ORIGINAL ARTICLE

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The Online Attention to Otorhinolaryngology Research: An Altmetric Analysis (1967-2021)

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Abstract

Background: As a new approach and complementary to traditional bibliometrics, altmetrics measures the influence of scientific research in social media tools and applications.

Aim: This study aimed at comprehensively analyzing research output in otorhinolaryngology research from its beginning in 1967 to 2021.

Methods: Using Scimago Journal Ranking (SJR), 107 otorhinolaryngology journals were retrieved. Of them, 84 journals with their 89044 papers as well as their altmetric scores were extracted from the Altmetric Explorer in 28 February 2022. The citation rates of the top ten papers having high altmetric scores were retrieved from Google Scholar, Scopus, Web of Science and Dimensions. Data were analyzed in excel.

Results: 67,529 otorhinolaryngology papers (75%) were mentioned 2,901,187 times in 17 different social media tools. The highest altmetric score of papers amounted to 3,989. The top-ranked media were Nendeley and Twitter, respectively. The USA was the first ranked country in Twitter and Facebook and the UK was such in News Outlet and Policy. The highest mentioned journal was *JAMA Otolaryngology–Head & Neck Surgery*. The top affiliation in sharing papers was Harvard University with 1621 shared papers. All of the top 10 papers in altmetric scores were multi-authored original research articles..

Conclusion: As one of the first altmetric studies in otorhinolaryngology field, this study provided helpful information for potential authors, researchers, research institutes and journals in the field in increasing the reach and influence of their researches.

Conflicts of Interest: The Authors declare no conflicts of interest.
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Introduction

The medical field deals with health care, prevention and treatment approaches, which its publications are important due to their role in health research promotion (1). As one of the main specialties in the field, otorhinolaryngology is challengeable in its practice and competency (2). In recent years, it has been considerably developed in scientific and clinical aspects as a result of physicians-researchers' collaboration on research on the profession.

The influence of research in different scientific fields is measured traditionally by citation counts, h-indexes, co-authorship networks, journal-based bibliometric indicators and use statistics (3-7). These indicators only measure

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the academic and formal influence of the scientific research. Development of new technologies resulted in the emergence of new approaches to scientific output evaluation (8). Coined in 2010, altmetrics aims at completing the performance of traditional bibliometric indicators by measuring scientific influence in social media tools and applications (9). Altmetrics tends to provide new measures for scientific influence in online social media tools (10). Non-academic individuals read considerable amounts of clinical papers and these items may be helpful in clinical practices. In addition, some years need to be passed from the publication time for achieving credible measure of citations (11, 13) and the citation behavior is sometimes not clear (14). It is argued that altmetrics provides reasonable explanation of access to and use of the scientific output (15-17). It is interesting that many studies found the predicting power of altmetric scores in future received citation counts (18-24).

Altmetric indicators explore the interactions between researchers and social media such as Twitter, Mendeley and so on (25, 26), measured by Altmetric Explorer, ReaderMeter and Impactstory (27, 28). It considers the number of mentions of a scientific item in online social media. Altmetrics has been widely developed as a complement to traditional citation-based bibliometrics (29-33). Altmetrics measure immediate impact of a scientific item after its publication as a pre-print or final product (10, 30-31). It reflects the public members' accessibility of and attention to a scientific paper (10, 18, 30, 33). In spite of many bibliometric and/or altmetric studies in medical fields, including among others, nursing research (34), arthroplasty research (35), spine surgery (36), radiology (37), neurosurgery (38), plastic and reconstructive surgery (39), general medicine (40), emergency medicine (41), especially those in otorhinolaryngology and related field (42-46), there is no comprehensive altmetric study on otorhinolaryngology. Therefore, this study aimed to analysis the presence of and attention to the otorhinolaryngology research output in online social media tools and applications.

