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An altmetric study: Social attention based evaluation of top-100 publications about the COVID-19 pandemic from notification of the first case to the 6th month

Altmetrik bir çalışma: COVID-19 pandemisinde ilk vakanın bildiriminden 6 ay sonrasına dek sosyal medya atıflarında liste başı olan 100 yayının değerlendirilmesi

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ABSTRACT

Objective: Altmetrics, or alternative-metrics, have recently emerged as a web-based metrics measuring the impact of an individual article in social media accounts with an emphasis on the public attention/engagement with the research output. Aim of this study is to perform mid-2020 altmetric analysis of top-100 articles about COVID-19 that provoked the most online attention.

Methods: Altmetric Explorer search was performed in June 3th ,2020. After ranked by altmetric attention score (AAS: an automatically calculated weighted count of all of the attention a research output has received in social media), articles that are not related by COVID-19 were excluded and the first-100 COVID-19-related articles were analyzed. Variables evaluated were (I) AAS, (II) dimensions-badge (interactive visualizations that showcase the citation data origins for individual publications), (III) month of publication, (IV) distribution of web-sources, (V) demographic-breakdown type distributions of citations, (VI) geographic-breakdown type distributions of citations, (VII) level-of-evidence (decided using SIGN-Criteria) (VIII) Q-categories of

ÖZET

Amaç: "Altmetrik" veya "alternatif" ölçümler, tek bir makalenin sosyal medya hesaplarındaki etkisini ölçen yeni bir değerlendirme türüdür ve kamuoyunun makaleye gösterdiği ilgiyi dikkate alan web tabanlı ölçümlerdir. Bu çalışmanın amacı, 2020 ortalarında COVID-19 hakkında en fazla çevrimiçi ilgiyi uyandıran ilk 100 bilimsel yayının altmetrik analizini yapmaktır.

Yöntem: Makale taraması 3 Haziran 2020 tarihinde Altmetric Explorer web sitesinde gerçekleştirilmiş, tüm makaleler aldıkları AAS (Altmetric Attention Score; bir araştırma çıktısının sosyal medyada aldığı tüm ilginin otomatik olarak hesaplanan ağırlıklı sayımı) değerine göre yüksekten düşüğe sıralandıktan sonra COVID-19 ile ilişkisi olmayanlar elenmiş ve COVID-19 ile ilişkili ilk 100 makale analiz edilmiştir. Araştırmada incelenen değişkenler şunlardır: (I) AAS, (II) dimensions-badge (tek bir yayın için atıf verilerinin kökenlerini gösteren etkileşimli görselleştirme), (III) makalenin yayımlandığı ay, (IV) web kaynaklarının dağılımı, (V) atıfların demografik dağılımı, (VI) atıfların coğrafi dağılımı, (VII) SIGN-kriterlerine göre makalenin kanıt

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scientific journals, and (IX) h-index. Descriptive and correlational statistics were performed. Kruskal-Wallis test was used for AAS and dimensions-badge value comparisons while post-hoc analyses were performed by Dunn test. Spearman correlation coefficients were calculated to detect linear relationship between numerical variables. Analyses were performed by SPSS-23.0 and $p<0.05$ was considered statistically significant.

Results: Most (74%) of the disseminated articles were published in Q1-journals while evidence levels were mostly level-3/level-4. Content of the first 3 articles was about the impact of non-pharmaceutical interventions, origin of COVID-19 and chloroquine usage, respectively. There was no significant difference between AAS in different months ($p=0.673$) but dimensions-badges in January were significantly higher ($p<0.05$). There was a weak positive correlation between AAS and dimensions-badge ($r=0.250$; $p=0.017$).

Conclusion: Dimensions-badge and AAS results revealed that academia discussed COVID-19 much more in the first-month of pandemic, but then interests continued parallelly in academia and other social media platforms, including public. Academicians have discussed experiences of large-patient series but public preferred what is potentially protective or risky for them. Although enormously fast accumulation and dissemination of new scientific publications were witnessed, it seems sens-clinique rather than strict evidence-based-advice transferred to journals. Because infodemic is another emerging problem, every scientist should be ethically more responsible about the publication they choose to disseminate. Interpretations/public-messages of scientists might also be critical, given the fact that only 15% of discussed Covid-19 articles was in level-1/level-2 evidence.

Key Words: Altmetrics, COVID-19, public health, social attention, infodemic, web-based metrics, electronic platforms, level-of-evidence

düzeyi (VIII), dergilerin Q-kategorileri ve (IX) h-indeksi. Tanımlayıcı istatistikler ve korelasyon analizi yapılmış; AAS ile dimensions-badge değerleri karşılaştırmalarında Kruskal-Wallis testi, post-hoc analizlerde Dunn testi kullanılmıştır. Sayısal değişkenler arasındaki doğrusal ilişkiyi tespit etmek için Spearman korelasyon katsayıları hesaplanmıştır. Analizler SPSS 23.0 ile gerçekleştirilmiş ve $p<0.05$ istatistiksel olarak anlamlı kabul edilmiştir.

Bulgular: Sosyal medyada paylaşılmış makalelerin çoğu (%74) Q1 dergilerde yayımlanırken, kanıt düzeyleri çoğunlukla düzey-3 ve düzey-4 seviyesinde kalmıştır. İlk 3 makalenin içeriği sırasıyla, ilaç dışı müdahalelerin etkisi, COVID-19'un kökeni ve klorokin kullanımı ile ilgilidir. Farklı aylarda AAS değerleri arasında anlamlı bir fark yok iken ($p=0,673$), dimensions-badge değerleri Ocak ayında anlamlı olarak daha yüksek bulunmuştur ($p<0.05$). AAS ile dimensions-badge değerleri arasında zayıf bir pozitif korelasyon saptanmıştır ($r=0.250$; $p=0.017$).

Sonuç: Dimensions-badge ve AAS incelemeleri, pandeminin ilk ayında akademinin COVID-19'u daha fazla tartıştığını, ancak sonrasında ilgilerin halk dahil diğer sosyal medya platformlarında paralel olarak devam ettiğini göstermektedir. Akademisyenler geniş hasta serilerine ilişkin deneyimleri tartışırken, halk, kendileri için potansiyel olarak koruyucu veya riskli olanı paylaşmayı tercih etmiştir. Yeni bilimsel yayınlar hızlı şekilde birikmiş ve sosyal medya platformlarında paylaşılmış olmasına karşın, dergilere kanıta dayalı kesin tavsiyelerden ziyade, sezgisel yönelimlerin (sens clinique) aktarıldığı hissedilmektedir. Ortaya çıkan infodemi sorunu nedeniyle, her bilim insanı, paylaşmayı seçtiği yayın konusunda etik açıdan daha fazla sorumluluk duymalıdır. Tartışılan COVID-19 makalelerinin yalnızca %15'inin düzey-1 ve düzey-2 kanıtta olduğu gerçeği göz önüne alındığında, bilim insanlarının yorumları ve halka açık mesajları kritik önem taşımaktadır.

Anahtar Kelimeler: Altmetrik, COVID-19, halk sağlığı, sosyal ilgi, infodemi, web-tabanlı ölçümler, elektronik platformlar, kanıt düzeyi

INTRODUCTION

The rapidly spreading outbreak of SARS-CoV-2, which first emerged in Wuhan, Hubei Province in China in December 2019, was declared a global pandemic on 11th March 2020 and the disease officially named COVID-19 on February 12, 2020, by the World Health Organization (WHO) (1,2). Propagation of the pandemic is so fast and devastating that there were 6 287 771 confirmed cases and 379 941 deaths globally on June 3, 2020, when the web search was performed in this Altmetric Explorer study (3). COVID-19 is so new and secretive that attracts attention in every walk of life. Because there is very limited background about this new virus and disease, newly generated scientific knowledge being shared intensely with great interest in electronic platforms creating a huge flow of information in a short time interval.

Altmetrics are "a spectrum of social media-based metrics" (4) or a newly emerged web-based-metrics promptly measuring the "dissemination impact" of an individual article in social media accounts (5) and stands for the abbreviation for "alternative metrics" or "article-level metrics" (6). Contrary to citation-based metrics (such as journal impact factor and h-index) which reflect the citing dynamics of articles or books, this new method also detects, lists, and evaluates articles most discussed/disseminated in electronic literature, social media accounts, blogs, podcasts, and news media (7). Altmetrics reflect the attention of the general public; in other words, they emphasize the public attention/engagement with the research output. Altmetrics therefore complete citation-based metrics with qualitative data (8). Citation-based methods are criticized because they are slow (9), weak (10), and based on journals, not the articles they contain (11). On the other hand, altmetrics are "quicker to accumulate" and "capture more diverse impacts" (www.altmetric.com) (12). Because citations take a long time to accumulate but altmetrics eliminate time-cite-based bias and reflecting the social media interest in a standard mathematical approach, we decided altmetric analysis is a good quantification way for the evaluation of COVID-19 pandemic related article-burst.

This study aims to perform an Altmetric Explorer search at the 6th month of the declaration of the first case of SARS-CoV-2 and to evaluate top-100 publications about COVID-19 that provoked the most online attention; thus, exhibiting an insight into the impact of scientific milieu on different platforms in mid-year of the pandemic.

MATERIAL and METHOD

This web-based study does not necessitate approval by an ethics committee because the authors performed a secondary analysis of the published documents and no patient data was used. All authors declare that the research was conducted following the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects". "The Altmetric Explorer" web database used in this study is available on a site license basis, so approval was gained from its original organization in the United Kingdom.

Altmetric Explorer search was performed on 03rd June 2020, within the 6th month of the declared initial case of COVID-19. Because publications about the COVID-19 pandemic were already on the top-ranked ones on the Altmetric Explorer website, there was no need to use keyword-based search. Therefore, all publications are ranked by their Altmetric Attention Score (AAS: an automatically calculated weighted count of all of the attention a research output has received in social media), publications that are not related to COVID-19 were excluded and the first 100 COVID-related publications were analyzed. This method enabled us to avoid key-word related misses and reflected the real rating of articles in Altmetric Explorer (www.altmetric.com).

Variables evaluated in this study are listed below:

(I) Altmetric Attention Score (AAS): The Altmetric attention score is an automatically calculated, weighted count of all of the attention a research output has received. The score of a publication rises as more people mention it. It simply shows where citations originate from; namely, they originate from public policy documents, mainstream media, online reference managers (Mendeley), post-publication peer-review platforms (Publons, Pubpeer), Wikipedia, Open Syllabus Project, patent offices (IFI CLAIMS), blogs, citations (including Web of Science), research highlights from Faculty Opinions, social media (Twitter, LinkedIn, Google+, Sina Weibo and Pinterest) or Multimedia and other online platforms (YouTube, Reddit). In the webpage of Altmetric Explorer (www.altmetric.com) each web source has given a unique color and citation origins exhibited in donut shape in a weighted manner. The amount of each color in the donut changes depending on which sources a research output has received attention from, so one can understand at a glance that where an individual publication was cited most (12).

