet. Dimensions, Mendeley, and Twitter, had prominent sources of attention on social media platforms. The most number of tweets, and Mendeley's attentions, in the medical ethics fields, originated from the United States (US) and the United Kingdom (UK). Moreover, master students have the largest share in the citation of articles in Mendeley. *Journal of Medical Ethics and History of Medicine* has the most proportion of altmetrics score among Iranian papers in medical ethics. The correlation between the altmetrics score and citation index was significant ( $p < 0.05$ ). The medical ethics researchers have to pay more attention to social activities (such as creating and updating their profiles on social media) on the web for wide dissemination and proper evaluation of their scientific publications.

**Keywords:** Medical Ethics, Altmetrics, Mendeley, Twitter, Citation, Bookmark

### **Introduction**

Nowadays, researchers have been requested to publish their studies extensively to all those who are needed and possibly benefit scientific progress (Willinsky, 2006). For many years, the evaluation of individual research articles is measured through citation counts (Eyre-Walker &

Stoletzki, 2013). The incredible transformation in information and communication technologies (ICTs), especially the development of the internet and social media, has remarkably augmented the rapid publication of science among more different audiences (Trueger, Thoma, Hsu, Sullivan, Peters & Lin, 2015). Traditional citation analysis has been used extensively by many government and non-government bodies to measure scientific outcomes and make decisions about professional promotion (Azer & Azer, 2019). Traditional citation analysis has been greatly criticized due to it takes a long time to determine the impact of an article among scholars of the specific field. So, given the limitation of traditional citation metrics, the term altmetrics stands for an alternative to article-level metrics. It was proposed in 2010 to measure the scientific and social impact of a paper since publication (Citrome, 2015). Altmetrics defined as the study and use of non-traditional scholarly impact measures that are based on activity in web-based environments (Azer & Azer, 2019). These tools and environments are included sharing online tools (Twitter, Topsy, Facebook, Reddit, News articles, Blog posts, Google+, YouTube, Figshare, Mendeley), adaptations (Github), scholarly social networks (ResearchGate or Academia.edu), online reference managers (CiteULike, Zotero, and Mendeley), save tools (Mendeley, CiteULike, Delicious; Github, Twitter, and Slideshare), comments (Faculty of 1000 named "F1000", blog posts, article comments, and Facebook comments), conference organization sites (Lanyrd.com), and social usage statistics (Figshare, Slideshare, Dryad, Facebook, and Youtube) (Priem, Groth & Taraborelli, 2012, Konkiel, 2013). The altmetrics score reflects the immediate feedback is acquired by a paper, through the public and scientific interest in the research findings. Medical ethics is defined as a field that separates legal obligation from moral obligation and the relationships except for the fiduciary duty of the physician to his/her patients (Choudhury & Kapoor, 2018). This field has a significant role in discussing the effects of conflicts and other violent human rights abuses (Chisholm & Sheather, 2018). According to the importance of ethical issues in medical procedures, it becomes a necessity for the researchers to know more about their publication's effectiveness on social media alongside the rate of attention to them in scientific databases. So, we performed a comprehensive search for medical ethics publications. In this study, we applied the altmetrics dataset to report the correlation between the altmetrics index in the published papers by Iranian scholars in the Scopus database from the beginning till 2019 and the number of traditional bibliometric citations of these papers.

## Methodology

### Data collection

In this descriptive-analytical study, on July 2, 2020, we retrieved the articles discussing any topics relating medical ethics that published from the beginning till 2019 in the Scopus database using search terms: TITLE-ABS-KEY ("medical professionalism" OR "medical professional behavior" OR "physician accountability" OR "doctor accountability" OR "physician code" OR "physician charter" OR "medical ethics" OR bioethics OR "clinical ethics" OR "health care ethics" OR "biomedical ethics" OR "compassionate doctor" OR "compassionate Physician" OR "resilient doctor" OR "resilient Physician" OR "patient autonomy" OR "patient welfare" OR "physician professional responsibility" OR "doctor professional responsibility" OR "patient confidentiality" OR "physician Social contract" OR "doctor Social contract"). Scopus database has been used since it contains high indexed peer-reviewed documents in medical ethics, the most well-known database in many fields, the largest and the most comprehensive global