Methods

This altmetric survey is an applied study. Research population included all papers published in otorhinolaryngology journals indexed in Scopus from the beginning to 2021. Data were extracted from SCImago, Altmetric Explorer (Altmetric LLP, London, UK), Scopus, Google Scholar, Web of Science (WoS) and Dimensions.

The two-leveled hierarchal categorization of Scimago Journal & Country Rank (SJR) was used to identify the related journals. SJR is a public accessed portal including journal and country-wise rankings achieved by Scopus-extracted data. It is used for analyzing scientific fields and journals. It includes journals in Scopus from 1996. Journals can be categorized based on 27 core subject areas and 313 specific subject categories (47). One hundred and seven otorhinolaryngology journal titles in otorhinolaryngology as one of the subject categories in medicine were retrieved on 28 February 2022 without any limitations and saved in excel.

Altmetric Institute was consulted for accessing Altmetric Attention Scores (ASSs). Some known bibliometric scientists such as Priem and Piwowar have developed Altmetric.com (48). AAS as a weighted score is measured by counting the presence of an individual scientific item in different social media, such as Twitter, Facebook, Citeulike, Patent, News Outlet, etc. The AAS weight ranged from .25 up to 8 for each online tool. The high scores are given to mentions in news and blog and low scores are for Facebook, Q&A, YouTube, Pinterest and Reddit (49). Altmetric data were extracted from the social web, including among others, Blog, Policy, Patent, Twitter, Peer review, Weibo, Facebook, Wikipedia, Google+, LinkedIn, Reddit, Pinterest, F1000,

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Q&A, Video, Syllabi and Mendeley. We chose Altmetric Explorer due to its high coverage of scientific papers for each metrics (50) and better coverage of blogs, news and tweets. In overall, Altmetric Explorer is a service with high percentage of papers (51) as well as a pioneering one comparing other altmetric services (50). Several studies used the service for their analyses (24, 52-57). All 107 SJR-retrieved otorhinolaryngology journals were searched in Altmetric Explorer, without defining any limitations. As Altmetric Explorer uses DOI for searching papers and ISSN for searching journals, 19 journals were not retrieved and 88 journals included in the study and all of their papers were considered. Data were saved in EXCEL files. For the top papers in altmetric scores, their citation counts were extracted from Google Scholar, Scopus, WoS and Dimensions. These databases were chosen for their better and relatively comprehensive depiction of citation performance as each database provides different citation counts of a scientific item. Excel software was used for data analysis (58).

Results

Presence in online social media

Out of 107 otorhinolaryngology journals indexed in Scopus in the time span of 1967-2021, 88 journals were retrieved from Altmetric Explorer. Of them, 84 journals were present in online social media. The papers of these journals amounted to 89,044 items that 67,529 papers (about 75%) were mentioned at least one time in online social media and had AASs. 21,515 papers (about 25%) were not mentioned in online social media and had not any AASs. Figure 1 shows the frequency distribution of AAS ranges of studied papers. As can be seen, the majority of papers (n= 63,407) had AASs in the range of 1-10. 2,198 papers received AASs in the range of 11-20. By increase in the AAS ranges, the paper numbers decreased. Therefore, few papers has higher AASs. Only 310 papers (.44%) had ASSs of 100 or more.

