Top COVID-19 100 vaccine papers: An Altmetric study

1st Ahmed Shehata Information Studies department, Faculty of Arts Sultan Qaboos University Muscat, Oman a.shehata@squ.edu.om 2nd Metwaly El Dakar Library and Information Science department, Faculty of Arts Minia Uinversity Minia, Egypt metwaley.mohmed@mu.edu.eg 3rd Nahed Salem Information Studies department, Faculty of Arts Sultan Qaboos University Muscat, Oman naheds@squ.edu.om

Abstract - The high number of COVID-19 studies has attracted scholars to produce many studies on the topic. However, while we know the impact of these studies on academia by analyzing their citation score in different indexing outlets, little is known about their impact on social networks. The current study aims to measure the impact of the top 100 vaccination papers on social networks. An Altmetrics analysis is conducted to measure the Altmetrics attention scores of the paper. We retrieved the data through the Web of Science and Scopus. The researchers selected Altmetric.com as a tool to obtain social media and mainstream internet outlet counts. The findings of the study revealed that there is a significant correlation between the citations and Altmetric indicators. Our findings indicate that Twitter and Mendeley represent the most contributes social networks in the final AAS in almost all journals included in the study. The study's findings have confirmed that COVID-19 vaccination papers have gained many citations and attention on social networks.

The study's main limitation is that it only measured the Altmetrics score for the top 100 papers. Hence, while the current paper gave us insight into the performance of vaccination papers on the social web, there is a need to conduct further studies covering a larger sample.

Keywords: Covid-19 – Scholarly publishing – Vaccines – Altmetric scores

Introduction

COVID-19 pandemic might be the most discussed topic in 2020 and 2021 because of the impact of this pandemic on people's life. Thousands of papers have been published about the virus resulting in increased attention from scholars and the public [1]. The purpose of the papers is to mitigate the COVID-19 effect by answering questions related to the treatment of the side effects of the virus. In order to explore the impact of scholarly papers on social networks and research in general, studies were carried out using Altmetrics to find how social networks contributed to the spread of the virus research [2-5].

Traditional citation indexes such as Scopus and WoS might not be enough to learn about the importance of the published research. Even in the COVID-19 case, which received high attention from the scholarly community, there is a need to find how scholars and others engage with research when it is published. Altmetrics provided us with exceptional tools that give us insight into the papers and predict the performance of these papers in terms of citation count. Vaccines studies are not an exception, as Altmetrics can help identify papers with the highest engagement on social networks and predict which papers are important for the scholarly community.

This paper focuses on the above issues by analyzing the top 100 vaccine papers published from 2020 to May 2021. The paper tries to find a correlation between Altmetrics' score and the number of citations of vaccine papers. Additionally, the paper presents the characteristics of engagement with these papers on different social network outlets. The paper also tries to find if Altmetrics indicators can predict the future citation impact of the vaccines' papers.

Literature

The COVID-19 pandemic has been accompanied by a boom of publications that aimed to research the virus and its impact. However, with the number of publications increasing, it becomes difficult for researchers to distinguish the quality publications in the area. As a result, many researchers explored the importance of these publications using bibliometrics and Altmetrics analysis [1, 2, 6].

The bibliometric and Altmetrics studies aimed to understand the impact of the coronavirus research by analyzing the number of citations and people's engagement on social networks. For example, a study by Edakar and Shehata [1] aimed to measure the covid-19 research on social media. The study analyzed the Altmetrics scores of papers published between 2019 and 2021. The findings of the study revealed that Altmetrics could help to understand the social impact of covid-19 papers. Parabhoi [6] analyzed the Altmetrics of the top papers published about the virus. The study, alongside Moezinia [7], showed that Twitter was the most dominating network sharing scholarly research outputs. Moreover, the paper indicated that China is considered the top country in producing scholarly

research, followed by the USA. Uysal, Islamoglu [8] also analyzed the top papers. The findings revealed that the citation count of the papers is not necessarily a good indicator of the performance, and other metrics measures should be incorporated in order to be able to understand how people engage and react to specific scholarly research.

Other publications' characteristics also were measured using bibliometric and Altmetrics analysis. For example, Mahmoudi [9] found that most of the top papers' authors about the virus are males, while women represented a small percentage of the papers. Batooli and Sayyah [10] showed that one of the characteristics of the virus research is that a significant portion of the authors is from China and Japan. The study also revealed a correlation between Altmetrics and bibliometrics, which means that Altmetrics can serve as an indicator of papers performance and citation count.

Regarding the vaccine, Zhang, Xiong [11] analyzed the bibliometrics of the top 100 papers about the vaccine. The papers revealed that the top papers were published in 32 journals and scored citations ranging from 593 to 2406. Interestingly, the new England journal of medicine published the highest number of papers regarding the vaccine. Notably, unlike other studies that explored covid-19 publications, the USA was the top country producing research about the vaccine, followed by Switzerland, then England.

Methodology

This study is a descriptive-analytical study that uses altmetric analysis to answer the research questions. Web of Science was used to collect the data and obtain a comprehensive sample of publications. We used this search strategy was selected because it covers a wide range of publications, thereby increasing the research scope. The data retrieved consisted of papers, citations of these papers, and altmetrics data. The data collection was carried out in two phases. The first phase mainly focused on retrieving all papers related to COVID-19. The researchers used an advanced search option in Scopus to retrieve all COVID-19 vaccine papers indexed by Scopus from 2020 to 20 May 2021. We used this search strategy : TS= ("corona*" OR "2019-nCoV" OR "nCoV-19" OR "SARS-CoV-2" OR "SARS-CoV2" OR "COVID*") AND TI= ("vacc*" OR "immuniz*"). In total, 4054 publications were retrieved in May 2021. The results were limited to research articles in English (removing reports, editorials, book reviews, etc.). The publication years were set as 2020 and 2021. The articles before 2020 were excluded. Articles number in May 2021 were 1643. They were sorted in descending order of citation times.

The 100 top-cited (T100) COVID-19 vaccine studies were identified by citation times. Next, the data were imported into Microsoft Excel 2016. The citation count in Scopus (We used this search strategy : TITLE ("corona*" OR "2019-nCoV" OR "nCoV-19" OR "SARS-CoV-2" OR "SARS-CoV2" OR "COVID*") AND TITLE ("vacc*" OR "immuniz*")), and Dimensions (We used this search strategy : ("corona*" OR "2019-nCoV" OR "nCoV-19" OR "SARS-CoV-2" OR "SARS-CoV2" OR "COVID*") AND ("vacc*" OR "SARS-CoV2" OR "COVID*") AND ("vacc*" OR "immuniz*")) was harvested from the corresponding databases and was updated on 20 May 2021.

The second phase aimed to measure the presence of the papers retrieved on social media. To perform this measurement, the researchers chose Altmetric.com as a tool to obtain social media and mainstream internet outlet counts. This tool was selected because it was considered the most comprehensive altmetric tool on the internet The tool is a service provided for researchers by Altmetric.com to give them insight into the papers. The researchers used the papers' DOI to collect data by using Altmetric.com. Altmetric.com provided a complete record of all the shares and mentions of every paper. Hence, it enabled the researchers to identify the research articles with the highest altmetric scores. Subsequently, the collected data were stored separately in two Excel files.

Analysis

Table 1 shows the top 100 papers that were published in 35 journals. Notably, the journal with the highest number of articles that were authored about the vaccines was New England Journal of Medicine (n = 9), followed by The Lancet (n=8), Nature (n=7), Cell(n=7), and MMWR-Morbidity And Mortality Weekly Report (n=6).

As highlighted in the table, the New England Journal of Medicine had the highest citation score in the web of science as the papers were cited 1720 times and 2192 times in Scopus. Notably, the journal had the highest dimension citations (4359), but it was ordered second in the Altmetric attention score (AAS) with only 70351 AAs. The Lancet was ordered second in terms of the number of citations in WoS (1397), Scopus (1676), and Dimension (2723), but the journal had the highest AAS score (89205).