abstracts and citation database (Ali, Ahmi & Sudin, 2020). These keywords were selected via consultation with medical ethics specialists in Iran who have had an experience in publishing literature in English. They were chosen because they were the most frequently used words to search for topics related to medical ethics. This data extracted in the Excel format from the Scopus database. All of 455 articles related to medical ethics indexed in the Scopus database validated with the article's identifiers including digital object identifier (DOI) or PubMed ID. Then, altmetrics data were derived via altmetrics Bookmarklet (Altmetric.com), a quick and easy to understand tool that describes the frequency of attention and specify social media sources. All results were examined and verified, and if there was a discrepancy, a consensus decision was achieved, following reading the full text of articles. The information on altmetrics donuts was written in detail. Along with, the citations counts were retrieved from the Scopus database. The most common sources of social media platforms, as well as the geographic breakdown of the related to medical ethics, was extracted.

### Statistical analysis

Continuous variables are reported as mean  $\pm$  SD. The normality of continuous variables was evaluated using the Kolmogorov-Smirnov test. Spearman's correlation analysis was applied to investigate the relationship between the number of citations and the altmetrics score. A p-value < 0.05 was measured statistically significant. The data were analyzed using SPSS software (version 21).

## Results

### Search Output

The search keywords yielded a total of 455 outputs, of which, 77 articles (17%) lacked DOI and PMID, so making them impossible to examine using the altmetrics explorer. Among the DOI and PMID articles, only 93 articles (20%) were mentioned on social media and subsequently had altmetrics score, while 287 articles (63%) were not mentioned on any of the social networks.

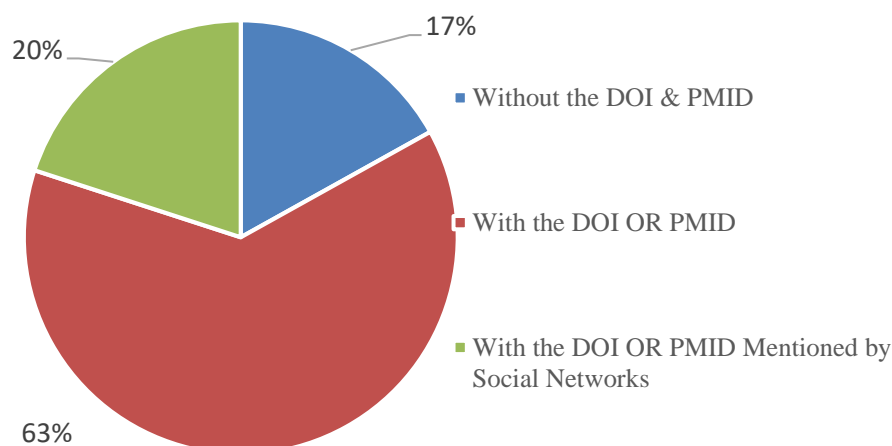


Figure 1. Articles with/without DOI or PMID

According to Table 1, the number of articles with Altmetrics score was 93 during the period of the study. The number of medical ethics articles on social networks has gradually increased with fluctuation during the period of study. The average per year of altmetrics score was  $2.86 \pm SD$ .