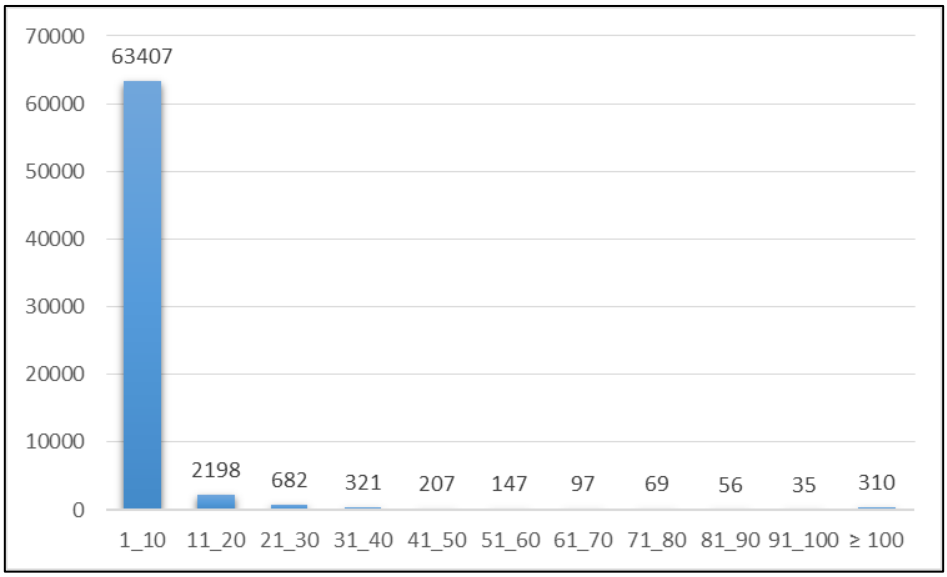

Figure 1. Frequency distribution of otorhinolaryngology papers by their AAS ranges

Figure 2 depicts the presence rate of otorhinolaryngology research papers worldwide in different online social media. Mendeley ranked first in sharing the papers with covering 85,237 papers (about 95%), followed by Twitter with sharing 51,650 papers (about 58%) and Facebook with sharing 10,638 papers (about 11%). Syllabi did not

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cover any paper. Detailed statistics on mentions of each online social medium is shown in Table 1. Mendeley was in the top with total 2,559,837 events with mean rate of 30.03 events per paper. The maximum reading rate amounted to 8,042 for a paper entitled as "production of Spanish grammatical forms in U.S. bilingual children" that authored by Alisa Baron and colleagues in August 2018. This paper is a green open-accessed one that was published in the *American Journal of Speech-Language Pathology*. Twitter ranked second with 255802 tweets and mean rate of 4.95 tweets per paper. The most tweeted paper authored by Sullivan et al. in December 2020 under title "cerebrospinal fluid leak after nasal swab testing for Coronavirus disease 2019" and was published in *JAMA Otolaryngology–Head & Neck Surgery*. This fee-based access paper had the highest AAS, too. The third rank belonged to Patent with 25,066 events and mean rate of 4.51 events per paper. The most-occurred paper entitled as "a computer-aided design for orthognathic surgery" which authored by S.N. Bhatia and J.H. Sowray in Auguest 1994 and was published in *British Journal of Oral & Maxillofacial Surgery*. With having 330 events in Patent, the paper was close-accessed.