The data shows that the number of journals that achieved more than 50000 AAS in the topic of the COVID-19 vaccine is two journals, while six journals (Nature, Science, Vaccine, MMWR-Morbidity, and Mortality Weekly Report, Lancet Infectious DISEASES and CELL) had more than 6000 AAS. Notably, nineteen journals out of 35 had AAS less than 500, which means that 54% of the extracted journals did not achieve high AAS. **TA B L E 1** Summary statistics for Altmetric Attention Score (mean), citation count in Dimensions (mean), Scopus (mean) and Web of Science (mean), and number (*N*) of articles per journal

er of articles critation s e clitation s ns s ns s ns clitations c clitations c s d clitations c clitations Total number of citations 100 9049 10810 17766 1236729 44.13 70351 7816.77 DVEW ENGLAND 9 1720 191.1 2192 24.3.5 4359 444.3 70351 7816.77 JOURNAL OF MEDICINF 8 1397 174.6 1676 209.5 2723 340.3 89205 1150.6 NATURE 7 776 51 10.8 887 12.6 1613 230.4 124.18 1774 CELL 7 371 53 445 63.57 760 108.5 654.4 934.85 MMWRMORBIDITY WEEKLY REPORT 5 662 132.4 803 160.6 126.90 253.8 10628 2125.60 NATURE 5 156 31.20 102 38.40 357 71.40 382.00	Journals	Numb	WOS	Mean	Scopus	Mean	Dimensio	Mean	Altmetri	mean
articles s s Citations Attentio rotal Total number of citations 100 9049 10810 17766 226729 NEW INGLAND 9 1720 191.1 2192 243.5 4359 484.3 70351 7816.77 JOURNAL OP 8 1397 174.6 1676 209.5 2723 7.0 8205 31150.6 NATURE 7 776 110.8 887 126.7 1613 230.4 12418 1774 CELL 7 371 53 445 63.57 760 108.5 6544 934.85 MNWR-MORBIDITY CELL 7 371 53 445 63.57 760 108.5 6544 934.85 MOMORTALITY WEEKLY MEPORT 5 156 31.20 192 38.40 357 71.40 9722 194.40 LANCET INFECTIOUS 5 228 45.60 281 56.20 437 87.40 6911 138.2.20		er of	Citation		citation		ns		с	
Total number of citations 100 9049 10810 17766 236729 NEW ENGLAND 9 1720 191.1 2192 243.5 4359 484.3 70351 7816.77 JOURNAL OF 8 1397 174.6 1676 209.5 2723 340.3 89205 1115.0 LANCET 8 1397 174.6 1676 209.5 77.0 1613 230.4 12418 1774 CELL 7 371 53 445 63.57 760 108.5 6544 934.85 MMWR.MORBIDITY AND MORTALITY 6 282 47 341 56.83 492 82 9244 1540.66 VACCINE 5 156 31.20 192 38.40 357 71.40 9722 1944.40 VACUNE 5 228 45.0 217 71.40 9721 1944.40 VACUNE 5 218 15.0 16.6 40 285 71.25 </td <td></td> <td>articles</td> <td>s</td> <td></td> <td>s</td> <td></td> <td>Citations</td> <td></td> <td>Attentio</td> <td></td>		articles	s		s		Citations		Attentio	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$									n Score	
Ion minute of constraints Ioo Ioo <thioo< td="" th<=""><td>Total number of citations</td><td>100</td><td>0040</td><td></td><td>10810</td><td></td><td>17766</td><td></td><td>101a1 236720</td><td></td></thioo<>	Total number of citations	100	0040		10810		17766		101a1 236720	
JOURNAL OF MEDICINE: LANCET 9 1100 11 1200 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000	NEW ENGLAND	0 0	1720	101 1	2102	2/3 5	17700	1813	70351	7816 77
MEDICINE Image: Constraint of the second secon	IOURNAL OF	2	1720	191.1	2192	5	4339	3	70331	/010.//
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	MEDICINE			1		5		5		
NATURE 7 76 110.8 887 126.7 1613 230.4 12418 1774 CELL 7 371 53 445 63.57 760 108.5 6544 934.85 MMWR-MORBIDITY AND MORTALITY WEEKLY REPORT 6 282 47 341 56.83 492 82 9244 1540.66 VACCINE 5 156 31.20 192 38.40 357 71.40 9722 1944.40 LANCET INFECTIOUS 5 228 45.60 281 56.20 437 87.40 6911 1382.20 NATURE 4 244 61 294 73.50 444 111 1636 409 COMMUNICATIONS 4 126 31.50 160 40 285 71.25 220 55 OURNAL OF 4 195 48.75 215 53.75 268 67 78 19.50 IOURNAL OF 3 135 45	LANCET	8	1397	174.6	1676	209.5	2723	340.3	89205	11150.6
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		-		2		0		7		3
CELL 7 371 53 445 63.57 760 108.5 6544 934.85 MMWR-MORBIDITY AND MORTALITY WEEKLY REPORT 6 282 47 341 56.83 492 82 9244 1540.66 SCIENCE 5 662 132.4 803 160.6 1269 253.8 10628 2125.60 VACCINE 5 156 31.20 192 38.40 357 71.40 9722 1944.40 LANCET INFECTIOUS 5 228 45.60 281 56.20 437 87.40 6911 1382.20 DISEASES 4 244 61 294 73.50 444 111 1636 409 COMMUNICATIONS 4 126 31.50 160 40 285 71.25 220 55 JOURNAL OF 4 195 48.75 215 53.75 268 67 78 19.50 JOURNAL OF 3 135 <td< td=""><td>NATURE</td><td>7</td><td>776</td><td>110.8 5</td><td>887</td><td>126.7 1</td><td>1613</td><td>230.4 2</td><td>12418</td><td>1774</td></td<>	NATURE	7	776	110.8 5	887	126.7 1	1613	230.4 2	12418	1774
MMWR-MORBIDITY AND MORTALITY WEEKLY REPORT 6 282 47 341 56.83 492 82 9244 1540.66 SCIENCE 5 662 132.4 803 160.6 1269 253.8 10628 2125.60 VACCINE 5 156 31.20 192 38.40 357 71.40 9722 1944.40 LANCET INFECTIOUS 5 228 45.60 281 56.20 437 87.40 6911 1382.20 DISEASES 1 4 244 61 294 73.50 444 111 1636 409 COMMUNICATIONS 4 126 31.50 160 40 285 71.25 220 55 OURNAL OF 4 195 48.75 215 53.75 268 67 78 19.50 BIOMOLECULAR 3 135 45 155 51.66 215 71.66 387 129 HUMAN VACCINES & 3	CELL	7	371	53	445	63.57	760	108.5 7	6544	934.85
AND MORTALITY WEEKLY REPORT Image: Constraint of the second	MMWR-MORBIDITY	6	282	47	341	56.83	492	82	9244	1540.66
WEEKLY REPORT - <	AND MORTALITY									
SCIENCE 5 662 132.4 803 160.6 1269 23.8 10628 2125.60 VACCINE 5 156 31.20 192 38.40 357 71.40 9722 1944.40 LANCET INFECTIOUS 5 228 45.60 281 56.20 437 87.40 6911 1382.20 DISEASES 228 45.60 281 56.20 437 87.40 6911 1382.20 NATURE 4 244 61 294 73.50 444 111 1636 409 COMMUNICATIONS EUROPEAN JOURNAL 4 126 31.50 160 40 285 71.25 220 55 OURNAL OF 4 195 48.75 215 53.75 268 67 78 19.50 NPJ VACCINES 3 135 45 155 51.66 215 71.66 387 129 HUMAN VACCINES & IN 3 73 24.3	WEEKLY REPORT									
VACCINE 5 156 31.20 192 38.40 357 71.40 9722 1944.40 LANCET INFECTIOUS 5 228 45.60 281 56.20 437 87.40 6911 1382.20 DISEASES - - - - - 73.50 444 111 1636 409 COMMUNICATIONS 4 126 31.50 160 40 285 71.25 220 55 OURNAL OF 4 195 48.75 215 53.75 268 67 78 19.50 BIOMOLECULAR 4 195 48.75 215 51.66 215 71.66 387 129 MUMAN VACCINES 3 135 45 155 51.66 215 71.66 387 129 HUMAN VACCINES & 3 86 28.66 106 35.33 185 61.66 59 19.66 IMMUNOLOGY 3 73 24.33 88	SCIENCE	5	662	132.4 0	803	160.6 0	1269	253.8 0	10628	2125.60
LANCET INFECTIOUS 5 228 45.60 281 56.20 437 87.40 6911 1382.20 DISEASES NATURE 4 244 61 294 73.50 444 111 1636 409 COMMUNICATIONS 4 126 31.50 160 40 285 71.25 220 55 OF EPIDEMIOLOGY 4 195 48.75 215 53.75 268 67 78 19.50 BIOMOLECULAR 1 195 48.75 215 51.66 215 71.66 387 129 HUMAN VACCINES 3 135 45 155 51.66 215 71.66 387 129 HUMAN VACCINES & 3 86 28.66 106 35.33 185 61.66 59 19.66 IMMUNOTHERAPEUT 2 116 58 126 63 213 106.5 4356 2178 FROOTEDINGS OF 2 116	VACCINE	5	156	31.20	192	38.40	357	71.40	9722	1944.40
NATURE COMMUNICATIONS 4 244 61 294 73.50 444 111 1636 409 COMMUNICATIONS 4 126 31.50 160 40 285 71.25 220 55 OF EPIDEMIOLOGY 4 195 48.75 215 53.75 268 67 78 19.50 JOURNAL OF BIOMOLECULAR 3 135 45 155 51.66 215 71.66 387 129 HUMAN VACCINES & DYNAMICS 3 135 45 155 51.66 215 71.66 387 129 HUMAN VACCINES & IMMUNOTHERAPEUT ICS 3 73 24.33 88 29.33 170 56.66 32 10.66 IMMUNOLOGY 3 73 24.33 88 29.33 170 56.66 32 10.66 IMMUNOLOGY 4 116 58 126 63 213 106.5 4356 2178 ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA	LANCET INFECTIOUS DISEASES	5	228	45.60	281	56.20	437	87.40	6911	1382.20
EUROPEAN JOURNAL OF EPIDEMIOLOGY 4 126 31.50 160 40 285 71.25 220 55 OF EPIDEMIOLOGY 4 195 48.75 215 53.75 268 67 78 19.50 BIOMOLECULAR STRUCTURE & DYNAMICS 3 135 45 155 51.66 215 71.66 387 129 HUMAN VACCINES & IMMUNOTHERAPEUT 3 86 28.66 106 35.33 185 61.66 59 19.66 IMMUNOTHERAPEUT 3 73 24.33 88 29.33 170 56.66 32 10.66 IRMUNOLOGY 3 73 24.33 88 29.33 170 56.66 32 10.66 RONTIERS IN IMMUNOLOGY 3 73 24.33 88 29.33 170 56.66 32 10.65 4356 2178 ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA 2 126 61 132 66 286 143 3188	NATURE COMMUNICATIONS	4	244	61	294	73.50	444	111	1636	409
OF EPIDEMIOLOGY -	EUROPEAN JOURNAL	4	126	31.50	160	40	285	71.25	220	55
JOURNAL OF BIOMOLECULAR STRUCTURE & DYNAMICS 4 195 48.75 215 53.75 268 67 78 19.50 NPJ VACCINES 3 135 45 155 51.66 215 71.66 387 129 HUMAN VACCINES 3 86 28.66 106 35.33 185 61.66 59 19.66 IMMUNOTHERAPEUT ICS 3 73 24.33 88 29.33 170 56.66 32 10.66 IMMUNOLOGY 3 73 24.33 88 29.33 170 56.66 32 10.66 IPROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA 116 58 126 63 213 106.5 4356 2178 NATURE MEDICINE 2 122 61 132 66 286 143 3188 1594 JAMA-JOURNAL OF THE AMERICAN 2 136 68 161 80.50 262 131 2118 1059	OF EPIDEMIOLOGY									