(II) Dimensions-badge: Dimensions-badge is the summary of the web origin of citations about the publication in concern. It is a special calculation that summarizes 4 different metrics of a publication: (a) total citations, (b) recent citations, (c) Field Citation Ratio (FCR) indicating the relative citation performance of an article when compared to similarly-aged articles in its Fields of Research area and (d) Relative Citation Ratio (RCR) is an article-level metric that indicates the relative citation performance of an article when compared to other articles in its area of research, as defined by the subject area of the articles that cite it (12).

(III) Month of publication: In this study, we evaluated how AAS and dimensions-badge values distributed and changed on monthly basis for top-100 publications. Distribution of AAS and dimensions-badge mean values of articles are given in scientific journal basis, also. Correlation between dimensions-badge and AAS values were evaluated and detailed with regression analysis.

Additionally, **(IV) distribution of web sources**, **(V) demographic breakdown type**, and **(VI) geographic breakdown type distributions of citations/disseminations for top-100 COVID-19 publications** were summarized.

(VII) Level of evidence of the research: SIGN (Scottish Intercollegiate Guidelines Network) Criteria were used to decide evidence levels of publications in concern (13) (https://www.sign.ac.uk/media/1052/sign100.pdf). Briefly; Level-1: meta-analyses, systematic reviews of RCTs, or RCTs; Level-2: systematic reviews of case-control or cohort studies; cohorts, case-control studies; Level-3: Nonanalytical studies, such as case reports, case series; Level-4: Expert opinion, animal studies, physiologic laboratory studies. In this altmetric study, the level of evidence distribution of top-100 COVID-19 publications is summarized.

Among those top-100 publications, articles published in scientific journals are also evaluated according to some bibliometric aspects, as given in items (H) and (I).

(VIII) Q-categories of journals that contain the articles in concern. The Q categories of the journals reflect the citation performance of a given journal and its place in the community of journals in the given scientific category (14). In this study, journal ranking quartiles (Q1 to Q4) of those articles detected from the webpage of Scimago (15) and summarized with descriptive statistics.

(IX) Hirsh (h)-index: The h-index is an author-level metric that measures both the productivity and citation impact of the publications of a scientist or scholar (16). After h-index of the author in concern in the publication were noted from Web of Science; bibliometric (h-index) and altmetric parameters (AAS and dimensions-badge) were compared and interpreted.

Statistical analysis

Descriptive and correlational statistics were performed; mean±SD/min-max for numerical and number/percentage for categorical values are given. Kruskal-Wallis test was used for altmetric and dimensions-badge value comparisons while post-hoc analyses were performed by Dunn test. Spearman correlation coefficients were calculated to detect a linear relationship between numerical variables. Beta coefficients were estimated by univariate linear regression analysis. All statistical analyses were performed by using SPSS (Statistical Package for the Social Sciences, SPSS Inc., Chicago, IL, USA) 21.0 package program and $p<0.05$ was considered statistically significant.

RESULTS

Descriptive Data

Among the top-100 publications with the highest AAS in Altmetric Explorer homepage (https://www.altmetric.com/), 67 was related to COVID-19 and the top-100 COVID-19 publications were extracted amongst the first 145 AAS-ranked publications. The top-100 publication list is given in Appendix 1 with some basic descriptive values such as where it is published; the main subject, AAS, and dimensions-badge values of each publication. Briefly, the content of the first 3 articles was about the impact of non-pharmaceutical interventions on virus transmission, the origin of SARS-CoV-2 and, chloroquine usage, respectively. Publication-year was 2020 for 96% of publications; two were published in 2015 while one in 2007 and one in 2005. The distribution of top-100 publications on monthly basis is shown in Figure 1.

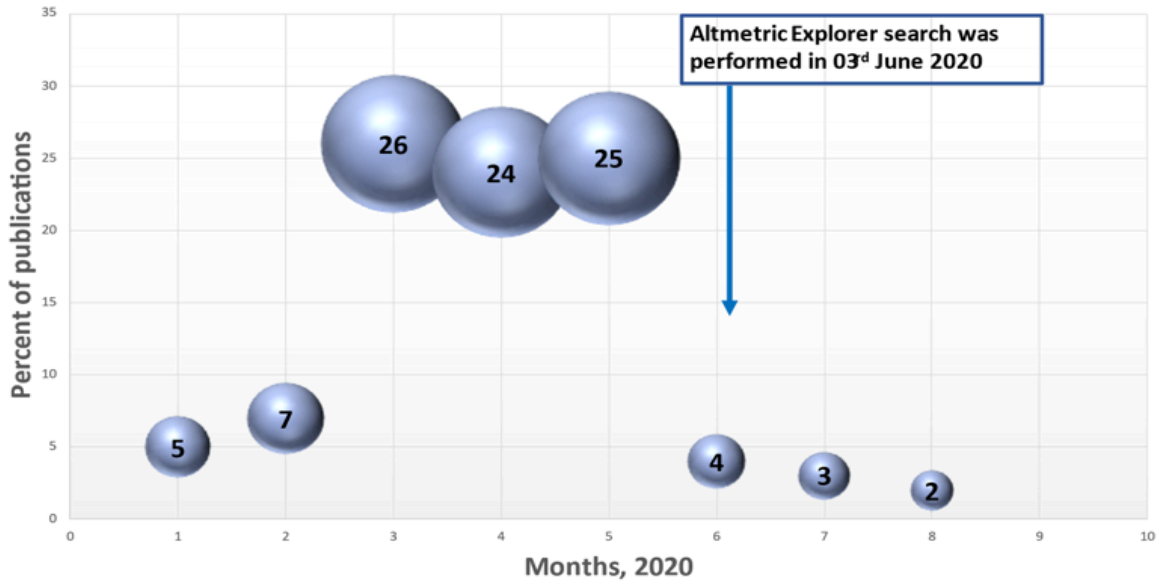

Figure 1. Monthly distribution of top-100 publications

Articles in June, July, and August are the ones declared to be accepted for publication for that month.

*4 (4%) of the articles published in different years, not in the first 6 months of the pandemic, and categorized differently (#16 published in December 2015; #35 published in October 2007; #3 published in March 2005; #20 published in August 2015)

The number of publications in January and February is only 5 and 7 respectively, while a nearly equal number of publications exist in March (n=26), April (n=25), and May (n=24).

The main scientific areas of top-100 COVID-19 publications are summarized in Figure 2 while the main content/main idea of publications is given in Figure 3 and Table 1. Predominated scientific areas