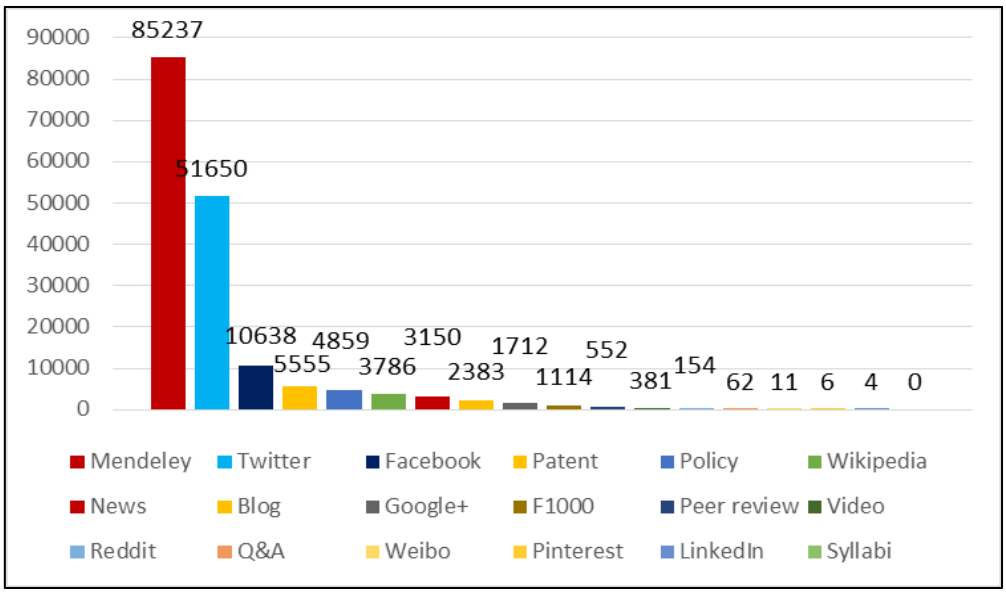

Figure 2. Presence rate of otorhinolaryngology papers in different online media

Top ten journals in presence rates and total mentions of their papers

As Table 2 shows, 84 otorhinolaryngology journals were present in online social media. The first to third ranks in total mention rates belonged to JAMA Otolaryngology–Head & Neck Surgery (with sharing 2,034 papers in 56,800 mentions), The Laryngoscope (with sharing 5,781 papers in 26,777 mentions) and Otolaryngology–Head and Neck Surgery (with sharing 3,648 papers in 17,411 mentions), respectively. All, but 4 journals were in Q1 and all, but two journals were from the USA.

Top 10 active countries in Twitter, Facebook, Nwes Stories and Outlets and Policy

Table 3 shows the top ten countries as to their contribution in some online social media. In total, 69,211 unique tweeters from 197 World's countries tweeted on otorhinolaryngology papers. 112,924 tweets were unknown in this regard. The first to third ranks belonged to the USA (with 54,706 tweets by 11,412 accounts), the UK (with 24,533 tweets by 4982 accounts) and Australia (with 9,123 tweets by 1,558 accounts), respectively. The share amounts of

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these countries worldwide were 21.40%, 9.59% and 3.56%, respectively.Regarding Facebook posts and pages, 21,465 posts were posted by 3,606 unique pages from 73 countries worldwide. 13,896 posts were unknown in this regard. The first to third ranks belonged to the USA with 4,337 posts, Australia with 560 posts and the UK with 430 posts, respectively.

The share amounts of these countries worldwide were 20.20%, 2.60% and 2.00, respectively.1,642 news stories and outlets distributed 16,707 news items from 78 countries worldwide. 72 news items were unknown in this regard. The UK with 1,838 news items, India with 977 news item sand Australia with 691 news items were at the first to third ranks, respectively.

Fifty seven unique policy sources published 6,569 policy documents from 19 World's countries. The top three countries were the UK (with 2,464 policy documents), Germany (with 1,192 policy documents) and the USA (with 1,051 policy documents), respectively.

Table1. The most-used altmetric sources of otorhinolaryngology papers

Sources of Attention	NP	Total Altmetric Events	Mean Events per Paper	Max.	Min.	Rank
Mendeley	89044	2559837	30.03	8042	0	1
Twitter	89044	255,802	4.95	5485	0	2
Patent	89044	25066	4.51	330	0	3
Facebook	89044	21465	2.01	183	0	4
News	89044	16707	5.30	400	0	5
Policy	89044	6569	1.35	21	0	6
Wikipedia	89044	5628	1.48	23	0	7
Blog	89044	3183	1.33	26	0	8
Google+	89044	2854	1.66	264	0	9
Peer review	89044	2094	3.80	12	0	10
F1000	89044	1188	1.06	4	0	11
Video	89044	485	1.27	7	0	12
Reddit	89044	190	1.23	6	0	13
Q&A	89044	70	1.12	2	0	14
Weibo	89044	12	1.09	2	0	15
Pinterest	89044	6	1	1	0	16
LinkedIn	89044	4	1	1	0	17
Syllabi	89044	0	0	0	0	18
Total	-	**2901187**	-	-	-	-

Top three affiliations in total mentions of otorhinolaryngology papers

Figure 3 depicts the total events and mentions of otorhinolaryngology papers made by the top three affiliations in different social media tools. The first rank belonged to Harvard University with 1,621 papers that were mentioned 11,342 times in different social media tools. Johns Hopkins University ranked second with its 1,076 papers mentioned 10,825 times. Washington University in St. Louis was in the third rank with contributing 568 papers that were mentioned 6,679 times.