BIOMOLECULAR STRUCTURE & DYNAMICS Image: Structure information of the structure information	JOURNAL OF	4	195	48.75	215	53.75	268	67	78	19.50
STRUCTURE & Image: Constraint of the symbol of the sym	BIOMOLECULAR									
DYNAMICS Image: constraint of the state of	STRUCTURE &									
NPJ VACCINES 3 135 45 155 51.66 215 71.66 387 129 HUMAN VACCINES & IMMUNOTHERAPEUT 3 86 28.66 106 35.33 185 61.66 59 19.66 FRONTIERS IN ICS 3 73 24.33 88 29.33 170 56.66 32 10.65 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA 116 58 126 63 213 106.5 4356 2178 NATURE MEDICINE 2 122 61 132 66 286 143 3188 1594 JAMA-JOURNAL OF AMERICA 2 136 68 161 80.50 262 131 2118 1059 THE AMERICAN MEDICINE 2 162 81 179 89.50 226 113 1800 900 INFECTIOUS DISEASES 2 78 39 96 48 114 57 1099 549.50 PATHOGENESIS<	DYNAMICS		125						20-	100
HUMAN VACCINES & 3 3 86 28.66 106 35.33 185 61.66 59 19.66 IMMUNOTHERAPEUT 3 73 24.33 88 29.33 170 56.66 32 10.66 PROCEEDINGS OF 1 116 58 126 63 213 106.5 4356 2178 ACADEMY OF 2 116 58 126 63 213 106.5 4356 2178 NATURE MEDICINE 2 122 61 132 66 286 143 3188 1594 JAMA-JOURNAL OF 2 136 68 161 80.50 262 131 2118 1059 THE NATIONAL 2 136 68 161 80.50 262 131 2118 1059 MACICAL 2 162 81 179 89.50 226 113 1800 900 INECICAL 2 78 39 96 48 114 57 1099 549.50 INFECTIOUS 2	NPJ VACCINES	3	135	45	155	51.66	215	/1.66	387	129
INDUCTION 3 73 24.33 88 29.33 170 56.66 32 10.66 IMMUNOLOGY 2 116 58 126 63 213 106.5 4356 2178 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA 2 122 61 132 66 286 143 3188 1594 JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION 2 136 68 161 80.50 262 131 2118 1059 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION 2 162 81 179 89.50 226 113 1800 900 INFECTIOUS DISEASES 2 78 39 96 48 114 57 1099 549.50 COMPUTERS IN BIOLOGY AND MEDICINE 2 93 46.50 111 55.50 144 72 41 20.50 BIOLOGY AND MEDICINE 1 95 95 108 108 138 138 3948 <	IMMUNOTHERAPEUT	3	80	28.66	106	35.33	185	61.66	59	19.66
IMMUNOLOGY Image of the state Image of the state <thimage of="" state<="" th="" the=""> Image of the sta</thimage>	FRONTIERS IN	3	73	24.33	88	29.33	170	56.66	32	10.66
PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA 2 116 58 126 63 213 106.5 4356 2178 NATURE MEDICINE 2 122 61 132 66 286 143 3188 1594 JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION 2 136 68 161 80.50 262 131 2118 1059 JOURNAL OF INFECTIOUS DISEASES 2 162 81 179 89.50 226 113 1800 900 MICROBIAL PATHOGENESIS 2 78 39 96 48 114 57 1099 549.50 COMPUTERS IN BIOLOGY AND MEDICINE 2 93 46.50 111 55.50 144 72 41 20.50 BIOLOGY AND MEDICINE 1 371 371 426 426 501 501 1155 1155 CELLULAR & MOLECULAR 1 400 400 434 434 618 618 363	IMMUNOLOGY	_							-	
THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA Image: state of the s	PROCEEDINGS OF	2	116	58	126	63	213	106.5	4356	2178
ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA Image: state sta	THE NATIONAL							0		
SCIENCES OF THE UNITED STATES OF AMERICA 2 122 61 132 66 286 143 3188 1594 JAMA-JOURNAL OF JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION 2 136 68 161 80.50 262 131 2118 1059 JOURNAL OF JOURNAL OF JOURNAL OF DISEASES 2 162 81 179 89.50 226 113 1800 900 INFECTIOUS DISEASES 2 162 81 179 89.50 226 113 1800 900 MICROBIAL PATHOGENESIS 2 78 39 96 48 114 57 1099 549.50 COMPUTERS IN BIOLOGY AND MEDICINE 2 93 46.50 111 55.50 144 72 41 20.50 BIOLOGY AND MEDICINE 1 95 95 108 108 138 138 3948 3948 ACS CENTRAL SCIENCE 1 371 371 426 426 501 501 1155 1155 CELLULAR & MOLECULAR 1 <	ACADEMY OF									
UNITED STATES OF AMERICA 2 122 61 132 66 286 143 3188 1594 JAMA-JOURNAL OF THE AMERICAN 2 136 68 161 80.50 262 131 2118 1059 JOURNAL OF MEDICAL ASSOCIATION 2 162 81 179 89.50 226 113 1800 900 INFECTIOUS DISEASES 2 162 81 179 89.50 226 113 1800 900 MICROBIAL PATHOGENESIS 2 78 39 96 48 114 57 1099 549.50 COMPUTERS IN BIOLOGY AND MEDICINE 2 93 46.50 111 55.50 144 72 41 20.50 EBIOMEDICINE 1 95 95 108 108 138 138 3948 3948 ACS CENTRAL SCIENCE 1 371 371 426 426 501 501 1155 1155 CELLULAR & MOLICOLORY 1 400 400 434 434 618	SCIENCES OF THE									
AMERICA Image: Constraint of the second	UNITED STATES OF									
NATURE MEDICINE 2 122 61 132 66 286 143 3188 1394 JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION 2 136 68 161 80.50 262 131 2118 1059 JOURNAL OF INFECTIOUS 2 162 81 179 89.50 226 113 1800 900 INFECTIOUS 2 162 81 179 89.50 226 113 1800 900 INFECTIOUS 2 78 39 96 48 114 57 1099 549.50 PATHOGENESIS 2 78 39 96 48 114 57 1099 549.50 COMPUTERS IN BIOLOGY AND MEDICINE 2 93 46.50 111 55.50 144 72 41 20.50 EBIOMEDICINE 1 95 95 108 108 138 138 3948 ACS CENTRAL 1 371 371	AMERICA	2	100	(1	122		296	1.42	2100	1504
JAMA-JOONAL OF 2 150 68 161 80.50 202 151 2118 1039 THE AMERICAN MEDICAL ASSOCIATION 2 162 81 179 89.50 226 113 1800 900 JOURNAL OF INFECTIOUS DISEASES 2 162 81 179 89.50 226 113 1800 900 MICROBIAL PATHOGENESIS 2 78 39 96 48 114 57 1099 549.50 COMPUTERS IN BIOLOGY AND MEDICINE 2 93 46.50 111 55.50 144 72 41 20.50 EBIOMEDICINE 1 95 95 108 108 138 138 3948 3948 ACS CENTRAL SCIENCE 1 371 371 426 426 501 501 1155 1155 CELLULAR & MOLECULAR 1 400 400 434 434 618 618 363 363	IAMA IOURNAL OF	2	122	61	152	00 80.50	280	143	3188	1050
MEDICAL ASSOCIATION 2 162 81 179 89.50 226 113 1800 900 JOURNAL OF INFECTIOUS DISEASES 2 162 81 179 89.50 226 113 1800 900 MICROBIAL PATHOGENESIS 2 78 39 96 48 114 57 1099 549.50 COMPUTERS IN BIOLOGY AND MEDICINE 2 93 46.50 111 55.50 144 72 41 20.50 EBIOMEDICINE 1 95 95 108 108 138 138 3948 3948 ACS CENTRAL SCIENCE 1 371 371 426 426 501 501 1155 1155 CELLULAR & MOLECULAR 1 400 400 434 434 618 618 363 363	THE AMERICAN	2	150	08	101	80.50	202	151	2110	1039
ASSOCIATION Image: second	MEDICAL									
JOURNAL OF INFECTIOUS DISEASES 2 162 81 179 89.50 226 113 1800 900 MICROBIAL PATHOGENESIS 2 78 39 96 48 114 57 1099 549.50 COMPUTERS IN BIOLOGY AND MEDICINE 2 93 46.50 111 55.50 144 72 41 20.50 EBIOMEDICINE 1 95 95 108 108 138 138 3948 3948 ACS CENTRAL SCIENCE 1 371 371 426 426 501 501 1155 1155 CELLULAR & MOLECULAR 1 400 400 434 434 618 618 363 363	ASSOCIATION									
INFECTIOUS DISEASES Image: Section of the section	JOURNAL OF	2	162	81	179	89.50	226	113	1800	900
DISEASES Image: Constraint of the second secon	INFECTIOUS	-			- / /					
MICROBIAL PATHOGENESIS 2 78 39 96 48 114 57 1099 549.50 COMPUTERS IN BIOLOGY AND MEDICINE 2 93 46.50 111 55.50 144 72 41 20.50 EBIOMEDICINE 1 95 95 108 108 138 138 3948 3948 ACS CENTRAL SCIENCE 1 371 371 426 426 501 501 1155 1155 CELLULAR & MOLECULAR 1 400 400 434 434 618 618 363 363	DISEASES									
PATHOGENESIS Computers in Biology and Medicine 2 93 46.50 111 55.50 144 72 41 20.50 BIOLOGY AND MEDICINE 1 95 95 108 108 138 138 3948 3948 ACS CENTRAL SCIENCE 1 371 371 426 426 501 501 1155 1155 CELLULAR & MOLECULAR 1 400 400 434 434 618 618 363 363	MICROBIAL	2	78	39	96	48	114	57	1099	549.50
COMPUTERS IN BIOLOGY AND MEDICINE 2 93 46.50 111 55.50 144 72 41 20.50 BIOLOGY AND MEDICINE 1 95 95 108 108 138 138 3948 3948 ACS CENTRAL SCIENCE 1 371 371 426 426 501 501 1155 1155 CELLULAR & MOLECULAR 1 400 400 434 434 618 618 363 363	PATHOGENESIS									
BIOLOGY AND MEDICINE Image: March and March an	COMPUTERS IN	2	93	46.50	111	55.50	144	72	41	20.50
MEDICINE 1 95 95 108 108 138 138 3948 3948 ACS CENTRAL 1 371 371 426 426 501 501 1155 1155 SCIENCE 1 400 400 434 434 618 618 363 363 MOLECULAR MUNOLOGY 400 434 434 618 618 363 363	BIOLOGY AND									
EBIOMEDICINE 1 95 95 108 108 138 138 3948 3948 ACS CENTRAL 1 371 371 426 426 501 501 1155 1155 SCIENCE 1 400 400 434 434 618 618 363 363 MOLECULAR 1 400 400 434 434 618 618 363 363	MEDICINE	1	05	0.5	100	100	120	120	20.10	20.10
ACS CENTRAL 1 5/1 5/1 426 426 501 501 1155 SCIENCE 1 400 400 434 434 618 618 363 363 MOLECULAR Image: Constraint of the second se	EBIOMEDICINE	1	95	95	108	108	138	138	3948	3948
CELLULAR & 1 400 400 434 434 618 618 363 363 MOLECULAR MMUNOLOGY Image: Comparison of the second seco	ACS CENTRAL SCIENCE	1	5/1	3/1	426	426	501	501	1155	1155
MULECULAK	CELLULAR &	1	400	400	434	434	618	618	363	363
	MULECULAR									