Table 1

*The number of medical ethics articles with altmetric scores from the beginning until 2019*

N	Year	Number of Articles	Number of Articles With the Altmetrics Score	Sum of the Altmetrics Score	Average of the Altmetrics Score of Articles Which the Altmetrics Score
1	1995	1	0	0	0
2	2000	2	0	0	0
3	2001	1	0	0	0
4	2002	1	0	0	0
5	2003	3	0	0	0
6	2004	5	2	10	5
7	2005	11	0	0	0
8	2006	6	3	9	3
9	2007	11	0	0	0
10	2008	12	5	15	3
11	2009	22	3	95	31.67
12	2010	9	0	0	0
13	2011	25	2	14	7
14	2012	23	7	61	8.71
15	2013	35	5	7	1.4
16	2014	30	4	22	5.5
17	2015	29	6	88	14.67
18	2016	49	17	63	3.70
19	2017	56	15	79	5.27
20	2018	64	15	41	2.73
21	2019	60	9	37	2.78
	2000-2019	292	93	532	5.72

## Analysis of altmetrics status

### Social Networks Platform

The number of altmetrics data resources for medical ethics articles indexed in Scopus is shown in Figure 2. Dimensions, Mendeley and Twitter were the main sources of attention on social media platforms.

The breakdown of the attention score showed the following sources include Dimensions with 85 articles (93.41%) and 1124 sharing, Mendeley with 84 articles (92.31%) and 3453 sharing, Twitter with 79 articles (86.81%). For Twitter, 79 (86.81%) articles were shared 386 times, with a total of 6,552,487 followers. Then, Facebook with 18 articles (19.78%) and 23 sharing, Policy source with 11 articles (12.09%) and 12 sharing, Blogs with 8 articles (8.79%) and 10 sharing, News outlet with 4 articles (4.39%) and 11 sharing, Google plus with 4 articles (4.39%) and 4 sharing, Wikipedia with 3 articles (3.30%) and 4 sharing, CiteULike with 2

articles (2.20%) and 5 sharing, Connotea with 2 articles (2.20%) and 2 sharing, and Research Highlight Platform with 1 article (1.10%) and 1 sharing.