Top 10 papers in altmetric scores and their citation counts

Table 4 shows the bibliometric information on the top 10 papers in altmetric scores. The first-ranked paper (AAS= 3,989) entitled as "cerebrospinal fluid leak after nasal swab testing for Coronavirus disease 2019" and

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authored by Sullivant et al. in December 2020. The paper under the title of "association of chemosensory dysfunction and Covid-19 in patients presenting with influenza-like symptoms" (AAS= 1,744) and another under the title of "lipoic acid in the treatment of smell dysfunction following viral infection of the upper respiratory tract" (AAS= 1,671) ranked second and third, respectively. The top 6 papers were published in *JAMA Otolaryngology–Head & Neck Surgery*, as an influential journal in social media tools.

Table 2. Characteristics of the top 10 otorhinolaryngology journals mentioned in online social media

Rank	Journal title	Number of mentioned papers	Total mentions	Country	SJR	Quartile	H-Index	IF
1	JAMA Otolaryngology–Head & Neck Surgery	2034	56800	US	1.571	Q1	128	6.223
2	The Laryngoscope	5781	26777	US	1.181	Q1	148	3.325
3	Otolaryngology–Head and Neck Surgery	3648	17411	US	1.232	Q1	121	3.497
4	Head and Neck Pathology	820	16546	US	.801	Q1	50	2.031
5	American Journal of Speech-Language Pathology	1176	14420	US	.993	Q2	72	2.408
6	Otology & Neurotology	3558	14046	US	1.147	Q2	104	2.311
7	Head & Neck	3346	11536	US	1.012	Q1	127	3.147
8	International Journal of Pediatric Otorhinolaryngology	3191	11527	Ireland	.631	Q2	78	1.675
9	Dysphagia (0179051X)	1141	10336	US	.989	Q1	83	3.438
10	International Journal of Speech-Language Pathology	620	9707	UK	.761	Q2	43	2.00