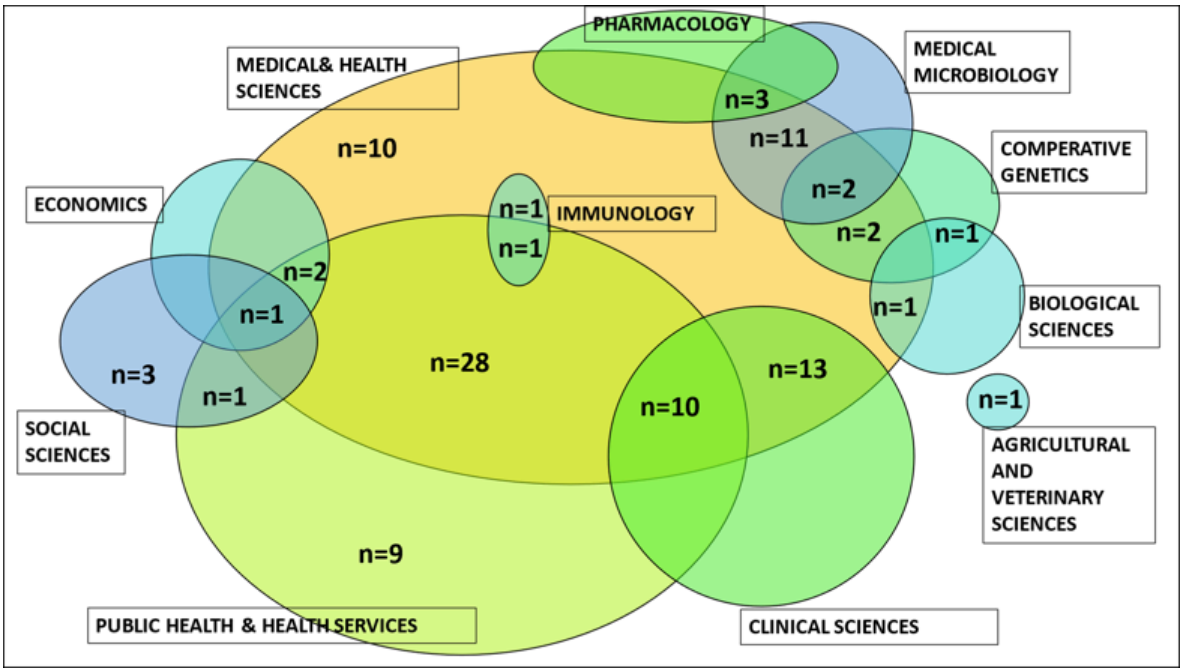

Figure 2. Main scientific areas of top-100 COVID-19 publications

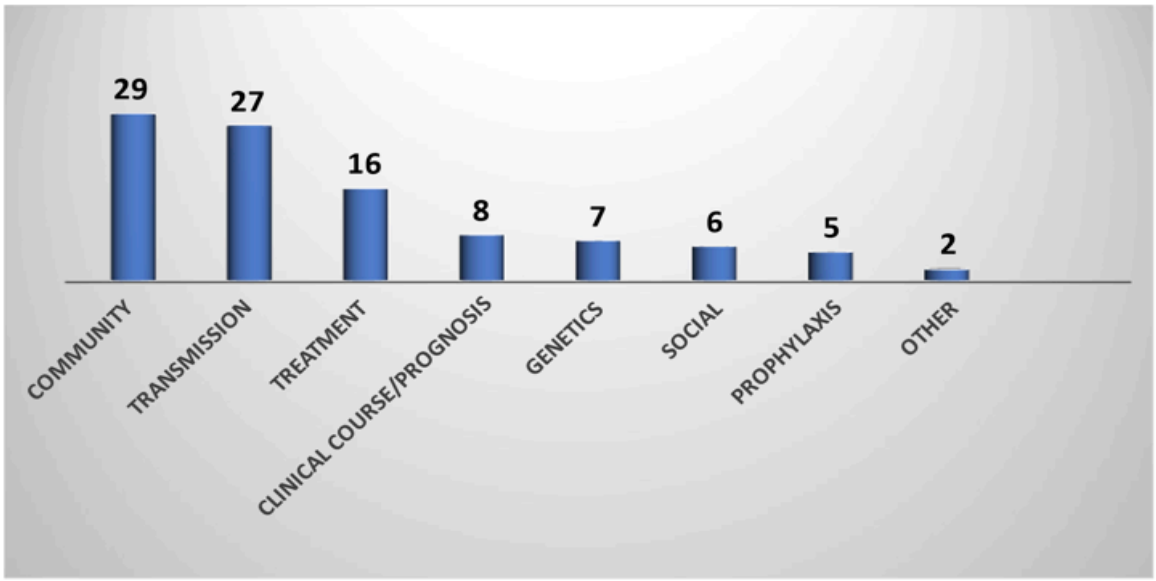

Figure 3. The main content of top-100 COVID-19 publications

Table 1. Distribution of the main idea of top-100 COVID-19 publications

Main Content	Main Idea of Publication	N
Community (n=29)	Scenario comparisons to predict the impact of nonpharmacological preventive methods for public	1
	Broader evaluation of the situation-Lessons from the disease	1
	Broader evaluation of the situation in a specific area	
	*Cities, places…	6
	*Approach evaluation	2
	*In cruise ship	2
	*Dynamics in a specific area	1
	Broader evaluation of the situation in a specific area and time	5
	1st case in a specific area	1
	Broader evaluation of the situation in a specific group	
	* General	3
	* In children	1
	*Fitness dance class	1
	*Research risks in specific groups	1
	*Specific groups dynamics	1
	*Outbreak dynamics	1
	Remote effects on population-psychological	1
	Different effects of country-based measures	1
Transmission (n=27)	Seroprevalence; estimated population prevalence	1
	Spread	1
	Lack of documentation of spread	1
	Protective equipment	6
	Transmission in general	5
	Viral persistence on surfaces	1
	Viral pathogenicity/ viability of virus on surfaces	1
	Viral shedding	1
	Virus load	1
	Incubation period	1
	Indoor transmission	1
	Transmission-temperature humidity	1
	Reducing the transmission in the community	1
	Airborne transmission	1
	Transmission-case	2
	Transmission dynamics	1
	Transmission via asymptomatic person	1

Table 1 (cont.) . Distribution of the main idea of top-100 COVID-19 publications

Main Content	Main Idea of Publication	N
Treatment (n=16)	Hydroxychloroquine	5
	Plasma	1
	Ivermectin	1
	Remdesivir	3
	Azithromycin/ hydroxychloroquine	2
	Remdesivir/ hydroxychloroquine	1
	Azithromycin clearance	1
	Ritonavir	1
	Adverse effects-mortality increase	1
Clinical course and prognosis (n=8)	Clinical features	1
	Clinical course-risk-mortality	1
	Severe outcomes	1
	Outcomes in specific body systems	1
	Risky conditions for the emergence of disease in an individual	1
	Clinical characteristics in a specific area and people	1
	Laboratory characteristics of people in a specific area	1
	Severity estimates, bias	1
Genetics (n=7)	Viral genomics/genetic origin	1
	Spike protein	1
	General-biology and genetics	5
Social (n=6)	Economic effects	2
	Female academic	1
	Social evaluation of the situation	2
	Global spread origin	1
Prophylaxis (n=5)	Prophylaxis in general	3
	Prophylaxis with BCG	2
Other (n=2)	Reinfection prevention	1
	Laboratory-seroconversion	1
TOTAL		100

of top-100 COVID-19 publications are medical and health sciences; followed by public health/ health services and clinical medicine. Clinical microbiology, comparative genetics/genomics, pharmacology, social sciences, and economics are the other prominent aspects. The main contents of publications can be grouped in order as (A) community-related (evaluation of the situation in specific places and groups in specific times; especially estimates about the impact of nonpharmacological preventive methods for the public; n=28), (B) transmission (seroprevalence, spread, experimental and theoretic estimates;

n=27), (C) treatment (mainly hydroxychloroquine, azithromycin, ivermectin, remdesivir, ritonavir, plasma; n=16), (D) clinical course and prognosis (clinical and laboratory characteristics, biases in severity estimates, severe outcomes, mortality risk; n=8), (E) genetics (virus genomics and spike protein; n=7), (F) social (including economic aspects and global spread origin; n=6), (G) prophylaxis (in general and with BCG; n=5), (H) other (seroconversion and prevention of reinfection; n=2).

Journal Q Categories And Level Of Evidence

While 84 of those top-100 publications were published in journals, 16 were found in electronic resources other than journals. Q categories of publications in journals were listed as follows; seventy-four (88,1%) were in Q1, nine (%10,7) in Q2, and one (%1,2) in Q4 categories. Percentages of publications are 5%, 7%, 28%, and 47% for Level 1, Level 2, Level 3, and Level 4 evidence, respectively. Figure 4 summarizes the distribution of top-100 COVID-19 publications based on journal Q categories and level of evidence.

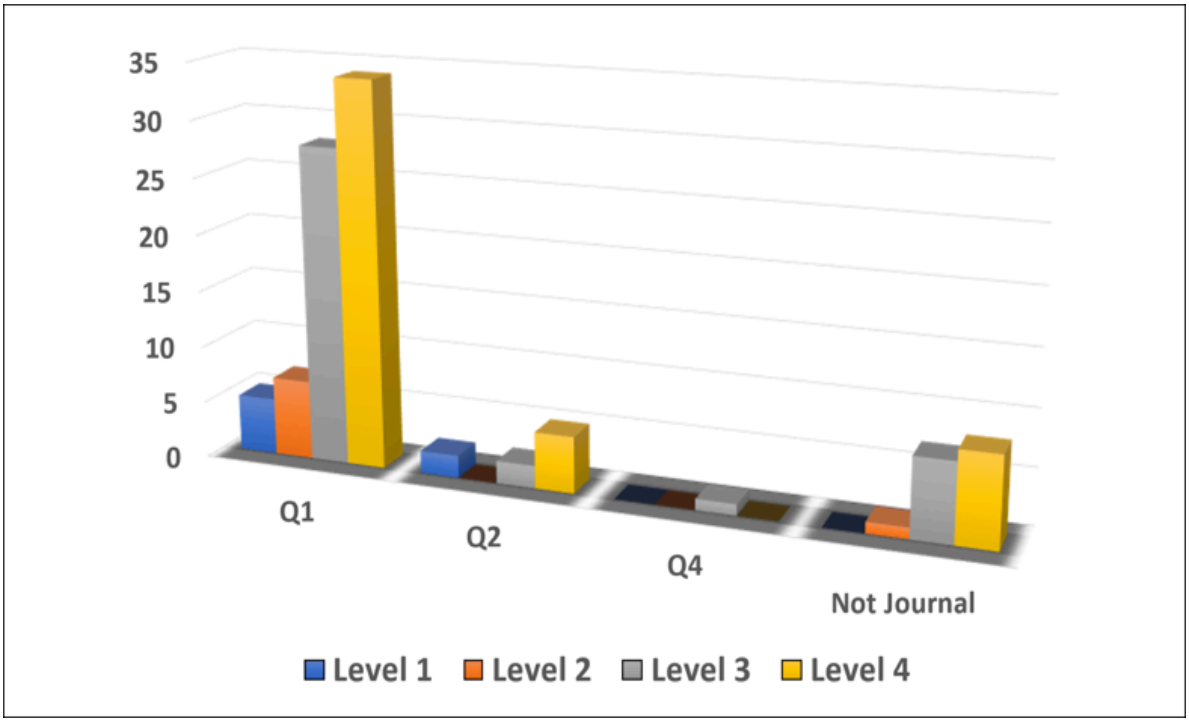

Figure 4. Distribution of top-100 COVID-19 publications based on journal Q categories and level of evidence

*SIGN (Scottish Intercollegiate Guidelines Network) Criteria were used to decide evidence levels of publications in concern (Sign 100, 2015) (https://www.sign.ac.uk/media/1052/sign100.pdf).
Level-1: meta-analyses, systematic reviews of RCTs, or RCTs;
Level-2: systematic reviews of case-control or cohort studies; cohorts, case-control studies;
Level-3: Non-analytic studies, such as case reports, case series;
Level-4: Expert opinion, animal studies, physiologic laboratory studies

Journal categories (Q1, Q2, Q3, and Q4) detected from Web of Science. Publications that are not published in scientific journals but published only in electronic sources such as Medrxiv, Biorxiv, Mendeley, etc. categorized as “Not Journal”.

Altmetric Attention Score And Dimensions-Badge

Mean AAS was 9958,07±7543,15 (min-max: 5178-66129) and mean dimensions-badge value was 270,21±566,96 (min-max: 1-3800). Dimensions-badge value and AAS representation of the #3 article of top-100 COVID-19 publications given as an example in Figure 5. The distribution of mean values of altmetric attention score (AAS) and dimensions-badge on scientific journal-basis and publication-year basis are shown in Table 2. There was no significant difference in AAS on monthly comparisons (p=0,673) but the dimensions-badge mean value in January was significantly higher than in other months (p<0,05) (Table 3).

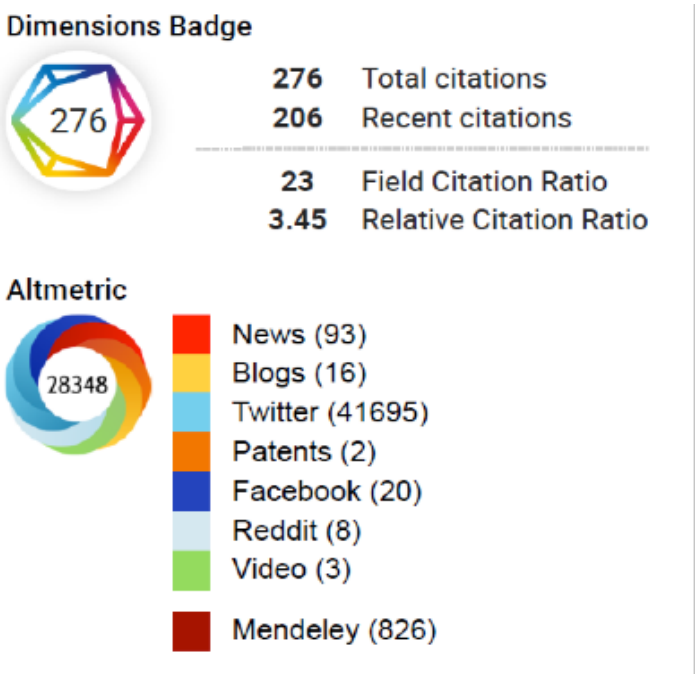

Figure 5. Altmetric attention score (AAS) and dimensions-badge of the #3 article of top-100 COVID-19 publications

Table 2. Journal-based and publication-year-based distributions of mean values of altmetric attention score (AAS) and dimensions-badge