CELL HOST &	1	22	22	26	26	61	61	229	229
MICROBE									
ANNALS OF	1	46	46	58	58	134	134	221	221
INTERNAL MEDICINE									
VIRUSES-BASEL	1	364		405		571		198	
PATHOGENS	1	47	47	60	60	89	89	193	193
CURRENT TROPICAL	1	174	174	206	206	248	248	162	162
MEDICINE REPORTS									
IMMUNITY	1	30	30	37	37	61	61	128	128
EUROSURVEILLANCE	1	22	22	25	25	57	57	43	43
DRUG	1	27	27	34	34	36	36	39	39
DEVELOPMENT									
RESEARCH									
JOURNAL OF	1	118	118	139	139	180	180	6	6
MEDICAL VIROLOGY									
CHAOS SOLITONS &	1	110	110	133	133	141	141	4	4
FRACTALS									
BIOMED RESEARCH	1	35	35	43	43	59	59	3	3
INTERNATIONAL									
VACCINES	1	30	30	36	36	50	50	0	0
Mean per published item		90.49		108.1		177.66		2367.29	

Note: The total number of citations in each database and AAS and the mean score per item are presented.

Table 2 breaks down which social media had contributed most to the altimetric attention score of each journal. Twitter users were the most popular data in all journals with a score of 252037. Twitter was followed by Mendeley readers which had a score of 57545. The difference between Twitter and Mendeley is very significant as Twitter contributed 78% AAS while Mendeley contributed 17.8% of the total AAS. Notably, policy sources, peer review sites, and research highlight platforms had low AAS. It is notable for the reader that Lancet has achieved the highest AAS on Twitter with a score of 103772. New England Journal of Medicine ordered second in Twitter but was with the highest AAS in Mendeley with a score of 13518. Lancet, on the other hand, was ordered second in Mendeley with a score of 9652. The table also shows that only one journal (Vaccines) scored zero on Twitter, but it scored 55 on Mendeley, which is considered the lowest score in Mendeley.

Journals	Num ber of articl es	<u>Ne</u> <u>ws</u> <u>outl</u> <u>ets</u>	<u>Blo</u> gs	Poli cy sou rce	Twee ters	Peer revi ew site	Faceb	<u>Wikip</u> edia	<u>Reddi</u> tors	Resea rch highli ght platfo rm	<u>Vide</u> <u>o</u> <u>uploa</u> <u>ders</u>	<u>Mend</u> eley	Altme tric Attent ion Score
Total	100	109 13	10 32	60	2520 37	8	671	122	257	21	193	57545	2367 29
LANCET	8	362 3	28 1	9	1037 72	2	172	35	81	4	59	9652	8920 5
NEW ENGLAND JOURNAL OF MEDICINE	9	279 4	29 9	6	8729 5	5	223	26	62	5	76	13518	7035 1
VACCINE	5	107	6	2	1195 0	0	85	2	8	0	8	1307	9722
SCIENCE	5	474	51	1	1149 2	0	23	1	14	2	2	2014	1062 8
NATURE	7	642	91	7	1009 9	1	27	9	29	3	17	3695	1241 8
CELL	7	392	42	2	5543	0	9	3	19	3	2	2073	6544
PROCEEDINGS OF THE	2	194	15	2	4959	0	8	1	9	1	2	514	4356

TABLE2 Summary statistics for different social media networks of articles per journal