SJR: SCImago Journal Rank; IF: Impact Factor

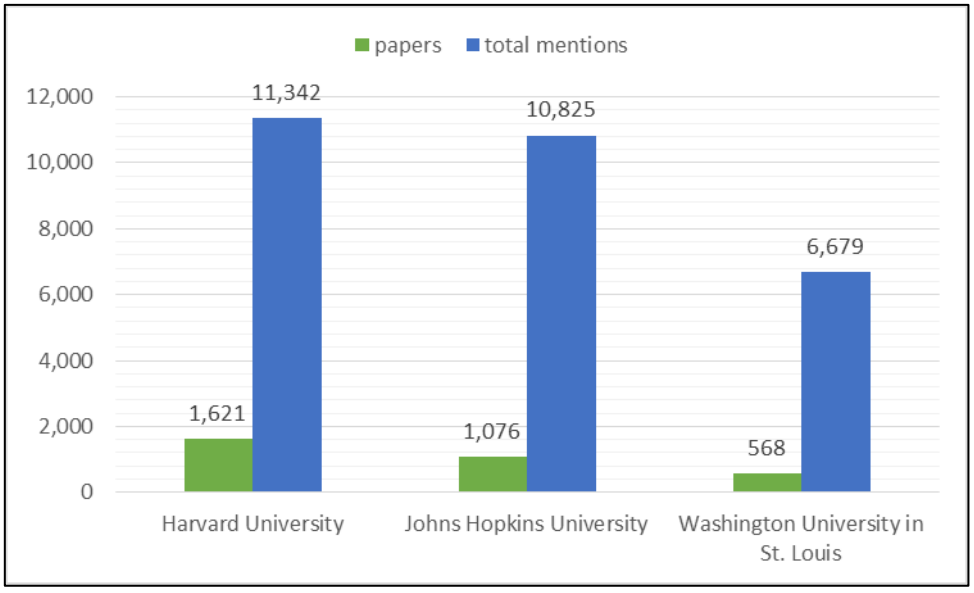

Figure 3. Top three affiliations with highly-mentioned otorhinolaryngology papers

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Table 3. Top 10 countries in Twitter, Facebook, News Stories and outlets and Policy document

Tweets and tweeters				Facebook posts and Pages				News stories and outlets				Policy documents and sources			
Country name	**Number of posts**	**Number of profiles**	**%**	**Country name**	**Number of posts**	**Number of profiles**	**%**	**Country name**	**Number of posts**	**Number of profiles**	**%**	**Country name**	**Number of posts**	**Number of profiles**	**%**
United States	54706	11412	21.4	United States	4337	850	20.2	United Kingdom	1838	212	11.00	United Kingdom	2464	10	37.50
United Kingdom	24533	4982	9.59	Australia	560	79	2.60	India	977	90	5.84	Germany	1192	2	18.14
Australia	9123	1558	3.56	United Kingdom	430	104	2.00	Australia	691	41	4.13	United States	1051	12	16
Spain	7280	1888	2.84	Mexico	365	28	1.70	Turkey	397	5	2.37	Switzerland	909	4	13.83
Japan	3882	2011	1.51	Canada	309	108	1.43	Germany	268	49	1.60	Sweden	402	3	6.11
Canada	3571	1567	1.39	Italy	239	35	1.11	Canada	168	27	1.00	Netherlands	259	4	3.94
Venezuela, Bolivarian Republic of	3142	598	1.22	Brazil	140	40	0.65	France	160	30	0.95	Australia	149	4	2.26
India	2563	763	1.00	Spain	139	41	0.64	New Zealand	149	10	0.89	Luxemburg	45	1	0.68
Saudi Arabia	2477	814	0.96	Paraguay	135	1	0.62	Spain	124	60	0.74	New Zealand	30	1	0.45
Turkey	2399	433	0.93	Ecuador	88	1	0.40	Singapore	107	10	0.64	Canada	21	4	0.31

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Table 4. Top 10 highly-mentioned articles in ENT papers