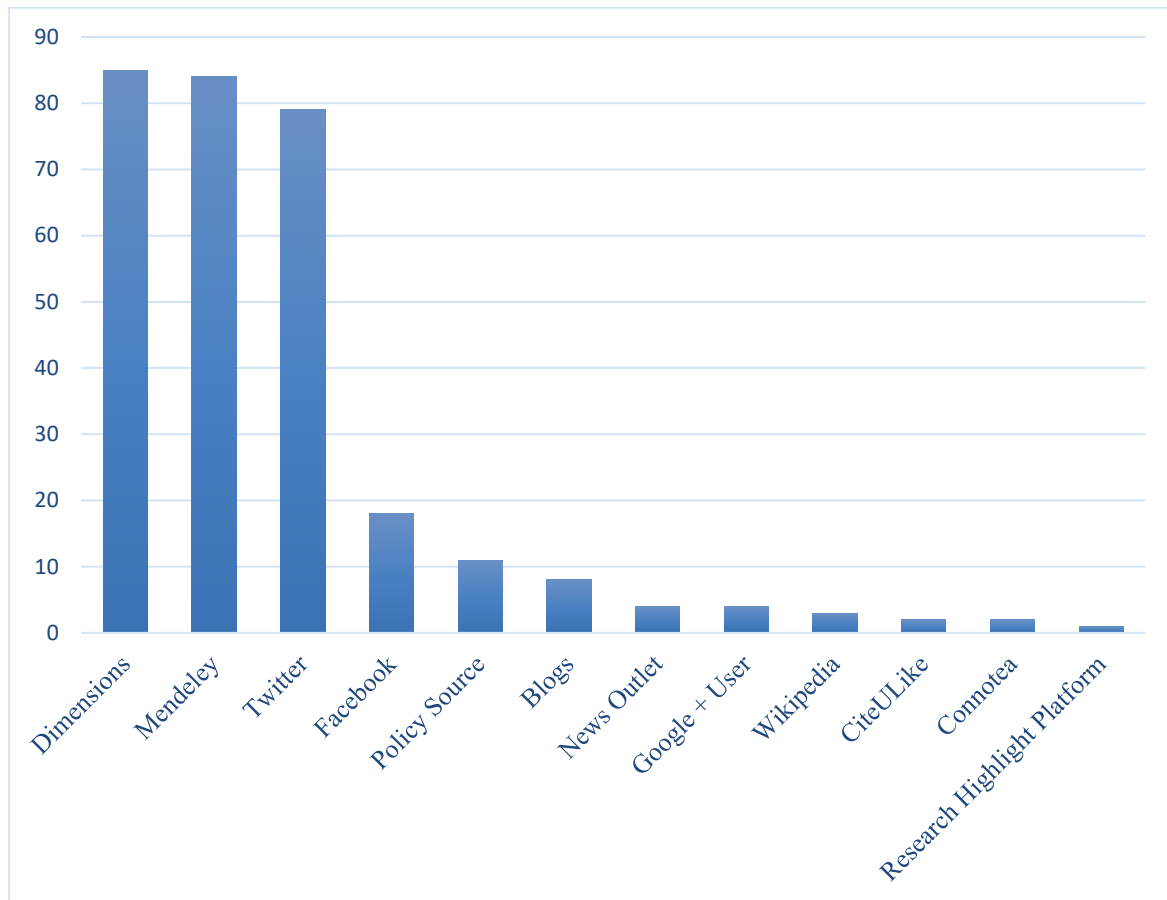


Figure 2. The number of altmetrics data resources for medical ethics articles in social network platforms

### The outbreak of countries with tweets related to medical ethics

Considering geolocation distribution of tweets using the altmetrics bookmarklet and based on the information in the sender's profile and geotagged tweets the most percentage (18.73%) of tweets attention in the medical ethics fields are originated the United States (U.S) (n=77). The subsequent countries were the United Kingdom with 6.81% (n=28), Spain with 4.38% (n=18), and Canada with 3.16% (n=13). Also, in 46.96% of tweets (n=193), due to incomplete information on the sender's profile, it was not possible to identify the geographical location of the tweets. The geotagging is used rarely due to not being a default setting. The demographic breakdown of the top ten countries with the number of tweets related to nuclear is shown in Table 2.

Table 2

Demographic breakdown of the top ten countries based on number of tweets related to medical ethics

Rank	Country	Number of Tweets	Percentage of Tweets	Rank	Country	Number of Tweets	Percentage of Tweets
1	US	77	18.73	11	Georgia	2	0.49
2	UK	28	6.81		Belgium	2	0.49
3	Spain	18	4.38		New Zealand	1	0.24
4	Canada	13	3.16		Peru	1	0.24
5	South Africa	7	1.70		Portugal	1	0.24
	Australia	7	1.70		Taiwan	1	0.24
6	Netherland	6	1.47		Panama	1	0.24
7	Mexico	5	1.22		Argentina	1	0.24
	Switzerland	5	1.22		Puerto Rico	1	0.24
8	Germany	4	0.98		Egypt	1	0.24
	France	4	0.98		Singapore	1	0.24
	Japan	4	0.98	Ecuador	1	0.24	
9	India	3	0.73	Bangladesh	1	0.24	
10	Ireland	2	0.49	Slovenia	1	0.24	
	Italy	2	0.49	Kenya	1	0.24	
	Iran	2	0.49	Lebanon	1	0.24	
	Malaysia	2	0.49	Argentina	1	0.24	
	Chile	2	0.49	China	1	0.24	
	Grenada	2	0.49	Greece	1	0.24	
	Finland	2	0.49	Unknown	193	46.96	
	Sweden	2	0.49				

Moreover, Table 3 shows that 74.43% of all tweets were carried out by ordinary people (members of the public), practitioners (doctors, other healthcare professionals) by 11.90%, scientists by 9.11%, and science communicators (journalists, bloggers, editors) by 4.56%.

Therefore, member of the public has the largest contribution for tweets of medical ethics articles.