NATIONAL													
ACADEMY OF													
SCIENCES OF													
MMWR-	6	809	75	9	3721	0	33	14	5	0	1	1134	9244
MORBIDITY	Ũ	005	/3	5	5/21	Ũ	33		5	Ũ	-	1151	5211
AND													
MORTALITY													
WEEKLY													
REPORT													
LANCET	5	501	27	4	3628	0	5	10	4	0	12	1760	6911
DISEASES													
	1	316	22	1	2127	0	10	2	4	0	4	704	2049
	1	122	20	ו כ	2137	0	19	2 E	4	0	4	000	3940
OF THE	2	125	20	5	2077	0	'	5	2	0	5	000	2110
AMERICAN													
MEDICAL													
ASSOCIATION													
MICROBIAL	2	94	5	0	1147	0	1	0	8	0	0	431	1099
PATHOGENESI													
S													
ACS CENTRAL	1	63	9	0	854	0	10	<u> </u>	0	4	4	4070	4455
	4	107	10	2	715	0	12	0	0	1	1	1970	1155
	4	137	16	2	/15	0	6	1	4	0	0	1217	1636
ONS													
JOURNAL OF	2	146	21	1	673	0	5	3	1	0	2	1156	1800
INFECTIOUS	-	110		-	0/3	Ũ	5	5	-	Ũ	-	1150	1000
DISEASES													
NATURE	2	344	25	4	580	0	6	0	5	0	0	1203	3188
MEDICINE													
PATHOGENS	1	2	1	0	221	0	0	1	0	0	1	263	193
NPJ VACCINES	3	23	4	0	216	0	0	0	0	0	0	922	387
IMMUNITY	1	2	0	0	196	0	0	0	0	0	0	208	128
IMMUNITY ANNALS OF	1	2 12	0 3	0 1	196 179	0	0	0	0	0	0	208	128
IMMUNITY ANNALS OF INTERNAL	1 1	2 12	0 3	0	196 179	0	0	0	0	0	0	208	128
IMMUNITY ANNALS OF INTERNAL MEDICINE	1	2 12	03	0	196 179	0	0	0	0	0	0	208 350	128 221
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL	1 1 1	2 12 10	0 3 2	0 1 2	196 179 92	0	0	0	0	0	0	208 350	128 221
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE	1 1 1	2 12 10	0 3 2	0 1 2	196 179 92	0	0	0	0	0	0	208 350	128 221
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS	1 1 1	2 12 10	0 3 2	0 1 2	196 179 92	0	0	0	0	0 0 0 0	0	208 350 1148	128 221 162
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST &	1 1 1	2 12 10 23	032	0 1 2 0	196 179 92 84	0 0 0 0	0	0 0 2	0	0	0	208 350 1148	128 221 162
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE	1 1 1	2 12 10 23	0 3 2 1	0 1 2 0	196 179 92 84	0 0 0 0	0 1 2 0	0 0 2 0	0 0 0 1	0 0 0 0	0 0 1 0	208 350 1148 130	128 221 162 229
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES-	1 1 1 1 1	2 12 10 23 16	0 3 2 1 4	0 1 2 0 1	196 179 92 84 76	0 0 0 0 0 0 0	0 1 2 0	0 0 2 0	0 0 0 1	0 0 0 0	0	208 350 1148 130	128 221 162 229
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL	1 1 1 1 1	2 12 10 23 16	0 3 2 1 4	0 1 2 0 1	196 179 92 84 76	0 0 0 0 0	0 1 2 0 20	0 0 2 0 0	0 0 0 1 0	0 0 0 0 0	0 0 1 0 0	208 350 1148 130 1897	128 221 162 229 198
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLTONIAD	1 1 1 1 1 1	2 12 10 23 16 34	0 3 2 1 4 5	0 1 2 0 1 1	196 179 92 84 76 74	0 0 0 0 0	0 1 2 0 20	0 0 2 0 0	0 0 1 0	0 0 0 0	0 0 1 0 0	208 350 1148 130 1897	128 221 162 229 198
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR	1 1 1 1 1 1	2 12 10 23 16 34	0 3 2 1 4 5	0 1 2 0 1 1	196 179 92 84 76 74	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 1 2 0 20 0	0 0 2 0 0	0 0 1 0	0 0 0 0 0 0 1	0 0 1 0 0	208 350 1148 130 1897	128 221 162 229 198
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY	1 1 1 1 1 1	2 12 10 23 16 34	0 3 2 1 4 5	0 1 2 0 1 1	196 179 92 84 76 74	0 0 0 0 0	0 1 2 0 20 0	0 0 2 0 0 0	0 0 1 0 0	0 0 0 0 0	0 0 1 0 0	208 350 1148 130 1897 1772	128 221 162 229 198 363
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOLIBNAL OF	1 1 1 1 1 1 4	2 12 10 23 16 34 19	0 3 2 1 4 5 3	0 1 2 0 1 1 2	196 179 92 84 76 74 50	0 0 0 0 0 0	0 1 2 0 20 0 0	0 0 2 0 0 0 1	0 0 1 0 0 0	0 0 0 0 0 1 0	0 0 1 0 0 0	208 350 1148 130 1897 1772 1779	128 221 162 229 198 363 220
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOURNAL OF EPIDEMIOLOGY	1 1 1 1 1 1 4	2 12 10 23 16 34 19	0 3 2 1 4 5 3	0 1 2 0 1 1 2	196 179 92 84 76 74 50	0 0 0 0 0 0	0 1 2 0 20 0 0	0 0 2 0 0 0 1	0 0 1 0 0 0	0 0 0 0 1 0	0 0 1 0 0 0 1	208 350 1148 130 1897 1772 1779	128 221 162 229 198 363 220
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOURNAL OF EPIDEMIOLOGY FRONTIERS IN	1 1 1 1 1 1 4	2 12 10 23 16 34 19	0 3 2 1 4 5 3 0	0 1 2 0 1 1 2 0	196 179 92 84 76 74 50 41	0 0 0 0 0 0	0 1 2 0 20 0 0	0 0 2 0 0 0 1	0 0 1 0 0 0	0 0 0 0 1 0	0 0 1 0 0 1 0 0	208 350 1148 130 1897 1772 1779 954	128 221 162 229 198 363 220
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY FRONTIERS IN IMMUNOLOGY	1 1 1 1 1 1 4 3	2 12 10 23 16 34 19 1	0 3 2 1 4 5 3 0	0 1 2 0 1 1 2 0	196 179 92 84 76 74 50 41	0 0 0 0 0 0 0	0 1 2 0 20 0 0 0	0 0 2 0 0 0 1 0	0 0 1 0 0 0 0	0 0 0 0 0 1 0	0 0 1 0 0 1 0 0	208 350 1148 130 1897 1772 1779 954	128 221 162 229 198 363 220 32
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EVIROPEAN JOURNAL OF EPIDEMIOLOGY FRONTIERS IN IMMUNOLOGY COMPUTERS IN	1 1 1 1 1 1 4 3 2	2 12 10 23 16 34 19 1 1	0 3 2 1 4 5 3 0 0	0 1 2 0 1 1 2 0 0	196 179 92 84 76 74 50 41 39	0 0 0 0 0 0 0 0 0	0 1 2 0 20 0 0 0	0 0 2 0 0 0 1 0 0	0 0 1 0 0 0 0	0 0 0 0 0 1 0 0	0 0 1 0 0 1 0 1 1	208 350 1148 130 1897 1772 1779 954 1445	128 221 162 229 198 363 220 32 41
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOURNAL OF EPIDEMIOLOGY FRONTIERS IN IMMUNOLOGY COMPUTERS IN BIOLOGY AND	1 1 1 1 1 1 4 3 2	2 12 10 23 16 34 19 1 1	0 3 2 1 4 5 3 0 0	0 1 2 0 1 1 2 0 0	196 179 92 84 76 74 50 41 39	0 0 0 0 0 0 0 0 0	0 1 2 0 20 0 0 0	0 0 2 0 0 0 1 0 0 0	0 0 1 0 0 0 0	0 0 0 0 0 1 0 0	0 0 1 0 0 1 0 1 1	208 350 1148 130 1897 1772 1779 954 1445	128 221 162 229 198 363 220 32 41
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOURNAL OF EPIDEMIOLOGY FRONTIERS IN IMMUNOLOGY COMPUTERS IN BIOLOGY AND MEDICINE	1 1 1 1 1 1 4 3 2	2 12 10 23 16 34 19 1 1	0 3 2 1 4 5 3 0 0	0 1 2 0 1 1 2 0 0	196 179 92 84 76 74 50 41 39	0 0 0 0 0 0 0 0	0 1 2 0 20 0 0 0	0 0 2 0 0 0 1 0 0	0 0 1 0 0 0 0	0 0 0 0 0 1 0 0	0 0 1 0 0 1 0 1 1	208 350 1148 130 1897 1772 1779 954 1445	128 221 162 229 198 363 220 32 41
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOURNAL OF EPIDEMIOLOGY FRONTIERS IN IMMUNOLOGY COMPUTERS IN BIOLOGY AND MEDICINE JOURNAL OF	1 1 1 1 1 1 3 2 4	2 12 10 23 16 34 19 1 1 0	0 3 2 1 4 5 3 0 0 1	0 1 2 0 1 1 2 0 0 0 0	196 179 92 84 76 74 50 41 39 37		0 1 2 0 20 0 0 0 0 5	0 0 2 0 0 0 1 0 0 0 0 0	0 0 1 0 0 0 0 0	0 0 0 0 0 1 0 0 1	0 0 1 0 0 1 0 1 0	208 350 1148 130 1897 1772 1779 954 1445 729	128 221 162 229 198 363 220 32 41 78
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOURNAL OF EPIDEMIOLOGY FRONTIERS IN IMMUNOLOGY COMPUTERS IN BIOLOGY AND MEDICINE JOURNAL OF BIOMOLECULA B STDUCT IDF	1 1 1 1 1 1 4 3 2 4	2 12 10 23 16 34 19 1 1 0	0 3 2 1 4 5 3 0 0 1	0 1 2 0 1 1 2 0 0 0	196 179 92 84 76 74 50 41 39 37	0 0 0 0 0 0 0 0 0 0	0 1 2 0 20 0 0 0 0 5	0 0 2 0 0 0 1 0 0 0	0 0 1 0 0 0 0 0	0 0 0 0 0 1 0 0	0 0 1 0 0 1 0 1 0	208 350 1148 130 1897 1772 1779 954 1445 729	128 221 162 229 198 363 220 32 41 78