	%	AAS mean	Dimensions- badge mean
Publication Years			
2020	96	9714,62	274,40
2015	2	12722,50	119,50
2007	1	9167,00	206,00
2005	1	28348,00	276,00
TOTAL	100		

Table 2 (cont.). Journal-based and publication-year-based distributions of mean values of altmetric attention score (AAS) and dimensions-badge

	%	AAS mean	Dimensions- badge mean
Journals			
New England Journal of Medicine	19	9301,42	413,84
The Lancet	12	8074,00	551,83
Nature	8	13038,50	113,63
JAMA	7	8758,71	581,29
Medrxiv*	6	10301,50	46,00
Science	6	10920,67	89,50
Emerging Infectious Diseases	4	9076,75	23,75
MMWR (Morbidity and Mortality Weekly Report)	4	8576,75	47,75
BMJ (British Medical Journal)	3	8266,00	33,00
Annals of Internal Medicine	2	7745,50	176,50
Biorxiv*	2	7449,00	35,00
Proceedings of the National Academy of Sciences of the USA	2	7434,50	30,50
SSRN Electronic Journal	2	10135,50	38,50
Antiviral Research	1	12525,00	61,00
Bioscience Trends	1	8033,00	363,00
Cell Research	1	7286,00	740,00
Clinical Microbiology Reviews	1	9167,00	206,00
International Journal of Antimicrobial Agents	1	9912,00	530,00
Journal of Hospital Infection	1	12802,00	242,00
Journal of Medical Virology	1	5532,00	159,00
Journal of Travel Medicine	1	5712,00	48,00
Medecine & Maladies Infectieuses	1	5540,00	74,00
National Science Review	1	7234,00	140,00
Pediatrics	1	7410,00	252,00
Travel Medicine and Infectious Disease	1	6829,00	6,00
Virology Journal	1	28348,00	276,00
Subtotal	90	9438,80	270,21
Dimensions-badge value cannot be calculated by altmetric com**	10	1320,11	---
TOTAL	100	9958,07	270,21

**Not journal but an electronic area accumulating pre-print versions of articles in the peer-review process; so, AAS and dimensions-badge values of those articles can be calculated by altmetrics.com, thus grouped in "journal" categories in this table.*

***#1, #33, #50, #53, #12, #26, #41, #45, #71, #82*

Table 3. The monthly based comparisons of altmetric attention score (AAS) and dimensions- badge mean values

	Altmetric attention score (AAS)			Dimensions-badge		
	Mean±SD	Median	P	Mean±SD	Median	P
January	8284,50±4058,28	6667,5	0,673	[a]1177,75±1776,20	449,5	0,009
February	8201,71±2884,49	6812,0		[b]477,57±769,55	242,0	
March	10930,41±11457,39	8436,0		[b]333,83±467,65	144,5	
April	10430,75±7175,37	7294,5		[b]237,83±496,43	58,0	
May	8386,52±3427,03	7364		[b]58,86±91,94	23,0	
June	10461,50±4560,76	8601,5		[b]242,00±71,53	252,0	
July	11711,00±3234,13	11295,0		[b]49,67±23,63	58,0	
August	13605,67±12797,49	7114,0		[b]93,33±158,20	3,0	

P-value was obtained from the Kruskal-Wallis test. (post hoc test: Dunn).

a) Details of specific electronic sources

Specific electronic sources that give citations to top-100 COVID-19 publications in concern, number of citations given in this specific electronic source to the publication (only top-3 publications are given due to page/space limitations), ranking number of the publication based on AAS, some other descriptive (Mean±SD, min-max) values of citations of top-100 COVID-19 articles are summarized in Table-4. Also, a detailed version covering top-10 publications disseminated in each electronic source is given in Appendix 2. When carefully look at what is disseminated, one can notice different electronic sources interested in different articles in general. Top-10 interested publications in Twitter (the leader and the representative of public part of disseminations) was #1, #2, #10, #3, #13, #8, #5, #6, #11, #28 while #73, #21, #16, #35, #3, #13, #48, #20, #63, #51 for Mendeley (reflecting mostly academicians).

b)Geographic breakdown type distributions

The geographic breakdown type distribution of citations is given in Figure 6. The first 5 country contributing citations for each publication were documented; then total distribution for 100 publications calculated and summarized in that Figure. United States (19%), United Kingdom (18%), and Canada (11,6%) were the countries generating half of the citations. Mean values of the distribution of citations/electronic disseminations from different demographic groups for top-100 articles are given in Table 5 and the demographic breakdown type distribution of each of those 100 publications summarized in Figure 7. The mean value of citations from members of the public is the highest (13076,54; min-max:1423-140452); followed by scientists, practitioners, and science communicators such as journalists, bloggers, or editors.

c) Demographic breakdown type distributions

Mean values of citations/electronic disseminations from different demographic groups for top-100 articles are given in Table 5, while the demographic breakdown type distribution of citations/electronic disseminations for each of those top-100 publications summarized in Figure 7.

Table 4. Some descriptive values about specific electronic sources that give citations to top-100 COVID-19 publications in concern (short top-3 version)

The specific electronic source that gives citations to top-100 COVID-19 publications in concern	Number of citations given in this specific electronic source (only top-3)*	Ranking number of publication based on AAS	Mean±SD of citations of top-100 COVID-19 articles in concern on this specific electronic source	Min-Max values of citations of COVID-19 articles in concern on this specific electronic source
Tweeters&tweets	154442	#1	14781,77±17971,95	0-154442
	73357	#2		
	63684	#10		
Mendeley downloads& saves	3442	#73	113,06±467,24	0-3442
	2581	#21		
	1065	#16		
News outlets	933	#4	238,41±166,55	4-933
	626	#1		
	604	#37		
Facebook pages& posts	132	#2	25,48±21,68	0-135
	102	#54		
	91	#44		
Blogs&Blog posts	117	#1	25,48±19,62	0-117
	92	#4		
	74	#2		
Reddit(ors)& reddit threads	33	#17	10,64±8,52	0-33
	33	#89		
	32	#74		
Policy source& documents	7992	#83	2,18±1,47	1-6
	6	#14		
	6	#28		
Videos&video uploaders	17	#32	2,26±3,24	0-17
	13	#2		
	11	#14		
Wikipedia pages&references	12	#69	1,89±1,47	0-12
	11	#14		
	10	#31		
Q&A thread	3	#17	0.20±0,51	0-3
	2	#1		
	2	#14		
F1000 reviews	1	#17	0,32±0,47	0-1
	1	#14		
	1	#59		

*The top-10 version of this table is given in Appendix 2 to clarify the different scattering patterns of articles in specific electronic sources. There were no citations to those top-100 publications from Academic Source, News Media Stories, Publons, Pubpeer, Linkedin, Pinterest pins, SinaWeibio posts. Electronic sources giving only one citation in total were Research Highlight Platforms (for #2); CiteULike (for #35) and Book Reviews (for #28). Peer-Review Site posts gave only two citations, one for #85 and one for #94. Patent Websites created a total of 3 citations (two for #3 and one for #35). Google+ posts gave a total of 6 citations (three citations for #33, two for #20, and one for #16) to top-100 publications in concern.

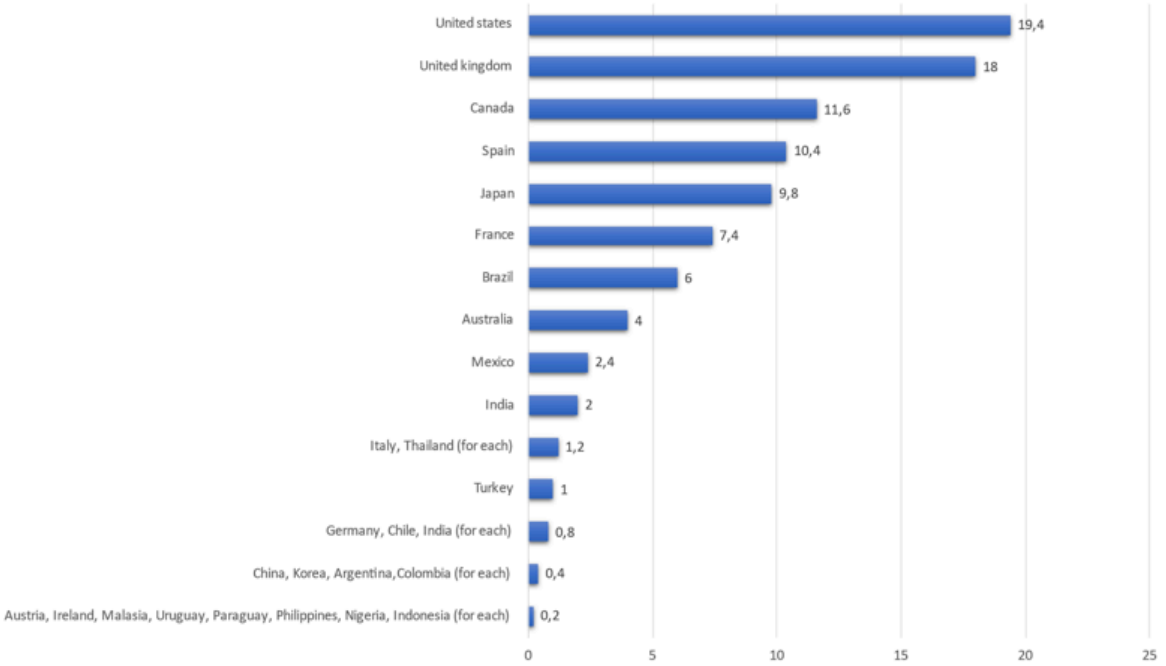

Figure 6. Geographic breakdown type distribution of citations for top-100 COVID-19 publications

Table 5. Mean values of citations and electronic disseminations from different demographic groups for top-100 articles

	Mean ±SD	Min-Max
Members of the public*	13076,54±16564,23	1423-140452
Scientists	905,91±931,90	61-7182
Practitioners	487,56±371,86	54-2973
Science communicators (journalists, bloggers, editors)	279,14±368,19	11-3185

*Altmetric Explorer website defines the group as "people who do not tweet links to scholarly publications".

d) Correlation and regression analysis of altmetric and bibliometric parameters

Correlation analysis of AAS, dimensions-badge, and h index summarized in Table 6. There was a weak positive correlation between two altmetric parameters (namely, AAS and dimensions-badge) (r=0.250; p=0.017). But when correlations between altmetric (AAS and dimensions-badge) and bibliometric (h-index) parameters were analyzed, there was no significant correlation (p>0.05). Regression analysis of AAS and dimensions-badge summarized with the scatterplot given in Figure 8. Univariate linear regression analysis reveals that 6.2% of the variation in AAS was explained by dimensions-badge. 1 unit increase in dimensions-badge resulted in a 1.1 increase in AAS. Model to estimate AAS was $Y_{\text{Altmetric Attention Score}} = 9188.61 + 1.1 * X_{\text{Dimensions-Badge}}$.