Table 3

Demographic breakdown of senders of tweets related to medical ethics

Rank	Senders of Tweets	Number of Tweets	Percentage of Tweets
1	Members of the public	294	74.43
2	Practitioners (doctors, other healthcare professionals)	47	11.90
3	Scientists	36	9.11
4	Science communicators (journalists, bloggers, editors)	18	4.56

### Geographic and Demographic Distribution of Medical Ethics Articles in Mendeley

The demographic breakdown of the top ten countries with the number of referral articles related to medical ethics in Mendeley is shown in Table 4. Here, the highest percentage of citations by medical ethics researchers was originated from the UK and Brazil by 0.15% (n=6). The 2<sup>nd</sup> rank belongs to Canada and Germany by 0.13% (n=5), and the 3<sup>rd</sup> belongs to US and Spain by 0.11% (n=4), respectively.

Table 4

*Geographic breakdown of the number of reads related to nuclear medicine in Mendeley*

Rank	Country	Number of Reads	Percentage of Reads	Rank	Country	Number of Reads	Percentage of Reads
1	UK	6	0.15		US	2	0.05
	Brazil	6	0.15		Peru	2	0.05
2	Canada	5	0.13	10	Bangladesh	1	0.02
	Germany	5	0.13		Chile	1	0.02
3	US	4	0.11		Malaysia	1	0.02
	Spain	4	0.11		India	1	0.02
4	Australia	3	0.07		Iran	1	0.02
	Egypt	3	0.07		Denmark	1	0.02
	Japan	3	0.07		Portugal	1	0.02
8	Nigeria	3	0.07		Finland	1	0.02
	Colombia	3	0.07		Sweden	1	0.02
9	Italy	2	0.07		Unknown	4005	98.52

Also, due to the incomplete profile information of the referrals, 98.52% of the references in the medical ethics articles was not possible to detect the geographical location. The findings of Table 5 show that a total of 16.15% of all referrals are from medical ethics master students in Mendeley. Therefore, master students have the largest share in the citation of articles in Mendeley. Bachelor students is next with 13.82 percent, Ph.D. students with 10.41 percent, and researchers with 8.20 percent, were next category in terms of the number of citations to medical ethics articles in Mendeley.

Table 5

*Demographic breakdown of the reader of medical ethics articles in Mendeley*

Rank	Readers by professional status	Number of Readers	Percentage of Readers	Rank	Readers by professional status	Number of Readers	Percentage of Readers
1	Master Student	563	16.15	∇	lecture	48	1.38
2	Bachelor Student	482	13.82	∧	Associate Professor	39	1.12
3	PHD Student	363	10.41	∩	Professor	20	0.57
4	Researcher	286	8.20	∪	librarian	13	0.37
5	Doctoral Student	165	4.73	∩∩	Senior Lecture	8	0.23
6	Postgraduate Student	103	2.96		Unknown/Unspecified/Other	1397	40.06

Also, in 40.06% of Mendelian referrals, it was not possible to identify the role of referrals

due to incomplete profile information of the sender.

### The Thematic Analysis based on Referral to the Medical Ethics Articles in Mendeley

The thematic analysis was applied to specify what the most filed referred to the articles related to medical ethics in Mendeley. As shown in Table 6, a total of 27.79% of the referral to the medical ethics articles in Mendeley related to the medical & dentistry field. The next field was included nursing and health professions with 20.59 %, social sciences with 6.08%, and psychology with 3.39 %. Additionally, 31.51% of Mendeley's referrals (n=1125), due to incomplete profile information of the sender, was not possible to identify the thematic areas of the referrals.

Table 6

*The thematic analysis based on a referral to the nuclear medicine articles in Mendeley*