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOURNAL OF EPIDEMIOLOGY FRONTIERS IN IMMUNOLOGY COMPUTERS IN BIOLOGY AND MEDICINE JOURNAL OF BIOMOLECULA R STRUCTURE & DYNAMICS	1 1 1 1 1 1 4 3 2 4	2 12 10 23 16 34 19 1 1 0	0 3 2 1 4 5 3 0 0 1	0 1 2 0 1 1 2 0 0 0	196 179 92 84 76 74 50 41 39 37	0 0 0 0 0 0 0 0 0	0 1 2 0 20 0 0 0 0 5	0 0 2 0 0 0 1 0 0 0 0	0 0 1 0 0 0 0 0	0 0 0 0 0 1 0 0	0 0 1 0 0 1 0 1 0 1 0	208 350 1148 130 1897 1772 1779 954 1445 729	128 221 162 229 198 363 220 32 41 78
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOURNAL OF EPIDEMIOLOGY FRONTIERS IN IMMUNOLOGY COMPUTERS IN BIOLOGY AND MEDICINE JOURNAL OF BIOLOGY AND MEDICINE JOURNAL OF BIOLOGY AND MEDICINE JOURNAL OF BIOLOGY AND MEDICINE JOURNAL OF BIOMOLECULA R STRUCTURE & DYNAMICS	1 1 1 1 1 1 4 3 2 4	2 12 10 23 16 34 19 1 1 0	0 3 2 1 4 5 3 0 0 1	0 1 2 0 1 1 2 0 0 0	196 179 92 84 76 74 50 41 39 37 31	0 0 0 0 0 0 0 0 0	0 1 2 0 20 0 0 0 0 5	0 0 2 0 0 0 1 0 0 0 0	0 0 1 0 0 0 0 0	0 0 0 0 0 1 0 1	0 0 1 0 0 1 0 1 0 1	208 350 1148 130 1897 1772 1779 954 1445 729	128 221 162 229 198 363 220 32 41 78
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOURNAL OF EPIDEMIOLOGY FRONTIERS IN IMMUNOLOGY COMPUTERS IN BIOLOGY AND MEDICINE JOURNAL OF BIOMOLECULA R STRUCTURE & DYNAMICS EUROSURVEILL ANCE	1 1 1 1 1 1 3 2 4	2 12 10 23 16 34 19 1 1 0 0	0 3 2 1 4 5 3 0 0 1 1	0 1 2 0 1 1 2 0 0 0 0	196 179 92 84 76 74 50 41 39 37 31	0 0 0 0 0 0 0 0 0 0	0 1 2 0 20 0 0 0 5 0	0 0 2 0 0 0 1 0 0 0 0 0 0	0 0 1 0 0 0 0 0 0	0 0 0 0 0 1 0 0	0 0 1 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	208 350 1148 130 1897 1772 1779 954 1445 729 226	128 221 162 229 198 363 220 32 41 78
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOURNAL OF EPIDEMIOLOGY FRONTIERS IN IMMUNOLOGY FRONTIERS IN IMMUNOLOGY COMPUTERS IN BIOLOGY AND MEDICINE JOURNAL OF BIOMOLECULA R STRUCTURE & DYNAMICS EUROSURVEILL ANCE HUMAN	1 1 1 1 1 1 1 4 3 2 4 1 3	2 12 10 23 16 34 19 1 1 0 0 4	0 3 3 1 4 5 3 0 0 1 1 1 0	0 1 2 0 1 1 2 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1	196 179 92 84 76 74 50 41 39 37 31 24		0 1 2 0 20 0 0 0 0 5 0 2	0 0 2 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 1 0 0 0	0 0 1 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	208 350 1148 130 1897 1772 1779 954 1445 729 226 1122	128 221 162 229 198 363 220 32 41 78 78
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOURNAL OF EPIDEMIOLOGY FRONTIERS IN IMMUNOLOGY COMPUTERS IN BIOLOGY AND MEDICINE JOURNAL OF BIOMOLECULA R STRUCTURE & DYNAMICS EUROSURVEILL ANCE HUMAN VACCINES &	1 1 1 1 1 1 1 4 3 2 4 1 3	2 12 10 23 16 34 19 1 1 0 0 4	0 3 3 1 4 5 3 0 0 1 1 1 0	0 1 2 0 1 1 2 0 0 0 1 1 1 1 1	196 179 92 84 76 74 50 41 39 37 31 24	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 1 2 0 20 0 0 0 0 5 0 2	0 0 2 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1 0 0 0 0 0 0 0 0 0 1	0 0 0 0 0 0 0 0 0 1 0 0 0	0 0 1 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	208 350 1148 130 1897 1772 1779 954 1445 729 226 1122	128 221 162 229 198 363 220 32 41 78 43 59
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOURNAL OF EPIDEMIOLOGY FRONTIERS IN IMMUNOLOGY COMPUTERS IN BIOLOGY AND MEDICINE JOURNAL OF BIOMOLECULA R STRUCTURE & DYNAMICS EUROSURVEILL ANCE HUMAN VACCINES & IMMUNOTHERA	1 1 1 1 1 1 1 4 3 2 4 1 3	2 12 10 23 16 34 19 1 1 1 0 0 4	0 3 3 1 4 5 3 0 0 1 1 1 0	0 1 2 0 1 1 2 0 0 0 1 1 1 1 1	196 179 92 84 76 74 50 41 39 37 31 24	0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 1 2 0 20 0 0 0 0 5 0 2	0 0 2 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1 0 0 0 0 0 0 0 0 1	0 0 0 0 0 0 0 0 1 0 0 0	0 0 1 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	208 350 1148 130 1897 1772 1779 954 1445 729 226 1122	128 221 162 229 198 363 220 32 41 78 43 59
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOURNAL OF EPIDEMIOLOGY FRONTIERS IN IMMUNOLOGY COMPUTERS IN IMMUNOLOGY COMPUTERS IN BIOLOGY AND MEDICINE JOURNAL OF BIOLOGY AND MEDICINE JOURNAL OF BIOLOGY AND MEDICINE JOURNAL OF BIOLOGY AND MEDICINE JOURNAL OF BIOMOLECULA R STRUCTURE & DYNAMICS EUROSURVEILL ANCE HUMAN VACCINES & IMMUNOTHERA PEUTICS	1 1 1 1 1 1 1 4 3 2 4 1 3	2 12 10 23 16 34 19 1 1 1 0 0 4	0 3 2 1 4 5 3 0 0 1 1 0 1 0	0 1 2 0 1 1 2 0 0 0 1 1 1 1 1	196 179 92 84 76 74 50 41 39 37 31 24	0 0 0 0 0 0 0 0 0 0 0 0 0	0 1 2 0 20 0 0 0 0 5 0 2 0 2 0 2 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1 0 0 0 0 0 0 0 1	0 0 0 0 0 0 0 0 1 0 0 0	0 0 1 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	208 350 1148 130 1897 1772 1779 954 1445 729 226 1122	128 221 162 229 198 363 220 32 41 78 43 59
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOURNAL OF EPIDEMIOLOGY FRONTIERS IN IMMUNOLOGY COMPUTERS IN BIOLOGY AND MEDICINE JOURNAL OF BIOMOLECULA R STRUCTURE & DYNAMICS EUROSURVEILL ANCE HUMAN VACCINES & IMMUNOTHERA PEUTICS JOURNAL OF	1 1 1 1 1 1 1 4 3 2 4 1 3 1	2 12 10 23 16 34 19 1 1 1 0 0 4	0 3 3 1 4 5 3 0 0 1 1 1 0 0	0 1 2 0 1 1 2 0 0 0 1 1 1 1 0	196 179 92 84 76 74 50 41 39 37 31 24 7		0 1 2 0 20 0 0 0 0 5 0 2 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 2 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1 0 0 0 0 0 0 0 1	0 0 0 0 0 0 0 0 1 0 0 0	0 0 1 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	208 350 1148 130 1897 1772 1779 954 1445 729 226 1122	128 221 162 229 198 363 220 32 41 78 78 43 59
IMMUNITY ANNALS OF INTERNAL MEDICINE CURRENT TROPICAL MEDICINE REPORTS CELL HOST & MICROBE VIRUSES- BASEL CELLULAR & MOLECULAR IMMUNOLOGY EUROPEAN JOURNAL OF EPIDEMIOLOGY FRONTIERS IN IMMUNOLOGY COMPUTERS IN BIOLOGY AND MEDICINE JOURNAL OF BIOMOLECULA R STRUCTURE & DYNAMICS EUROSURVEILL ANCE HUMAN VACCINES & IMMUNOTHERA PEUTICS JOURNAL OF MEDICAL VIROLOGY	1 1 1 1 1 1 1 4 3 2 4 1 3 1	2 12 10 23 16 34 19 1 1 1 0 0 4	0 3 3 2 1 4 5 3 0 0 0 1 1 1 0 0	0 1 2 0 1 1 2 0 0 0 1 1 1 0 0	196 179 92 84 76 74 50 41 39 37 31 24 7		0 1 2 0 20 0 0 0 0 0 0 5 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1 0 0 0 0 0 0 1	0 0 0 0 0 0 0 0 1 0 0 0	0 0 1 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	208 350 1148 130 1897 1772 1779 954 1445 729 226 1122 676	128 221 162 229 198 363 220 32 41 78 43 59 6