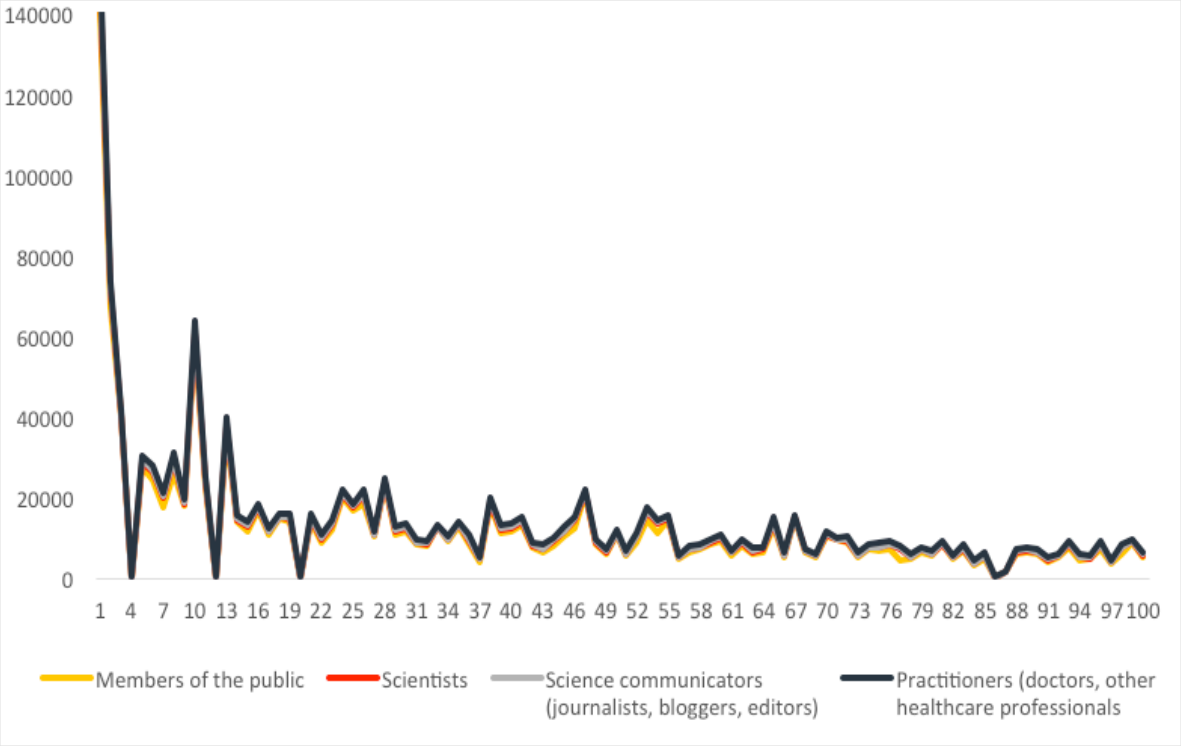

Figure 7. Demographic breakdown type distribution of citations and electronic disseminations for each of those top-100 publications

"Member of the public" is defined as "person who do not tweet links to scholarly publications" on the Altmetric Explorer website.

Table 6. Correlation analysis of altmetric attention score (AAS), dimensions-badge, and h index

		AAS	Dimensions-badge
Dimensions-badge	r	0,250	
	p	0,017	
	n	90	
H Index	r	-0,002	-0,057
	p	0,982	0,615
	n	84	79

r was obtained from the spearman rank correlation coefficient.

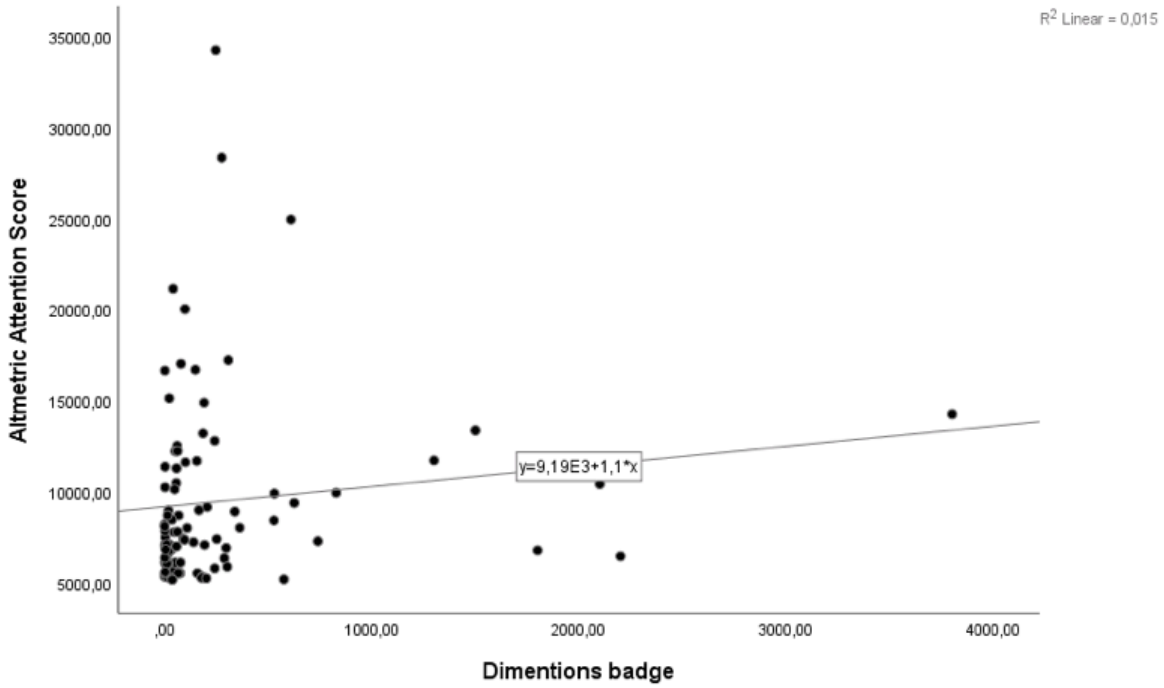

Figure 8. Scatterplot of altmetric attention score and dimensions-badge regression analysis

DISCUSSION and CONCLUSION

In the first 6th month of COVID-19 pandemic, there was a surge of scientific knowledge dissemination globally. COVID-19 is the most popular scientific content disseminated in social media at the beginning of June 2020; namely, 6-months-after the notification of the first case by the Chinese Government or 3-months-after the declaration of the pandemic by the World Health Organization. The matter is so popular that 100 of the first 145 most remarkable publications is about COVID-19 regardless of the publication date, discipline, or scientific area on the Altmetric Explorer website.

The content of the most-disseminated 100 publications seems parallel to the incognita phase of the pandemic. The main content of publications can be listed in descending order as follows: community-related (evaluation of the situation in specific places and groups in specific times, especially estimates about the impact of nonpharmacological preventive methods for the public); transmission (seroprevalence, spread, experimental and theoretic estimates); treatment (mainly hydroxychloroquine, azithromycin, ivermectin, remdesivir, ritonavir, plasma); clinical course and prognosis (clinical and laboratory characteristics, biases in severity estimates, severe outcomes, mortality risk); genetics (virus genomics and spike protein), social (including economic aspects and global spread origin), prophylaxis (in general and with BCG); seroconversion and prevention of reinfection. Eventually, what shapes the publications as well as the share-tendencies in electronic sources are the needs of people who are confronted with an unfamiliar threat, the curiosity, and some expert assumptions with previous connotations. For example, the top-3 publications were about the impact of non-pharmaceutical interventions on virus transmission (17), the origin of SARS-CoV-2 (18), and, chloroquine usage (19), respectively.

Scientifically productive 3 countries [United States (19%), United Kingdom (18%), and Canada (11,6%)] generated the half of the citations. The other foremost countries were Spain, Japan, France, Brazil, Australia, Mexico, India, Italy, Thailand, Turkey, Germany, Chile, China, Korea, Argentina, Colombia, Austria, Ireland, Malesia, Uruguay, Paraguay, Philippines, Nigeria, Indonesia. Some of those countries were the ones effected by the pandemic badly. So, the relationship between the fluctuations in the epidemic curve in global context and the citations of countries can be searched in future studies.

Not surprisingly, publication year was 2020 for all top-100 publications, except 4 of them: (A) #3 discussing chloroquine is a potent inhibitor of SARS coronavirus infection and spread (August 2005) reflecting a hope for COVID-19 treatment (B) #16 laboratory study discussing a SARS-like cluster of circulating bat coronaviruses shows potential for human emergence (November 2015) probably reflecting the curiosity about the origin of the pandemic (C) #20 cluster-randomized trial comparing cloth masks with medical masks in healthcare workers (March 2015) reflecting the prioritized protective need for healthcare workers and (D) #35 severe acute respiratory syndrome coronavirus as an agent of emerging and reemerging infection (October 2007) reflecting a need for a background knowledge that potentially related to COVID-19. All other publications are newly generated and cited/disseminated during the epidemic.

Although enormously fast accumulation and dissemination of new scientific publications were witnessed, it seems sens clinique rather than strict evidence-based advice has transferred to Q1 scientific journals as well as to policy documents within the 6th month of the pandemic. Most (74%) of the disseminated publications were published in Q1 scientific journals but evidence levels of those articles were mostly level-4 (n=47) and level-3 (n=38). In epidemiology, the level of evidence is very crucial for what we can or cannot conclude from a publication. On 7th and 8th of April, the WHO Information Network for Epidemics (EPI-WIN) held a global online consultation on managing the COVID-19 infodemic and the first principle declared was “interventions and messages must be based in science and evidence” (20). Infodemic is a new terminology gathering the terms “information” and “epidemic” defined by the WHO as “overabundance of information – some accurate and some not – that occurs during an epidemic” (21). Publications with controversies or with a low level of evidence status (namely level III or level IV) may be kept back for journals by scientists, while scientists/practitioners/science communicators may prefer to share publications with more concrete results with a high level of evidence (namely level I or level II) in their electronic sources during this pandemic. Eventually, scientists do their share of diminishing infodemic about COVID-19.

When we carefully look at what kind of scientific knowledge was disseminated during the first 6-months of the pandemic, one can easily notice that different electronic sources were interested in different articles in general.

In Twitter, which is the leader and the representative of the public part of disseminations, top-10 publications were #1 (is there a benefit of personal protective equipment usage on COVID-19 mortality or healthcare demand?), #2 (can the origin of the virus be pangolins rather than bats?), #10 (urgent and undeferrable need of personal protective equipment for healthcare facilities), #3 (chloroquine treatment effectiveness on SARS-CoV-1), #13 (successful treatment with convalescent plasma), #8 (evidence about surgical face masks could prevent transmission of human coronaviruses and influenza viruses from symptomatic individuals), #5 (seroprevalence and estimate of how many people infected in Santa Clara County, California), #6 (understanding the future effects of COVID-19 transmission), #11 (COVID-19 outbreak associated with air conditioning in a restaurant in China) and #28 (clinical characteristics of coronavirus disease

2019 in China).