Rank	Readers by discipline	Number of Readers	Percent age of Readers	Rank	Readers by discipline	Number of Readers	Percenta ge of Readers
1	Medical & dentistry	992	27.79	12	Immunology and Microbiology	19	0.53
2	Nursing & Health Professions	735	20.59		Environmental Sci.	19	0.53
3	Social Sci.	217	6.08	13	Computer Sci.	17	0.48
4	Psychology	121	3.39	14	Engineering	15	0.42
5	Biochemistry, Genetics & Molecular Biology	65	1.82	15	Economics, Econometrics & Finance	13	0.36
6	Business, Management & Accounting	60	1.68	16	Neurosciences	7	0.20
7	Agricultural & Biological Sci.	54	1.51	15	Physics & Astronomy	4	0.11
8	Arts and Humanities	37	1.04	16	Chemistry	3	0.08
9	Philosophy	23	0.64	17	Linguistics	2	0.06
10	Pharmacology, Toxicology & Pharmaceutical Sci.	21	0.59	18	Veterinary Sci. & Veterinary Medicine	1	0.03
11	Sports & Recreations	20	0.56	19	Unknown/Unspecified/Other	1125	31.51

### Altmetric score versus conventional citation correlation

In order to measure the correlation between the altmetrics score and the citation count of medical ethics articles, the Kolmogorov-Smirnov test was performed. The value of z calculated in the Kolmogorov – Smirnov test is not significant for the altmetrics score and citation Index ( $P>0.05$ ). Therefore, non-parametric analysis (Spearman correlation coefficient) was used to measure the correlation between these two variables.



Table 7

*The Normal/Abnormal indices of data*

Indices	Mean	Std. Deviatin	Z	P	Output
Altmetrics Score	1.42	6.89	0.42	0.0001	Abnormal
Citation Index	648	11.61	0.29	0.0001	Abnormal

As seen in Table 8, the correlation coefficient between the altmetrics score and citation index in medical ethics articles is significant ( $P < 0.05$ ).

Table 8

*Relationship between altmetrics score & citation index in medical ethics articles*

Indices	N	R	P
Altmetrics Score & Citation Index	378	0.28	0.0001

### Discussion

There are evolving studies on altmetrics assessment and the impact it on scholarly material. Medical ethics is defined as an analytical field in which various thoughts, commitments, behaviors, feelings, arguments, and discussions in ethical decisions in medicine (Våga, Moland & Blystad, 2016). The dramatic increase in medical ethics publication (Chisholm & Sheather, 2018) as a result of the incredible innovation in procedures and codes in this field makes a necessity to be easily accessible to the researchers and the public. To our knowledge, this is the first altmetrics analysis of Iranian articles related to the medical ethics field. In this study, we collected and characterized the published articles related to medical ethics in the Scopus database from the beginning until 2019. The lack of required attention of journals, especially in developing countries, to receive and allocate digital object identifiers (DOI) for articles results to be retrieved some articles with DOI. Furthermore, only 20% of published articles related to medical ethics had altmetrics scores. It is an indication that shows the scientific community is less likely to use social media, or they are unaware of why and how important it is to share their articles on social networks. The lack of attention of the authors to develop scientific profiles on social networks may correlate to those who cannot translate their knowledge (expressing specific science in simple and understandable language) to the general public.

A review of different types of social media demonstrated that Dimensions, Twitter, and Mendeley are the most widely used and more popular than others. It is likely to be related to the wider popularity and acceptance of these three social networks. As stated, tweets can estimate highly cited articles, especially within the earliest days of publication. Social media altmetrics can increase citations or reflect the qualities of the paper that as well predict most frequency citations (Eysenbach, 2011). Also, the number of articles with the altmetrics index and related to medical ethics from the beginning till 2019 showed the improvement in acceptance rate and application of social networks. Distribution of tweets of publication related to medical ethics according to the position of sender showed the members of the public (74.43%) had the highest contribution in the publishing of these articles. The reason may be related, on the one hand, to the strong attendance of scientists who introduced themselves as general users in their Twitter profiles, and on the other hand, the interest of the general public in pursuing research related to medical ethics. A study of the geolocation distribution of the

tweet of the medical ethics era showed that the majority of tweets (18.73%) in this field originated in the United States. This result is compatible with previous studies in many fields, including medicine, nursing, and radiology, that mentioned most attention on Twitter originated in the USA and the UK. The extend of the scientific community, high funding for research, and maybe the more tendency of them to disseminate their finding may account for the high proportion of scientific publications arising US (Kelly, Glynn, O'Briain, Felle, & McCabe, 2010, Yoon et al., 2013, Delli, Livas, Spijkervet & Vissink, 2017, Baek et al.,2020).