CHAOS	1	0	0	0	4								
SOLITONS &													
FRACTALS						0	0	0	0	0	0	100	4
BIOMED	1	0	0	0	3								
RESEARCH													
INTERNATIONA													
L						0	0	0	0	0	0	181	3
DRUG	1	5	0	0	1								
DEVELOPMENT													
RESEARCH						0	0	0	0	0	0	325	39
VACCINES	1	0	0	0	0	0	0	0	0	0	0	55	0

Table 3 Characteristics of the top 10 articles with the highest citations of the COVID-19 Vaccine field in the various social media

Article	Journal/year	WOS citatio n	Scopu s citatio n	Dimension s	<u>News</u> outlet <u>s</u>	<u>Blogs</u>	Policy sourc e	Tweeter s	<u>Peer</u> <u>revie</u> <u>w site</u>	<u>Faceboo</u> <u>k</u>	<u>Wikipedi</u> <u>a</u>	<u>Redditor</u> <u>s</u>	Researchhighlightplatform	<u>Video</u> <u>uploader</u> <u>s</u>	<u>Mendele</u> ⊻	Altmetric Attention Score
Safety and Efficacy of the BNT162b2 mRNA Covid-19 Vaccine	NEW ENGLAND JOURNAL OF MEDICINE/2020	454	654	1252	642	73	1	21429	1	61	9	8	1	27	4528	19811
Safety and immunogenicity of the ChAdOx1 nCoV-19 vaccine against SARS-CoV-2: a preliminary report of a phase 1/2, single-blind, randomized controlled trial	LANCET/2020	364	423	641	883	62	2	16290	1	41	5	19	1	9	2052	15586
An mRNA Vaccine against SARS-CoV-2-Preliminary Report	NEW ENGLAND JOURNAL OF MEDICINE/2020	415	540	888	721	82	2	16386	1	56	4	19	1	20	2411	14635
Efficacy and Safety of the mRNA-1273 SARS-CoV-2 Vaccine	NEW ENGLAND JOURNAL OF MEDICINE/2021	237	289	754	246	34	1	10273	0	39	5	5	1	10	1743	7741
Safety, tolerability, and immunogenicity of a recombinant adenovirus type-5 vectored COVID-19 vaccine: a dose-escalation, open-label, non-randomized, first-in-human trial	LANCET/2020	331	380	525	295	36	2	7827	0	35	3	32	1	3	1230	6989
DNA vaccine protection against SARS-CoV-2 in rhesus macaques	SCIENCE/2020	251	337	488	126	23	0	4908	0	4	0	2	1	0	666	3462
Development of an inactivated vaccine candidate for SARS- CoV-2	SCIENCE/2020	299	338	515	102	12	1	4047	0	16	1	4	1	1	830	3448

Research and Development on Therapeutic Agents and Vaccines for COVID-19 and Related Human Coronavirus Diseases	ACS CENTRAL SCIENCE/2020	371	426	501	63	9	0	854	0	12	6	0	1	1	1970	1155
Characterization of the receptor-binding domain (RBD) of 2019 novel coronavirus: implication for development of RBD protein as a viral attachment inhibitor and vaccine	CELLULAR & MOLECULAR IMMUNOLOGY/ 2020	400	434	618	34	5	1	74	0	0	0	0	1	0	1772	363
Preliminary Identification of Potential Vaccine Targets for the COVID-19 Coronavirus (SARS-CoV-2) Based on SARS-CoV Immunological Studies	VIRUSES- BASEL/2020	364	405	571	16	4	1	76	0	20	0	0	0	0	1897	198

The characteristics of the top 10 papers that received the highest citation score are outlined in Table 3. The first paper was published in the New England Journal of Medicine in 2020. The paper scored 454 in WoS and 654 in Scopus. Notably, the paper also had the highest AAS as it scored 19811. The third paper, which scored a high score in both WoS and Scopus, was published in the same journal with 415 and 540, respectively. The paper also scored high AAS 14635. The second paper was published in The Lancet journal.

Interestingly, while this paper had low WoS score and Scopus score than the third journal and some other journals in the list, the paper had a high AAS score (15586). According to the data displayed in the table, except for the first three papers, no other papers had AAS higher than 10000. While some of the papers ranked in the top ten papers had almost similar citation scores in WoS and Scopus as the first two papers, non-had high AAS score as the score for the eight papers ranged from 1000 to 155 AAS. The results indicate that even though these papers had high scores, they did not significantly affect social media and informal outlets. Also, this is an indicator that the first two papers which were published in the same date range, had more attention than other papers.

ruble i riesenee or eo na ry vaceme papers researen pabrieanons at maneare per yee
--

year	Number of Publications	WOS citation	Mean	Scopus citation	Mean	Dimensions	Mean	Alemetric attention	Mean
								score	
2020	87	8143	93.60	9688	111.36	15309	175.97	156467	1798.47
2021	13	906	69.69	1122	86.31	2457	189.00	80262	6147.00

Table 4 outlines the presence of Covid-19 vaccine papers at Altmetric per year. We found that in 2020, the number of published papers about the vaccine with a high Altmetrics score was 87. The total Altmetrics attention score for these papers was 156467.

On the other hand, 13 papers in 2021 had high AAS with a score of 80262, which is considered high considering that the study's data was collected in

May 2021. The data confirms an increased interest in COVID-19 vaccine papers because of the distribution of around five vaccines during this period (Pfizer, Moderna, Johnson & Johnson's Janssen, Sinovac, and Sinopharm).

Social	WO	Scop	Dimens	New	Blogs	Poli	Tweet					Resea			
network	S	us	ions	<u>s</u>		cy	ers					rch			Altme
s sites	citati	citati	citation	outl		sour		Peer				highli			tric
	on	on		ets		ce		revi				<u>ght</u>	Video		Attent
								ew	Faceb	Wikip	Reddit	<u>platfo</u>	<u>uploa</u>	Mend	ion
								site	<u>ook</u>	edia	ors	<u>rm</u>	ders	eley	Score
WOS	1	.999	.900**	.545	.659	.821	.318*	.320	.560*	.393**	.349*	.385*	.458*	.731**	.501*
citation		**		**	*	**	*	**	*		*	*	*		*
		.000	.000	.000	.000	.000	.001	.001	.000	.000	.000	.000	.000	.000	.000
		1													
Scopus	.999	1	.903**	.581	.704	.293	.356*	.322	.564*	.400**	.356*	.386*	.464*	.734**	.509*
citation	**			**	**	**	*	**	*		*	*	*		*
	.000		.000	.000	.000	.003	.000	.001	.000	.000	.000	.000	.000	.000	.000

Table 5 Spearman correlations between WOS citation counts and altmetrics for all papers of COVID-19 vaccine