In Mendeley, on the other hand, reflecting mostly academician part of disseminations, preferentially shared #73 (clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan), #21 (characteristics of and important lessons from 72.314 cases from China), #16 (a SARS-like cluster of circulating bat coronaviruses shows potential for human emergence), #35 (severe acute respiratory syndrome coronavirus as an agent of emerging and reemerging infection), #3 (chloroquine for SARS-CoV-1 treatment), #13 (treatment with convalescent plasma), #48 (response to COVID-19 in Taiwan big data analytics, new technology, and proactive testing), #20 (cloth masks compared with medical masks in healthcare workers), #63 (experience about 5700 patients hospitalized with COVID-19 in the New York City), #51 (turbulent gas clouds and respiratory pathogen emissions, potential implications for reducing transmission of COVID-19).

Thus, we can easily understand that within the 6th month of the pandemic academicians preferred to disseminate experiences of large-patient series while the public preferred to disseminate implications about what is potentially protective or risky for them. But interestingly, treatment modalities are disseminated not only by academicians/scientists but also by the public. Therefore, it is wise not to share uncertain treatment options on electronic platforms. For example, articles about hydroxychloroquine (that had been used in SARS-CoV-1 treatment) shared as a worth-trying drug in SARS-CoV-2 in electronic platforms and the record-breaking number of citations and disseminations were given to articles related to chloroquine (in our study 10% of articles related to chloroquine/hydroxychloroquine; #3,#27,#32,#42 ,#47,#55,#58,#67,#90,#95). Later on, preliminary large-scale randomized controlled trials and meta-analyses have failed to show any survival benefit and even some authors declared about potential harms of hydroxychloroquine prophylaxis/treatment in COVID-19 (22-24); eventually, controversies about the efficacy and safety of hydroxychloroquine in COVID-19 treatment had emerged (25). While innocent scientific prudence turned into a gain for authors, journals, and websites in terms of citations; it had probably risen the infodemic in public. Because infodemic is another emerging problem adding on COVID-19 pandemic, information generator groups should remind themselves honesty is crucial and misleading messages for the public may have enormous consequences compared to easily repairable or revisable consequences in the world of science.

Another clue for this suggestion comes from the analysis of dimension-badge and AAS in our study. Results reveal that academia discussed and disseminated publications related to COVID-19 much more in the first month of pandemic (dimensions-badge mean value in January was significantly higher than in other months); but then knowledge transfer propagated parallelly in academia and other platforms, including the public (there was no significant difference in AAS on monthly comparisons). Tweets are the main distributor of publications (Table 4) and publications forwarded mostly by public members rather than scientists, practitioners, or science communicators (journalists, bloggers, editors) (Table 5). Because the discussions propagated parallelly in those groups for each of the top-100 publications (Figure 7), we may assume that the initiator of the dissemination was the scientists, practitioners, and science communicators. Consequently, every scientist/ practitioner/ communicator should be careful, or more ethically responsible, about the publication they choose to disseminate. Although EPI-WIN specifically works for diminishing infodemic, scholarly also undertaken the responsibility.

On the other hand, because the public shares knowledge that seems beneficial or risky for them, dissemination of important scientific knowledge about COVID-19 in social media platforms may be a good device for health professionals who wants

to affect the public's knowledge and attitudes. Their interpretation and clear explanatory public messages might also be critical, considering only 15% of discussed COVID-19 articles were in level-1 and level-2 evidence.

Eventually, the results of our study emphasize the importance of communication of scientists with the public. A recent digital epidemiological study investigating the COVID-19 related web search behaviors using Google trends revealed that Google searches related to COVID-19 in Turkey rapidly increased following around 30th January 2020 when the epidemic was announced in China, then clear peak was seen around 26th February 2020 when the number of infections rapidly increased in Italy, the apex point was seen around 11th March 2020 when the announcements of the first case in the country (synchronized with the declaration of the pandemic) and public attention continued parallelly with the massive precaution measures for 26 days (26). Since scientific knowledge affects everyday life, scientists should be aware of their hidden impact; should not forget they are talking with the public when they are discussing or sharing something on electronic platforms.

We found a positive correlation between the weighted count of all of the attention a research output has received (namely, AAS) and the summary of the web origin of citations about the publication in concern (namely, dimensions-badge). Although the correlation is weak, two altmetric parameters are related to each other. Eventually, the relative citation performance of an article when compared to similarly-aged articles in its fields of research area, relative citation performance of an article when compared to other articles in its area of research (namely, dimensions-badge) effects the raised score of a publication by people's mentions (namely, AAS). Expectedly, we found that those two altmetric parameters (namely, AAS and dimensions-badge) that measures the "dissemination impact" of an individual article in social media accounts were not significantly correlated with h-index (a bibliometric parameter and an author-level metric measuring productivity and citation impact of the publications of a scientist or scholar). These relatively new "altmetric parameters" gives an insight about the what is "hot" in the web or what is "popular nowadays" for people, independent from the "words of popular authors. Thus, altmetric look to COVID-19 in this mid-year evaluation reflects what is more popular for people rather than what most cited-authors said.

Altmetric analysis may be a good quantification way for the evaluation of COVID-19 pandemic related article-burst, but it has some limitations (27). First of all, altmetrics "don't tell the whole story" (12). Unless we give a detailed look at "who talks and says what" in electronic platforms, we may not interpret the situation completely by altmetrics. Although the main dissemination route is Twitter for Altmetric Explorer, it gathers other disseminations generated by very different platforms in a limited amount. Within the 6th month of pandemic contribution of electronic sources were as follows in descending order: Tweeters&tweets, Mendeley downloads&saves, news outlets, Facebook pages&posts, blogs&blog posts, Reddit(ors)&reddit threads, policy source&documents, videos&video uploaders, Wikipedia pages&references, Q&A thread, F1000 reviews (Table 4). Remarkably, one publication in policy document group (#83: an editorial about "war of US with COVID-19", published in April 2020 and summarizing "the six steps to mobilize and organize the nation…. that enables…to defeat COVID-19 by early June, in 10-weeks) (28) doubles the cites of the most popular publication in Mendeley (article #73 summarizing the clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus in Wuhan) (7992 versus 3442 citations) (29). In other words, an opinion may be more popular than strict scientific observations, in electronic platforms. Thus, we should admit the qualitative aspects of altmetrics, even though we list publications via using mathematically calculated scores, namely AAS.

In conclusion, the first 6 month of pandemic

- COVID-19 was highly attractive topic in both scientific and public platforms worldwide, but evidence levels were unsatisfactory in general.
- There was a surge of scientific knowledge dissemination globally on electronic platforms but most have a relatively poor scientific evidence level
- Academicians preferred to disseminate experiences of large-patient series while the public preferred to disseminate implications about what is potentially protective or risky for them
- Altmetrics may reflect what is more popular for people rather than what most cited-authors said
- Treatment modalities for COVID-19 are disseminated not only by academicians/scientists but also by the public. Therefore, it is wise for academicians/scientists not to share uncertain treatment options on electronic platforms, to be ethically more responsible about the publication chosen to disseminate, and eventually to combat with infodemia.

Appendix 1. The top-100 publication list with some basic descriptive values of each publication

Rank Of Article	Title Of The Publication	First Author	Main Subject Of The Article	Where Published	Type Of The Publication	Level Of Evidence	AAS	Dimensions-Badge
#1	Report 9: Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand	Neil M Ferguson	Scenario comparisons to predict the impact of nonpharmacological preventive methods for public	Imperial College COVID-19 Response Team Report, London	Projection, via scenarios	4	66129	NC
#2	The proximal origin of SARS-CoV-2	Kristian G. Andersen	Viral genomics/ genetic origin	Nature Medicine	Comment, letter	4	34244	247
#3	Chloroquine is a potent inhibitor of SARS coronavirus infection and spread	Martin J Vincent	Drug treatment-chloroquine	Virology Journal	Laboratory study, cell culture	4	28348	276
#4	Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1	Neeltje van Doremalen	Viral pathogenicity/ viability of the virus	New England Journal of Medicine	Laboratory study, comparison	4	24951	610
#5	COVID-19 Antibody Seroprevalence in Santa Clara County, California	Eran Bendavid	Community-seroprevalence; estimated population prevalence	Medrxiv	Cross sectional, seroprevalance	3	21146	42
#6	Projecting the transmission dynamics of SARS-CoV-2 through the post-pandemic period	Stephen M. Kissler	Transmission-spread	Science	Projection	4	20034	99
#7	Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV-2)	Ruiyun Li	Transmission- lack of documentation of spread	Science	Simulative estimation	4	17233	308
#8	Respiratory virus shedding in exhaled breath and efficacy of face masks	Nancy H. L. Leung	Transmission-protective equipment	Nature Medicine	RCT	1	17029	79
#9	COVID-19— Navigating the Uncharted	Anthony S. Fauci	Transmission	New England Journal of Medicine	Comment, editorial	4	16706	149
#10	In Pursuit of PPE	Andrew W. Artenstein	Transmission-protective equipment	New England Journal of Medicine	Comment, letter	4	16658	2

Rank Of Article	Title Of The Publication	First Author	Main Subject Of The Article	Where Published	Type Of The Publication	Level Of Evidence	AAS	Dimensions-Badge
#11	COVID-19 Outbreak Associated with Air Conditioning in Restaurant, Guangzhou, China, 2020	Jianyun Lu	Transmission	Emerging Infectious Diseases	Case-series	3	15133	23
#12	WITHDRAWN. Uncanny similarity of unique inserts in the 2019-nCoV spike protein to HIV-1 gp120 and Gag	Prashant Pradhan	Genetic-spike protein	Withdrawn (And put on Biorxiv till editors complete the review process)	Comment, in Biorxiv	4	14900	17
#13	Treatment of 5 Critically Ill Patients With COVID-19 With Convalescent Plasma	Chenguang Shen	Treatment-plasma	JAMA	Case-series	3	14895	191
#14	Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China	Chaolin Huang	Clinical features	The Lancet	Case report	3	14271	3800
#15	Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study	Fei Zhou	Clinical course-risk-mortality	The Lancet	Retrospective cohort	2	13376	1500
#16	A SARS-like cluster of circulating bat coronaviruses shows potential for human emergence	Vineet D Menachery	Genetic	Nature Medicine	Laboratory study	4	13214	186
#17	Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents	Guenter Kampf	Transmission-persistence of the virus on surfaces	Journal of Hospital Infection	Review	4	12802	242
#18	The FDA-approved drug Ivermectin inhibits the replication of SARS-CoV-2 *in vitro*	Leon Caly	Treatment-ivermectin	Antiviral Research	Laboratory study, cell culture	4	12525	61
#19	Remdesivir in adults with severe COVID-19: a randomized, a double-blind, placebo-controlled, multicentre trial	Yeming Wang	Treatment-remdesivir	The Lancet	RCT, multicenter	1	12244	63
#20	A cluster-randomized trial of cloth masks compared with medical masks in healthcare workers	C Raina MacIntyre	Transmission-protective equipment	BMJ Open	RCT, cluster	1	12231	53
#21	Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention	Zunyou Wu	Community-lessons from disease- broader evaluation of the situation	JAMA	Case series	3	11727	1300
#22	Severe Outcomes Among Patients with Coronavirus Disease 2019 (COVID-19) - United States, February 12- March 16, 2020.	Stephanie Bialek	Prognosis-severe outcomes	Morbidity and Mortality Weekly Report (MMWR)	Cross-sectional	3	11699	156