Master students, bachelor students, and Ph.D. students have the largest contribution to referring articles by Mendeley an academic bibliographical tool. This may be attributed to the interest of students in studying and sharing scientific papers in the medical ethics field (Haustein, Larivière, Thelwall, Amyot & Peters, 2014, Syamili & Rekha, 2017, Thelwall, 2018). According to the results, it can be said that medical and dental researchers are more interested in publishing their research through social media constantly as well as looking for a new approach to diagnosis and treatment. They are more interested in publishing their research correlated to medical ethics through Mendeley and receive real-time online attention. *Journal of Medical Ethics and History of Medicine, Nursing Ethics, BMC Nursing, Lasers in Medical Science, PLoS ONE, JAMA Internal Medicine, Journal of Diabetes and Metabolic Disorders,* and *Journal of Medical Ethics* have the most proportion of altmetrics score among Iranian articles in medical ethics, accordingly. Among the papers included in this study, the document entitled "Fetus as a human being: Where is the cut-off point?" by Soroush Dabbagh published in *the Journal of Medical Ethics and History of Medicine* received the highest altmetrics score (altmetric score=91).

Based on the results of the statistical analysis, it was observed a significant relationship between the altmetrics score and the average number of citations to articles related to medical ethics fields. Some previous research has reported a significant statistical relationship between altmetrics scores and the higher number of citations of articles (Thelwall, Haustein, Larivière & Sugimoto, 2013, Waltman & Costas, 2014, Syamili & Rekha, 2017, Maggio, Leroux, Meyer & Artino, 2018). Mention of this fact that citation needs time to influence research evaluation, even a few years after publication, as well as positive associations between high traditional citation counts and high altmetrics score, it is proposed that researchers or writers of articles increase paying attention to share their finding in altmetrics tools including the social web. Altmetrics are mostly available earlier and make the possibility of us evaluating the social impact of academic research immediately. Therefore, it can be said that social media has a positive effect on introducing, establishing communication and cooperation between researchers and other enthusiastic, as well as the evaluation of their scientific products. The publication of research papers on the social web environment increases the visibility of these documents as well as represents them to a wider range of audiences, which is effective for the future more citations of these articles. Additionally, this approach will increase the impact factor of the relevant journals. Future altmetrics studies in medical ethics can identify any relation between high journal impact factor and citation counts with altmetrics score.

### Conclusion

We should remember that several bibliometric parameters neither correlated with citation scores nor altmetrics scores. These factors included years since publication, the number of authors, the number of institutions, and so on. In this study, there was a positive correlation

between the altmetrics index and the high number of citations in the articles related to the medical ethics field. So, the researchers in the field of medical ethics must have more attention to social activities for more disseminate and evaluation of their scientific publications. According to the Iranian medical ethics articles in the period of study, we can conclude that Iranian scholars have become more familiar with the importance of social media.