Rank	Article Title (First author/year)	Source Title	AAS	TC	NC	BC	FBC	WC	RC	VC	PS	MC
#1	Cerebrospinal Fluid Leak After Nasal Swab Testing for Coronavirus Disease 2019 (Christopher Blake Sullivan at el/December 2020)	JAMA Otolaryngology–Head & Neck Surgery	3989	5485	161	5	10	0	2	0	0	67
#2	Association of chemosensory dysfunction and Covid- 19 in patients presenting with influenza- like symptoms (Carol H. Yan at el/June 2020)	International Forum of Allergy & Rhinology	1744	358	217	12	4	1	0	0	1	773
#3	Lipoic Acid in the Treatment of Smell Dysfunction Following Viral Infection of the Upper Respiratory Tract (Thomas Hummel at el/November 2002)	The Laryngoscope	1671	2974	8	0	1	0	1	2	1	78
#4	Head and Neck Injuries Associated With Cell Phone Use (Roman Povolotskiy at el/February 2020)	JAMA Otolaryngology–Head & Neck Surgery	1477	175	218	8	3	0	1	0	0	42
#5	Can Sex Improve Nasal Function? An Exploration of the Link Between Sex and Nasal Function (Olcay Cem Bulut at el/January 2021)	Ear, Nose & Throat Journal	1159	697	79	21	4	4	3	1	0	16
#6	Evolution of Altered Sense of Smell or Taste in Patients With Mildly Symptomatic COVID-19 (Paolo Boscolo-Rizzo at el/August 2020)	JAMA Otolaryngology–Head & Neck Surgery	1093	734	116	2	1	0	2	2	2	248
#7	A Comparison of Alkaline Water and Mediterranean Diet vs Proton Pump Inhibition for Treatment of Laryngopharyngeal Reflux (Craig H at el/October 2017)	JAMA Otolaryngology–Head & Neck Surgery	1089	370	118	6	61	0	0	2	0	132
#8	Prevalence, Severity, Exposures, and Treatment Patterns of Tinnitus in the United States (Jay M at el/October 2016)	JAMA Otolaryngology–Head & Neck Surgery	1067	85	131	4	13	0	2	0	0	206
#9	Sudden and Complete Olfactory Loss of Function as a Possible Symptom of COVID-19 (Michael Eliezer at el/July 2020)	JAMA Otolaryngology–Head & Neck Surgery	1066	468	103	5	1	0	1	3	2	345
#10	A systematic review to examine the relationship between objective and patient?reported outcome measures in sinonasal disorders: recommendations for use in research and clinical practice (Ngan Hong Ta at el/January 2021)	International Forum of Allergy & Rhinology	1035	12	135	0	0	0	0	0	0	18

AAS: Altmetric Attention Score; TC: twitter count; NC: news count; BC: blog count; FBC: Facebook count; WC: Wikipedia count; RC: Reddit count; VC: Video count; PS: Policy Source; MC: Mendeley count.

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Table 5. Citation counts of top 10 highly-mentioned otorhinolaryngology papers

Row	Paper title (First author/publication year)	Type of paper	Google Scholar	Scopus	Web of Science	Dimensions
1	Cerebrospinal Fluid Leak After Nasal Swab Testing for Coronavirus Disease 2019 (Christopher Blake Sullivan at el/December 2020)	Article	67	39	41	56
2	Association of chemosensory dysfunction and Covid-19 in patients presenting with influenza-like symptoms (Carol H. Yan at el/June 2020)	Article	725	353	103	529
3	Lipoic Acid in the Treatment of Smell Dysfunction Following Viral Infection of the Upper Respiratory Tract (Thomas Hummel at el/November 2002)	Article	165	89	81	85
4	Head and Neck Injuries Associated With Cell Phone Use (Roman Povolotskiy at el/February 2020)	Article	15	10	9	14
5	Can Sex Improve Nasal Function?—An Exploration of the Link Between Sex and Nasal Function (Olcay Cem Bulut at el/January 2021)	Article	2	NA	NA	2
6	Evolution of Altered Sense of Smell or Taste in Patients With Mildly Symptomatic COVID-19 (Paolo Boscolo-Rizzo at el/August 2020)	Article	128	70	64	104
7	A Comparison of Alkaline Water and Mediterranean Diet vs Proton Pump Inhibition for Treatment of Laryngopharyngeal Reflux (Craig H at el/October 2017)	Article	66	39	40	59
8	Prevalence, Severity, Exposures, and Treatment Patterns of Tinnitus in the United States (Jay M at el/October 2016)	Article	226	165	158	188
9	Sudden and Complete Olfactory Loss of Function as a Possible Symptom of COVID-19 (Michael Eliezer at el/July 2020)	Article	322	205	194	258
10	A systematic review to examine the relationship between objective and patient reported outcome measures in sinonasal disorders: recommendations for use in research and clinical practice (Ngan Hong Ta at el/January 2021)	Article	7	6	5	6

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The citation counts of the top 10 highly-mentioned papers as extracted from Google Scholar, Scopus, WoS and Dimensions are shown in Table 5. The first ranked paper under the title of "cerebrospinal fluid leak after nasal swab testing for coronavirus disease 2019" received 67, 39, 41 and 56 citations in Google Scholar, Scopus, WoS and Dimensions, respectively. The second-ranked paper entitled as "association of chemosensory dysfunction and Covid-19 in patients presenting with influenza-like symptoms" received most citations with having 725, 353, 103 and 529 citations in Google Scholar, Scopus, WoS and Dimension, respectively. These ten papers are all original research articles and multi-authored. Five papers were published in 2020.

