Impact of COVID-19 over Infectious Diseases publications, 2020.

Roussel, Y.[1, 2*], Ouanezar, A.[1,3], Grine, G.[1,2]

1. IHU Méditerranée Infection, Marseille, France.
2. Aix-Marseille-Univ., IRD, MEPHI, IHU Méditerranée Infection, Marseille, France.
3. Assistance Publique-Hôpitaux de Marseille, Marseille, France

Corresponding author: Yanis Roussel, IHU - Méditerranée Infection, 19-21 boulevard Jean Moulin, 13005 Marseille, France. Tel.: +33 413 732 401, Fax: +33 413 732 402; email: yanis.roussel@mediterranee-infection.com

ABSTRACT

COVID-19 has generated an unprecedented amount of medical and scientific publications in 2020. Retrieving data from Clarivate, we examine here that COVID-19 publishing activity has changed the infectious diseases publishing activity with an Easter wards bascule and a Scientific Society model of publishing being associated with efficacy measured by the Immediate Citation value. These preliminary analyses warrant further confirmation to think about the post-COVID-19 publishing area.

INTRODUCTION

The COVID-19 pandemic has generated an unprecedented amount of medical and scientific publications worldwide as well as an unprecedented amount of controversial publications, including publications collected in the most prestigious journals that exhibit the highest impact factor such as the New England of Medicine and the Lancet [1, 2]. These facts suggested that the so-called COVID-19 crisis may have induced changes in the writing, editing and publishing of twin activities in the specific field of infectious diseases along 2020. The first works have been conducted on bibliometric analysis [3-7] that we wanted to deepen by focusing on factual data regarding these three lines of activities (writing, editing and publishing) in that field in order to have a first view of these trends if any, and a publishing position of the IHU Méditerranée Infection of this evolving background.

MATERIALS AND METHODS

Journal and publishers evaluation

We listed journals referenced in the Infectious Diseases category in the Clarivate Analytics' Web of Science (Yhttps://www.webofknowledge.com/) and selected the 50 journals that exhibited the highest Impact Factor in 2018. We identified the Publisher and the Editor-in-Chief for each one of these 50 journals, consulting each journal website in December 2020 for update information.

To obtain the number of citable items and the number of citations per journal, we used the Clarivate Analytics' Web of Science search tool. Investigation was done on the Web of Science Core Collection. We measured the number of articles published in 2017, 2018, 2019 and 2020 for each journal and the total number of citations at the as of December 30th, 2020 using the tool *Create Citation Report*. Using the same

tool, we measured for each journal and each year (2017-2020) an index that we named “Immediate Citations", equivalent to the number of citations the year N for articles published that year N. This indicator is closely related to the “Immediacy Index” published by Web of Science, which was not available for 2020 at the time of writing; so that we have done our own calculations. Finally, we calculated the average of the values of the immediate citations for the years 2017-2019, for each journal.

To assess the impact of publishing activity in 2020 for each journal, we divided the 2020 Immediate Citations by the 2017-2019 average. Also, using the Web of Science, we measured for each journal how many articles published in 2020 have been cited at least 10 times as of December 30th, 2020.

Top-papers

We used data available from the Web of Science of Clarivate Analytics. We first carried out the search "COVID-19 OR COVID19 OR SARS-COV-2 OR SARS-CoV-2". We then isolated the list of “highly-cited” papers published in 2020, as well as the list of “hot-papers” identified by the Web of Science. A “hihgly-cited articles” was a paper that belonged to the top 0.1% most cited papers in its field on a 10-year basis. A “hot-paper” was an article that has been published in the last two years, which belongs to the top 0.1% most cited papers in its field during the last two months [8]. We firstly established the list of countries with the most highly-cited papers (Table 4). From the hot-papers list, we established the list of researchers who have published the highest number of hot-papers, removing duplicates as the Web of Science only identifies authors by their last name and the initial of first name to establish the list presented in Table 5, as well as the list of institutions whose researchers have

published these 'hot-papers', using affiliations offered by the Web of Science (Table 6). We repeated these two analyses with the “highly-cited” articles (Tables 7 and 8). For top-papers analysis, we did a research regarding all papers published in the year 2020.

Statistical analyses. All statistical analyses were processed using the open-source statistical language R [9]. The threshold of 0.05 was the maximum p-value for each statistical conclusion. The model hypothesis was that the Immediate Citations evolution could be associated with number of published papers in 2020; the number of published COVID-19-related papers in 2020; the percentage of COVID-19-related papers; publication under the auspices of a Scientific Society; the Impact Factor in 2018; the publisher’ country and the editor diploma. We tested this hypothesis using a Principal Component Analysis (PCA) [10] with the functions of the FactoMineR (https://cran.rproject.org/web/packages/FactoMineR/index.html) and factoextra (https: //cran.r-project. org / web / packages / factoextra / index.html).

RESULTS

Journal evaluation

Of 92 journals referenced in the “Infectious Diseases” category, 50 (54%) journals exhibit the highest 2018 impact factor according to the Web of Science (range, 2.45-27.51) were here investigated (Table 1). The total number of articles in these 50 journals remained stable over the period, ranging from 14.198 papers in 2017 to 15.713 papers in 2018, 15.814 papers in 2019 and 15.814 papers in 2020 (Table 2). In contrast, the total of quotes for each year’s publication decreased from 2017 to 2019, being stable in 2020 compared to 2019 (Table 2). The immediate quote value

has increased from 10.502 in 2017 to 13.14 in 2019 and was multiplied by 4.3 between 2019 and 2020 to reach the unprecedented value of 56.623 Immediate Citations (Table 2).