### References

- Ali, R. R. M., Ahmi, A. & Sudin, S. (2020). Examining the trend of the research on the internet of things (IoT): A bibliometric analysis of the journal articles as indexed in the Scopus database. *Journal of Physics: Conference Series* 1529(2), IOP Publishing. doi:10.1088/1742-6596/1529/2/022075
- Azer, S. A. & Azer, S. (2019). Top-cited articles in medical professionalism: A bibliometric analysis versus altmetric scores. *BMJ open*, 9(7), e029433.
- Baek, S., Yoon, D. Y., Lim, K. J., Hong, J. H., Moon, J. Y., Seo, Y. L. & Yun, E. J. (2020). Top-cited articles versus top Altmetric articles in nuclear medicine: A comparative bibliometric analysis. *Acta Radiologica*, 61(10), 1343-1349. doi: 10.1177/0284185120902391
- Chisholm, J. & Sheather, J. (2018). Medical ethics in times of conflict-why silence is not an option. *Indian journal of medical ethics*, 3(1), 39-42.
- Choudhury, M. & Kapoor, P. M. (2018). Are we clinicians away from ethics?. *Journal of Cardiac Critical Care TSS*, 2(02), 66-70.
- Citrome, L. (2015). Moving forward with article level metrics: introducing altmetrics. *International journal of clinical practice*, 69(8), 811-821.
- Delli, K., Livas, C., Spijkervet, F. K. L., & Vissink, A. (2017). Measuring the social impact of dental research: An insight into the most influential articles on the Web. *Oral diseases*, 23(8), 1155-1161.
- Eyre-Walker, A. & Stoletzki, N. (2013). The assessment of science: The relative merits of post-publication review, the impact factor, and the number of citations. *PLoS Biol*, 11(10), e1001675.
- Eysenbach, G. (2011). Can tweets predict citations? Metrics of social impact based on Twitter and correlation with traditional metrics of scientific impact. *Journal of medical Internet research*, 13(4), e123.
- Haustein, S., Larivière, V., Thelwall, M., Amyot, D. & Peters, I. (2014). Tweets vs. Mendeley readers: How do these two social media metrics differ?. *Information Technology*, 56(5). doi: <https://doi.org/10.1515/itit-2014-1048>
- Kelly, J. C., Glynn, R. W., O'Briain, D. E., Felle, P., & McCabe, J. P. (2010). The 100 classic papers of orthopaedic surgery: a bibliometric analysis. *The Journal of bone and joint surgery. British volume*, 92(10), 1338-1343.
- Konkiel, S. (2013). Altmetrics: A 21st century solution to determining research quality. *Onlne Seracher*, 37(4). Retrieved from <https://www.infoday.com/OnlineSearcher/Articles/Features/Altmetrics-A-stCentury-Solution-to-Determining-Research-Quality-90551.shtml>
- Maggio, L. A., Leroux, T. C., Meyer, H. S. & Artino, A. R. (2018). #MedEd: Exploring the relationship between altmetrics and traditional measures of dissemination in health professions education. *Perspectives on Medical Education*, 7, 239–247. doi: <https://doi.org/10.1007/s40037-018-0438-5>

- Priem, J., Groth, P. & Taraborelli, D. (2012). The altmetrics collection. *PloS one*, 7(11), e48753.
- Syamili, C. & Rekha, R. V. (2017). Do altmetric correlate with citation?: A study based on PLOS ONE journal. *COLLNET Journal of Scientometrics and Information Management*, 11(1), 103-117.
- Thelwall, M. (2018). Early Mendeley readers correlate with later citation counts. *Scientometrics*, 115(3), 1231-1240.
- Thelwall, M., Haustein, S., Larivière, V., & Sugimoto, C. R. (2013). Do altmetrics work? Twitter and ten other social web services. *PloS one*, 8(5), e64841.
- Trueger, N. S., Thoma, B., Hsu, C. H., Sullivan, D., Peters, L. & Lin, M. (2015). The altmetric score: a new measure for article-level dissemination and impact. *Annals of emergency medicine*, 66(5), 549-553.
- Våga, B. B., Moland, K. M. & Blystad, A. (2016). Boundaries of confidentiality in nursing care for mother and child in HIV programmes. *Nursing Ethics*, 23(5), 576-586.
- Waltman, L. & Costas, R. (2014). F 1000 Recommendations as a potential new data source for research evaluation: A comparison with citations. *Journal of the Association for Information Science and Technology*, 65(3), 433-445.
- Willinsky, J. (2006). *The access principle: The case for open access to research and scholarship*. Cambridge, Mass.: MIT Press.
- Yoon, D. Y., Yun, E. J., Ku, Y. J., Baek, S., Lim, K. J., Seo, Y. L. & Yie, M. (2013). Citation classics in radiology journals: the 100 top-cited articles, 1945–2012. *American Journal of Roentgenology*, 201(3), 471-481.