Discussion

Focusing on the otorhinolaryngology research output, this altmetric study is a first comprehensive study aiming to analyze the presence of otorhinolaryngology papers in online social media. 89,044 papers were analyzed. As about 75% of otorhinolaryngology papers were considered at least once in the social media and had altmetric scores, the altmetric coverage of the field is in an appropriate level. However, low altmetric coverage has been reported for some fields (24, 53, 59-62). As the altmetric coverage and attention scores are different based on the kind and nature of the field under study, the studied social media and data-extraction databases (61, 63), some inconsistencies in the findings of different studies are reasonable. The majority of otorhinolaryngology papers had the altmetric scores in the range of 1-10. Mendeley was the most-used social medium, followed by Twitter. Mendeley was the top in total mentions, followed by Twitter. The reason for this is that Mendeley is a user-friendly, easy-to-access and open-accessed tool as well as one of the most-used applications (62). It is commonly used by researchers in technologies, mathematics and engineering (64). Some previous studies confirmed that Mendeley and Twitter are highly-considered tools in mentioning the scientific research (37, 52, 60, 65, 66). In addition, comparing most-used and highly-mentioned tools showed that a most-used tool is not necessarily a highly-scored one as can be seen, for example, in the case of Facebook in our study.

The majority of top otorhinolaryngology journals active in social media tools were Q1 and from the USA. *JAMA Otolaryngology–Head & Neck Surgery*, as one of the high-influential journals in the field ranked first in the rate of mentions, publishing six papers of the top ten highly-scored papers. Therefore, this journal is influential in the social media applications. Journal impact factor showed a positive relationship with the rate of total altmetric scores as well as with altmetric sources at hand. It can be concluded that highly-influential journals have high altmetric scores and are heavily considered in social media tools. Altmetric indicators of a journal can predict its impact (67). Further disciplinary-based studies need to be conduct for conformation and generalization of this finding.

As the top country in Twitter and Facebook, the USA was a main role-player in disseminating otorhinolaryngology research output. The UK was identified as the top country in News Outlet and Policy. The USA and UK identified as top countries in other altmetric studies, too (68). These two countries widely use social media for scientific goals. Filtering some social media such as Twitter and Facebook in Iran caused that Iran ranked 77th in Twitter. However, Twitter is the most-liked social medium worldwide with high amount of scientific production and a highly-considered application among academicians (69). The three top active affiliations in sharing data on otorhinolaryngology papers were from the USA universities, including Harvard University, Johns Hopkins University

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and Washington University in St. Louis, respectively. The top ten papers with high altmetric scores were multi-authored original research articles that five papers out of them were published in 2020. Both first-ranked papers in altmetric scores and citation counts focused on COVID-19 as the greatest pandemic of the millennium.

Conclusion

This altmetric study is the first exploratory study for analyzing the presence of otorhinolaryngology papers in the social media tools and applications, conducted in the Altmetric Explorer. Otorhinolaryngology research output is well reflected in the social media. Due to being a new-emerged approach, altmetrics needs to be deeply studied and extended in other disciplinary-based studies. Some standardization and clear strategies are needed for better depiction of research output in the social web by applying altmetric indicators. Collaborating with the USA and UK, as top contributing countries in social media can be beneficial to more sharing otorhinolaryngology research output in online social media. Further research is necessary for investigating the role of different social media tools in increasing the reach of research output in other similar fields.

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Conflicts of Interest

The authors declare no conflicts of interest.

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Ethics

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