Rank Of Article	Title Of The Publication	First Author	Main Subject Of The Article	Where Published	Type Of The Publication	Level Of Evidence	AAS	Dimensions-Badge
#23	Temporal dynamics in viral shedding and transmissibility of COVID-19	Xi He	Transmission-viral shedding	Nature Medicine	Estimation via cases	3	11626	101
#24	Indoor transmission of SARS-CoV-2	Hua QIAN	Transmission-indoor	Medrxiv	Cross-sectional evaluation of cases	3	11381	3
#25	High Temperature and High Humidity Reduce the Transmission of COVID-19	Jingyuan Wang	Transmission-temperature humidity	SSRN Electronic Journal	Case-control	2	11295	58
#26	Reducing the transmission of SARS-CoV-2	Kimberly A. Prather	Transmission-community reducing the transmission-	Science	Comment	4	11262	NC
#27	Outcomes of hydroxychloroquine usage in United States veterans hospitalized with COVID-19	Joseph Magagnoli	Treatment-hydroxychloroquine	Medrxiv	Two group comparison for treatment, interventions	2	10488	57
#28	Clinical Characteristics of Coronavirus Disease 2019 in China	Wei-Jie Guan	Community-broader evaluation of the situation in a specific area	New England Journal of Medicine	Cross-sectional, descriptive	3	10431	2100
#29	High SARS-CoV-2 Attack Rate Following Exposure at a Choir Practice —Skagit County, Washington, March 2020	Lea Hamner	Community-broader evaluation of the situation in a specific area	Morbidity and Mortality Weekly Report (MMWR)	Cross-sectional, descriptive	3	10253	3
#30	Universal Screening for SARS-CoV-2 in Women Admitted for Delivery	Desmond Sutton	Community-broader evaluation of the situation in a specific group	New England Journal of Medicine	Comment, letter	4	10145	49
#31	First Case of 2019 Novel Coronavirus in the United States	Michelle L Holshue	1st case in a specific area	New England Journal of Medicine	Case report	3	9948	828
#32	Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial	Gautret P	Treatment-azithromycin/ hydroxychloroquine	International Journal of Antimicrobial Agents	Two group comparison for treatment, nonrandomized	2	9912	530
#33	Engineered bat virus stirs debate over risky research	Declan Butler	Other-research risks-risk in specific groups	Nature News & Comments	Comment	4	9619	NC
#34	Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany	Camilla Rothe	Transmission-case	New England Journal of Medicine	Case report	3	9394	626
#35	Severe Acute Respiratory Syndrome Coronavirus as an Agent of Emerging and Reemerging Infection	Vincent C C Cheng	Prophylaxis	Clinical Microbiology Reviews	Review	4	9167	206
#36	Compassionate Use of Remdesivir for Patients with Severe Covid-19	Jonathan Grein	Treatment-remdesivir	New England Journal of Medicine	Retrospective analysis of treatment effects	3	9000	166
#37	The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported Confirmed Cases: Estimation and Application	Stephen A Lauer	Transmission-incubation period	Annals of Internal Medicine	Estimation via cases	3	8976	19

Rank Of Article	Title Of The Publication	First Author	Main Subject Of The Article	Where Published	Type Of The Publication	Level Of Evidence	AAS	Dimensions-Badge
#38	Pandemics Depress the Economy, Public Health Interventions Do Not: Evidence from the 1918 Flu	Sergio Correia	Other-economic effects	SSRN Electronic Journal	Review	4	8919	339
#39	Offline: COVID-19 and the NHS-"a national scandal"	Richard Horton	Situation	Lancet	Comment	4	8711	15
#40	High Contagiousness and Rapid Spread of Severe Acute Respiratory Syndrome Coronavirus 2	Steven Sanche	Community-dynamics in a specific area	Emerging Infectious Diseases	Estimation via cases, modeling	3	8705	68
#41	Reviving the US CDC	No authors	Community-broader evaluation of the situation in a specific area	The Lancet	Comment, editorial	4	8496	NC
#42	Observational Study of Hydroxychloroquine in Hospitalized Patients with Covid-19	Joshua Geleri	Treatment-hydroxychloroquine	New England Journal of Medicine	Observation of treatment effects	3	8478	36
#43	A Trial of Lopinavir-Ritonavir in Adults Hospitalized with Severe Covid-19	Bin Cao	Treatment-ritonavir	New England Journal of Medicine	RCT	1	8436	528
#44	Coronavirus: the first three months as it happened	No authors	Community-broader evaluation of the situation in a specific area	Nature	News	4	8211	1
#45	Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis	Derek K Chu	Transmission-protective equipment	The Lancet	Metaanalysis	1	8203	NC
#46	Do us a favor	H. Holden Thorp	Other- social evaluation	Science	Comment, editorial	1	8102	1
#47	Breakthrough: Chloroquine phosphate has shown apparent efficacy in the treatment of COVID-19 associated pneumonia in clinical studies	Jianjun Gao	Treatment-hydroxychloroquine	Bioscience Trends	Comment, letter	4	8033	363
#48	Response to COVID-19 in Taiwan: Big Data Analytics, New Technology, and Proactive Testing	C Jason Wang	Community-broader evaluation of the situation in a specific area (approach evaluation)	JAMA	Comment, viewpoint	4	8018	109
#49	The airborne lifetime of small speech droplets and their potential importance in SARS-CoV-2 transmission	Valentyn tadnytskyi	Transmission-airborne	Proceedings of The National Academy of Sciences of The USA	Estimation via cases	3	7862	3
#50	COVID-19: Attacks the 1-Beta Chain of Hemoglobin and Captures the Porphyrin to Inhibit Human Heme Metabolism	Wenzhong Liu	Prognosis- outcomes in specific body systems	Chemrxiv	Lab study, physiologic	4	7851	NC
#51	Turbulent Gas Clouds and Respiratory Pathogen Emissions	Lydia Bourouiba	Transmission-protective equipment	JAMA	Comment, insight	4	7804	63

Rank Of Article	Title Of The Publication	First Author	Main Subject Of The Article	Where Published	Type Of The Publication	Level Of Evidence	AAS	Dimensions-Badge
#52	Lack of Reinfection in Rhesus Macaques Infected with SARS-CoV-2	Linlin Bao	Other-reinfection prevention	Biorxiv	Lab study, animal experiment	4	7787	47
#53	SARS-CoV-2 RNA concentrations in primary municipal sewage sludge as a leading indicator of COVID-19 outbreak dynamics	Jordan Peccia	Community-outbreak dynamics	Medrxiv	Correlational study	3	7712	NC
#54	The race for coronavirus vaccines: a graphical guide	Ewen Callaway	Prophylaxis	Nature	News	4	7501	4
#55	Efficacy of hydroxychloroquine in patients with COVID- 19: results of a randomized clinical trial	Zhaowei Chen	Treatment-hydroxychloroquine	Medrxiv	RCT (randomized controlled trial)	1	7430	90
#56	Epidemiology of COVID-19 Among Children in China	Yuanyuan Dong	Community-broader evaluation of the situation in a specific group	Pediatrics	A descriptive evaluation of total cases of an area	3	7410	252
#57	Quantifying SARS-CoV-2 transmission suggests epidemic control with digital contact tracing	Luca Ferretti	Transmission-case	Science	Estimation via cases, modeling	3	7364	97
#58	Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) in vitro	Manli Wang	Treatment-remdesivir-hydroxychloroquine	Cell Research	Lab study, cell culture	4	7286	740
#59	On the origin and continuing evolution of SARS-CoV-2	Xiaolu Tang	Genetic	National Science Review	Lab study, genetic	4	7234	140
#60	Coronavirus Disease Outbreak in Call Center, South Korea	Shin Young Park	Transmission-case	Emerging Infectious Diseases	Descriptive, cross-sectional	3	7114	3
#61	Spike mutation pipeline reveals the emergence of a more transmissible form of SARS-CoV-2	Bette Korber	Genetic	Biorxiv	Lab study, genetic	4	7111	23
#62	An outbreak of severe Kawasaki-like disease at the Italian epicenter of the SARS-CoV-2 epidemic: an observational cohort study	Lucio Verdon	Community-specific groups dynamics	The Lancet	Retrospective cohort	2	7110	11
#63	Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area	Safiya Richardson	Community-broader evaluation of the situation in a specific area	JAMA	Descriptive, cross-sectional	3	7088	193
#64	Phylogenetic network analysis of SARS-CoV-2 genomes	Peter Forster	Genetic	Proceedings of The National Academy of Sciences of The USA	Lab study, genetic	4	7007	58
#65	The UK's public health response to COVID-19	Gabriel Scally	Community-broader evaluation of the situation in a specific area	BMJ Open	Comment, editorial	4	6984	3