Dimens	.900 **	.903 **	1	.641 **	.769 **	.307 **	.433* *	.360 **	.635* *	.426**	.453* *	.438* *	.560* *	.792**	.614* *
citation	.000	.000	-	.000	.000	.002	.000	.000	.000	.000	.000	.000	.000	.000	.000
News	.545	.581	.641**	1	.938	.399	.707*	.527	.659*	.598**	.661*	.458*	.781*	.673**	.856*
outlets	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Blogs	.659	.704	.659**	.938	1	.417	.676*	.546	.703*	.625**	.696*	.534*	.817*	.747**	.821*
	**	**	000	**		**	*	**	*	000	*	*	*	000	*
Policy	303	203	307**	300	417	1	.000	.000	221*	.000	282*	137	227*	250**	187
source	**	**	.307	**	.+17 **	1	.005	.004	.221	.075	*	.137	.221	.239	.107
	.002	.003	.002	.000	.000		.518	.408	.027	.472	.005	.175	.024	.009	.062
Tweeter	.318 **	.356 **	.433**	.707 **	.676 **	.065	1	.328 **	.659* *	.547**	.593* *	.485* *	.630* *	.491**	.960* *
	.001	.000	.000	.000	.000	.518		.001	.000	.000	.000	.000	.000	.000	.000
Peer	.320	.322	.360**	.527	.546	.084	.328*	1	.413*	.399**	.400*	.300*	.459*	.351**	.369*
site	.001	.001	.000	.000	.000	.408	.001	-	.000	.000	.000	.002	.000	.000	.000
Facebo	.560	.564	.635**	.659 **	.703	.221	.659* *	.413	1	.569**	.741*	.458* *	.690* *	.540**	.872* *
<u>OK</u>	.000	.000	.000	.000	.000	.027	.000	.000		.000	.000	.000	.000	.000	.000
Wikipe	.393	.400	.426**	.598	.625	.073	.547*	.399	.569*	1	.493*	.253*	.675*	.412**	.598*
<u>d1a</u>	.000	.000	.000	.000	.000	.472	* .000	.000	* .000		*	.011	* .000	.000	* .000
Reddito	.349	.356	.453**	.661	.696	.282	.593*	.400	.741*	.493**	1	.427*	.630*	.348**	.832*
<u>rs</u>	.000	.000	.000	.000	.000	.005	*	.000	*	.000	-	*	* .000	.000	*
Researc	.385	.386	.438**	.458	.534	.137	.485*	.300	.458*	.253*	.427*	1	.377*	.413**	.453*
<u>h</u> highlig	**	**	000	**	**	175	*	**	*	011	*	_	*	000	*
<u>ht</u>	.000	.000	.000	.000	.000	.175	.000	.002	.000	.011	.000		.000	.000	.000
<u>platfor</u>															
Video	.458	.464	.560**	.781	.817	.227	.630*	.459	.690*	.675**	.630*	.377*	1	.570**	.706*
uploade	**	**	000	**	**	*	*	**	*	000	*	*			*
rs	.000	.000	.000 792**	.000	.000	.024	.000	.000	.000	.000	.000	.000	570*	.000	.000
Mendel	**	**	.172	**	./+/ **	.239 **	*	**	*	.412	*	*	*	1	*
ey	.000	.000	.000	.000	.000	.009	.000	.000	.000	.000	.000	.000	.000		.000
Altmetr ic	.501 **	.509 **	.614**	.856 **	.821 **	.187	.960* *	.369 **	.872* *	.598**	.832* *	.453* *	.706* *	.516**	1
Attentio n Score	.000	.000	.000	.000	.000	.062	.000	.000	.000	.000	.000	.000	.000	.000	

Table 5 shows Spearman correlations between WoS citation counts and Altmetrics for all papers of COVID-19 vaccine. The correlation test results revealed a significant positive and moderate correlation between the WoS citations and Altmetrics in all social networks outlets. The correlation was strong in number of readers of papers in Dimensions (p=0.000 and r = 0.999**), News outlets (p=0.000 and r = 0.821**), blogs (p=0.000 and r = 0.659**), Facebook (p=0.000 and r = 0.731**).

The results Also showed moderate relation in Twitter (p=0.001 and r = 0.318**), Peer review site (p=0.001 and r = 0.320**), Wikipedia (p=0.000 and r = 0.393**), Redditors (p=0.000 and r = 0.349**), Research highlight platform, and Video uploaders. Similar correlation was visible between Scopus and social networks. In contrast, the correlation test results revealed a weak negative relationship between some social media outlets (Blocks in Gray). For instance, a negative correlation was clear between the policy sources and social outlets such as, Tweeter (p=0.065 and r = 0.518), peer reviewed

sites (p=0.084 and r = 0.408), Wikipedia (p=0.073 and r = 0.472), and Research highlight platform (p=0.137 and r = 0.145).

Discussion

This research aimed to describe and analyze the citations and Altmetrics scores of scientific production about COVID-19 vaccines. The topic has attracted many scholars in 2020 and 2021 because of the spread of the virus and the competition between the pharmaceutical companies in producing a vaccine for the virus. To our best knowledge, this is the first study to report on Altmetric results about the vaccines papers authored during 2020\2021. We decided to only limit our research to the top 100 papers on the topic to examine the performance of these papers on social networks. The study's findings indicated that the top two journals in the number of publications on the topic had achieved the highest citation and AAS score. All of the papers except one had AAS; that is, the highest and lowest AAS for these articles were 19811and 0. respectively.

The findings of the study revealed that there is a significant correlation between the citations and Altmetric indicators. Additionally, it is was found that there is a positive correlation between social media platforms. Notably, the papers that were extracted in this study were published in 2020 and 2021; that is, these papers did receive much attention from the scholarly community and the public on social media as the topic is one of the hot topics in this period. All papers had citations, and all papers were mentioned in one or more social networks that indicate the topic's importance. Similar studies that analyzed the performance of COVID-19 papers indicated the same results [1, 10, 12].

Our findings indicate that Twitter and Mendeley contributed the most in the final AAS in almost all journals included in the study. Notably, many studies have reached the same conclusion as the volume of users of Twitter and Mendeley is high, which makes the chances of noticing the papers on these networks higher from the users. Additionally, Twitter is a public social network that increases the chances that non-scholars read and share information about the papers [13]

Conclusion

The spread of the COVID-19 pandemic, followed by the number of vaccines developed to protect people from the dangerous effect of the virus, has motivated researchers to publish many studies on the topic. Thus, this momentum of research papers has led to more attention from scholars and the public toward vaccine research. Social networks were among the best outlets to discuss these papers and share scholarly results regarding the vaccine with others. We extracted the 100 scholarly outputs most cited on WoS and Scopus and shared by a broad audience of scientists and people on social networks. The findings indicated that a correlation between traditional citation analysis and altmetrics analysis of vaccine articles. The findings have confirmed that despite that these papers were published recently in 2020 and 2021, they have gained many citations and attention on social networks.

Social networks have contributed to taking the scholarly papers out of journals and presenting their results to the public. Social networks have made research more visible and accessible to the public, increasing the advance of research in many areas. Hence, this result illustrates the importance of integrating social networks in disseminating research and contributing to the increase in Altmetrics attention scores, which would later reflect on the citations count.

References

- 1. Edakar, M.A.M. and A.M.K. Shehata, *Measuring the impact of COVID-19 papers on the social web: an altmetric study.* Global Knowledge, Memory and Communication, 2021.
- 2. Torres-Salinas, D., N. Robinson-Garcia, and P.A. Castillo-Valdivieso, Open Access and Altmetrics in the pandemic age: Forescast analysis on COVID-19 related literature. BioRxiv, 2020.
- 3. Boetto, E., et al., Using altmetrics for detecting impactful research in quasi-zeroday time-windows: the case of COVID-19. Scientometrics, 2021: p. 1-27.
- 4. Kousha, K. and M. Thelwall, *COVID-19* publications: Database coverage, citations, readers, tweets, news, Facebook walls, Reddit posts. Quantitative Science Studies, 2020. 1(3): p. 1068-1091.
- 5. Fang, Z. and R. Costas, *Tracking the Twitter attention around the research efforts on the COVID-19 pandemic.* arXiv preprint arXiv:2006.05783, 2020.
- 6. Parabhoi, L., Analysis of Altmetrics Top 100 Altmetrics Attentions Score Coronavirus Publications. SocArXiv. September, 2020. 26.
- 7. Tornberg, H.N., et al., Assessing the Dissemination of COVID-19 Articles Across Social Media With Altmetric and

PlumX Metrics: Correlational Study. Journal of Medical Internet Research, 2021. **23**(1): p. e21408.

- Uysal, B.B., et al., Most notable 100 articles of COVID-19: an Altmetric study based on bibliometric analysis. Irish Journal of Medical Science (1971-), 2021: p. 1-7.
- 9. Mahmoudi, M., Gender parity among the Altmetric Top 100 publications on COVID-19. Future Science OA, 2021. 7(2): p. FSO651.
- 10. Batooli, Z. and M. Sayyah, Measuring social media attention of scientific research on Novel Coronavirus Disease 2019 (COVID-19): An investigation on article-level metrics data of Dimensions. 2020.
- 11. Zhang, Y., et al., *The 100 Top-Cited Studies on Neuropsychology: A Bibliometric Analysis.* Frontiers in psychology, 2020. **11**: p. 3306.
- 12. Kim, J.-E., et al., *Top 100 publications as* measured by altmetrics in the field of central nervous system inflammatory demyelinating disease. BioMed research international, 2019. **2019**.
- Garcovich, D., V. Ausina Marquez, and M. Adobes Martin, *The online attention to* research in periodontology: An Altmetric study on the most discussed articles on the web. Journal of clinical periodontology, 2020. 47(3): p. 330-342.