Rank Of Article	Title Of The Publication	First Author	Main Subject Of The Article	Where Published	Type Of The Publication	Level Of Evidence	AAS	Dimensions-Badge
#66	Are patients with hypertension and diabetes mellitus at increased risk for COVID-19 infection	Lei Fang	Prognosis-risky situations for catching the disease	The Lancet Respiratory Medicine	Comment, letter	4	6924	298
#67	Full-length title: Early treatment of COVID-19 patients with hydroxychloroquine and azithromycin: A retrospective analysis of 1061 cases in Marseille, France	Matthieu Million	Treatment-hydroxychloroquine azithromycin	Travel Medicine and Infectious Disease	Retrospective analysis of treatment effects	3	6829	6
#68	Public Health Responses to COVID-19 Outbreaks on Cruise Ships - Worldwide, February-March 2020	Leah F Moriarty	Community-broader evaluation of the situation in a specific area (cruise ships)	Morbidity and Mortality Weekly Report (MMWR)	A descriptive evaluation of total cases of a specific area	3	6812	31
#69	Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia	Rui Wang	Transmission	New England Journal of Medicine	Case series	3	6790	1800
#70	Coronavirus cases have dropped sharply in South Korea. What's the secret to its success?	Dennis Normile	Community-broader evaluation of the situation in a specific area (approach evaluation)	Science	News	4	6742	20
#71	A study on infectivity of asymptomatic SARS-CoV-2 carriers	Ming Gao	Transmission	Respiratory Medicine	Descriptive, cross-sectional	3	6694	NC
#72	Effectiveness of Surgical and Cotton Masks in Blocking SARS-CoV-2: A Controlled Comparison in 4 Patients (RETRACTED later on)	Seongman Bae	Prevention-personal protective equipment	Annals of Internal Medicine	Intervention study, comparison	3	6572	14
#73	Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China	Dawei Wang	Clinical characteristics in a specific area and people	JAMA	A descriptive evaluation of total cases of an area	3	6469	2200
#74	Safety, tolerability, and immunogenicity of a recombinant adenovirus type-5 vectored COVID-19 vaccine: a dose-escalation, open-label, nonrandomized, first-in-human trial	Feng-Cai Zhu	Prophylaxis	The Lancet	A nonrandomized clinical trial, ph ase1	2	6381	2
#75	Remdesivir for the Treatment of COVID-19 — Preliminary Report	John H Beigel	Treatment-remdesivir	New England Journal of Medicine	RCT, preliminary results	2	6373	6
#76	Virological assessment of hospitalized patients with COVID-2019	Roman Wölfel	Laboratory characteristics of a specific area and people	Nature	Case series, virologic evaluation	3	6358	289
#77	The pandemic and the female academic	Alessandra Minello	Social-female academic	Nature	News	4	6125	2
#78	Responding to COVID-19 — A Once-in-a-Century Pandemic?	Bill Gates	Social-evaluation of situation	New England Journal of Medicine	Comment	4	6122	77

Rank Of Article	Title Of The Publication	First Author	Main Subject Of The Article	Where Published	Type Of The Publication	Level Of Evidence	AAS	Dimensions-Badge
#79	Correlation between universal BCG vaccination policy and reduced morbidity and mortality for COVID-19: an epidemiological study	Aaron Miller	Prognosis; prophylaxis with BCG	Medrxiv	Correlational study	3	6118	51
#80	Visualizing Speech-Generated Oral Fluid Droplets with Laser Light Scattering	Philip Anfinrud	Transmission-dynamics	New England Journal of Medicine	Comment	4	6081	20
#81	Wuhan seafood market may not be source of novel virus spreading globally	Jon Cohen	Social-global spread origin	Science	Comment	4	6049	12
#82	SARS-CoV-2 was already spreading in France in late December 2019	Antoine Deslandes	Community-broader evaluation of the situation in a specific area and time	International Journal of Antimicrobial Agents	A descriptive study, short communication	4	6045	NC
#83	Ten Weeks to Crush the Curve	Harvey V Fineberg	Social community-broader evaluation of the situation in a specific area and time	New England Journal of Medicine	Comment, editorial	4	6014	7
#84	The psychological impact of quarantine and how to reduce it: rapid review of the evidence	Samantha K Brooks	Community-remote effects-psychological	The Lancet	Comment, editorial	4	5885	303
#85	COVID-19 and Italy: what next?	Andrea Remuzzi	Community-broader evaluation of the situation in a specific area and time	The Lancet	Review	4	5798	242
#86	COVID-19 outbreak on the Diamond Princess cruise ship: estimating the epidemic potential and effectiveness of public health countermeasures	Joacim Rocklöv	Community-broader evaluation of the situation in a specific area (cruise ship)	Journal of Travel Medicine	A descriptive evaluation of total cases of an area	3	5712	48
#87	Considering BCG vaccination to reduce the impact of COVID-19	Nigel Curtis	Prophylaxis with BCG	The Lancet	Comment, letter	4	5601	4
#88	COVID-19: four-fifths of cases are asymptomatic, China figures indicate	Michael Day	Community-broader evaluation of the situation in a specific area and time; transmission-asymptomatic cases	British Medical Journal (BMJ)	Comment, news	4	5583	43
#89	High COVID-19 Attack Rate Among Attendees at Events at a Church - Arkansas, March 2020.	Allison Jame	Community-broader evaluation of the situation in a specific area and time	Morbidity and Mortality Weekly Report (MMWR)	A descriptive evaluation of total cases of an area	3	5543	1
#90	No Evidence of Rapid Antiviral Clearance or Clinical Benefit with the Combination of Hydroxychloroquine and Azithromycin in Patients with Severe COVID-19 Infection	Jean Michel Molina	Treatment-azitromycin clearance	Medecine & Maladies Infectieuses	A clinical trial, letter	3	5540	74
#91	Spread of SARS-CoV-2 in the Icelandic Population	Daniel F. Gudbjartsson	Community-broader evaluation of the situation in a specific area and time	New England Journal of Medicine	A descriptive evaluation of total cases of an area	3	5538	66

Rank Of Article	Title Of The Publication	First Author	Main Subject Of The Article	Where Published	Type Of The Publication	Level Of Evidence	AAS	Dimensions-Badge
#92	Cross-species transmission of the newly identified coronavirus 2019-nCoV	Wei Ji	Genetic	Journal of Medical Virology	Estimation via phylogenetics	4	5532	159
#93	Cluster of Coronavirus Disease Associated with Fitness Dance Classes, South Korea	Sukbin Jang	Community-broader evaluation of the situation in a specific group (fitness dance class)	Emerging Infectious Diseases	A descriptive evaluation of total cases of an area	3	5355	1
#94	How will country-based mitigation measures influence the course of the COVID-19 epidemic?	Roy M Anderson	OTHER-country-based measures different effects	The Lancet	Estimation via cases, modeling	4	5332	182
#95	Association of Treatment With Hydroxychloroquine or Azithromycin With In-Hospital Mortality in Patients With COVID-19 in New York State	Eli S. Rosenberg	Treatment-adverse effects-mortality increase	JAMA	Retrospective cohort study	2	5310	13
#96	SARS-CoV-2 Infection in Children	Xiaoxia Lu	Community-broader evaluation of the situation in a specific group (children)	New England Journal of Medicine	Comment, letter	4	5285	179
#97	Estimates of the severity of coronavirus disease 2019: a model-based analysis	Robert Verity	Prognosis-severity estimates, bias	The Lancet Infectious Diseases	Estimation via cases, modeling	3	5255	202
#98	A serological assay to detect SARS-CoV-2 seroconversion in humans	Fatima Amanat	Laboratory-seroconversion	Medrxiv	Methodologic study, serological assay development	3	5246	33
#99	SARS-CoV-2 Viral Load in Upper Respiratory Specimens of Infected Patients	Lirong Zou	Transmission-virus load	New England Journal of Medicine	Descriptive study, letter	3	5199	576
#100	Asymptomatic Transmission, the Achilles' Heel of Current Strategies to Control COVID-19	Monica Gandhi	Transmission-via asymptomatic person	New England Journal of Medicine	Comment, editorial	4	5178	38

RCT: Randomized controlled trial; NC: Not calculated by the Altmetric Explorer.

Appendix 2. Some descriptive values about specific electronic sources that give citations to top-100 COVID-19 publications in concern (long top-10 version)

The specific electronic source that gives citations to top-100 COVID-19 articles in concern	Number of citations given in this specific electronic source (top-10)	Ranking number of publication based on AAS	Mean value of citations of top-100 COVID-19 articles in concern (on this specific electronic source	Min-Max values of citations of COVID-19 articles in concern
Tweeters&tweets	154442	#1	14781,77±17971,95	0-154442
	73357	#2		
	63684	#10		
	41695	#3		
	39639	#13		
	31006	#8		
	30101	#5		
	27601	#6		
	25090	#11		
	24425	#28		
Mendeley downloads& Mendeley saves	3442	#73	113,06±467,24	0-3442
	2581	#21		
	1065	#16		
	981	#35		
	826	#3		
	796	#13		
	466	#48		
	376	#20		
	278	#63		
	269	#51		
News outlets	933	#4	238,41±166,55	4-933
	626	#1		
	604	#37		
	595	#2		
	574	#87		
	555	#6		
	545	#15		
	543	#22		
	516	#14		
	460	#21		
Facebook pages& facebook posts	132	#2	25,48±21,68	0-135
	102	#54		
	91	#44		
	84	#4		
	60	#17		
	58	#71		
	55	#9		
	55	#21		
	53	#66		
	52	#14		

The specific electronic source that gives citations to top-100 COVID-19 articles in concern	Number of citations given in this specific electronic source (top-10)	Ranking number of publication based on AAS	Mean value of citations of top-100 COVID-19 articles in concern (on this specific electronic source	Min-Max values of citations of COVID-19 articles in concern
Blogs&Blog posts	117	#1	25,48±19,62	0-117
	92	#4		
	74	#2		
	73	#14		
	60	#21		
	59	#22		
	56	#28		
	54	#7		
	52	#32		
	50	#15		
Reddit(ors)& Reddit threads	33	#17	10,64±8,52	0-33
	33	#89		
	32	#74		
	28	#40		
	28	#6		
	26	#18		
	24	#2		
	24	#33		
	24	#9		
	24	#29		
Policy source& Policy documents	7992	#83	2,18±1,47	1-6
	6	#14		
	6	#28		
	6	#69		
	5	#1		
	5	#21		
	5	#15		
	4	#22		
	4	#97		
	4	#73		
Videos&video uploaders	17	#32	2,26±3,24	0-17
	13	#2		
	11	#14		
	11	#47		
	11	#1		
	9	#16		
	9	#17		
	8	#9		
	7	#58		
	7	#55		

The specific electronic source that gives citations to top-100 COVID-19 articles in concern	Number of citations given in this specific electronic source (top-10)	Ranking number of publication based on AAS	Mean value of citations of top-100 COVID-19 articles in concern (on this specific electronic source	Min-Max values of citations of COVID-19 articles in concern
Wikipedia pages& Wikipedia references	12	#69	1,89±1,47	0-12
	11	#14		
	10	#31		
	9	#81		
	8	#2		
	8	#94		
	7	#51		
	6	#43		
	6	#58		
	6	#70		
Q&A thread	3	#17	0.20±0,51	0-3
	2	#1		
	2	#14		
	1	#2		
	1	#4		
	1	#37		
	1	#31		
	1	#59		
	1	#38		
	1	#51		
F1000 reviews	1	#17	0,32±0,47	0-1
	1	#14		
	1	#59		
	1	#38		
	1	#31		
	1	#37		
	1	#40		
	1	#6		
	1	#49		
	1	#7		

ETHICS COMITTEE APPROVAL

* This study does not require Ethics Committee Approval.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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