Among the journals, the immediate citation value variation ranged from a 22.65 multiplication between 2017-2019 and 2020 for the Journal of Travel Medicine, and a 0.36 multiplication between 2017-2019 and 2020 for the Journal Infectious Disease Clinics of North America. A total of 40/50 (80%) journals improved their Immediate Citations in 2020 compared to the 2017-2019 average; and eight journals multiplied their immediate citation score by > 10 (Table 3). Thirty-seven journals published at least one paper in 2020 that has been cited at least 10 times in 2020; with The Lancet Infectious Diseases recorded with 91 published papers being cited > 10 times among the 747 papers cited > 10 times for the 50 journals analyzed.

Publishers evaluation

The 50 journals investigated were published by 15 different publishers: Elsevier published 17 journals, Springer published eight journals and Oxford Academic published six journals and 19 journals were published by 12 different additional publishers (Table 1). A total of 30 journals were published under the auspices of a Scientific Society and 20 were not. As for the editors, 49 of them were granted a PhD, 32 a MD, 2 a PharmD and one a Veterinary degree. One editor was not granted a PhD but dedicated his career to science edition. As for publishing activity, 5 journals published more than 50 papers cited more than 10 times in 2020, 7 published 20 to 49 papers cited more than 10 times, 5 published 10 to 19 papers cited more than 10 times, 8 published 5 to 9 papers cited more than 10 times and 25 published 0 to 4 papers cited more than 10 times (Table 3).

***Geography of publishing*.**

The 1.767 highly-cited articles here investigated have been published by authors affiliated with 131 different affiliations. As for the geographical location of these affiliations, 634 were located in China, 600 in the USA, 257 in Italia, 219 in the United Kingdom, 107 in Germany and 103 in France (Figure 1). The top four countries with the most highly-cited papers published in relation to the number of confirmed cases in their territory are as follows: China, 655 papers per 100,000 cases; Australia, 315 publications per 100,000 cases; Singapore 81 papers per 100,000 cases; Korea South, 58 papers per 100,000 cases (Table 4).

Hit-parade of institutions

We established a hit-parade of institutions in which the authors of the highly-cited and hot papers were affiliated. For both of these indicators, the leading institution is the Huazhong University of Science Technology, in China, with 136 highly-cited papers and 40 hot-papers. The following leading institutions regarding hot-papers were University of Hong Kong (Hong-Kong), University of California System (USA), Harvard University (USA), Wuhan University (China). The following leading institutions regarding highly-cited papers were Harvard University (USA), Wuhan University (China), University of California System (USA), University of London (UK). Full results are presented in table 6 and 8.

Aix-Marseille Université, to which IHU authors are affiliated, was the world 47th institution with 23 highly-cited papers and the world 18th institution with 10 hot-papers.

Hit-parade of authors

We established the list of authors regarding how many highly-cited papers and hot-papers they published on the COVID-19 topic. Results are presented in table 5 and 7. IHU researchers Didier Raoult, Philippe Colson and Jean-Marc Rolain were among top 5 in both these classifications.

Most-cited papers

We established the list of the most cited papers regarding SARS-COV-2 in 2020. Top 24 is presented in Table 9. The first IHU article was Gautret et al. in International Journal of Antimicrobial Agents.

Statistical correlations.

Further exploitation of seven available variables (Immediate Citations 2020, publisher's country, publisher's diploma, Scientific Society, percentage of COVID publisher manuscripts, number of published COVID-19 papers (2020) and total number of published papers, 2020) indicated a significant correlation between the number of published manuscripts ($p < 0.01$), number of published COVID manuscripts ($p < 0.05$), percentage of COVID published manuscripts ($p < 0.05$) and Immediate Citation positive evolution. More surprisingly, we observed a correlation between publishing under the auspice of a scientific society and Immediate Citation positive evolution ($p < 0.05$). However, we did not observe a significant correlation between the evolution of Immediate Citations and four variables including editor degree, publisher country and impact factor in 2018 (Table 10).

DISCUSSION

The 2020 publication trends survey in the field of infectious diseases specifically including SARS-CoV-2 infection disclosed major modifications over the three previous years, coinciding with so-called COVID-19 crisis [11]. Our analysis however were only provided to Clarivate Analytics ~~only~~, a commercial company which relative representatives in the expanding world of scientific editing remains to be evaluated; and by the fact that we limited our investigations to the field of infectious diseases and to top-cited journals, not taking into account the general journals that have published the most cited publications during the crisis. Our journal analysis however allows to open lines of work on the impact of a crisis on a scientific field.

At a macroscopic worldwide scale, we observed a bascule of the impacted publishing activity from Western countries towards Eastern countries led by China: this phenomena was illustrated at any one level of observation, from publishing countries, publishing national institutions, paper ranking and citations and publishing researchers. At the opposite, the ACP analysis suggested that an European based publisher, including Switzerland at worse, was associated with worse performance in term of Immediate Citation.

Further, with regard to publishers, we unexpectedly observed a significant correlation between the Immediate Citation, measuring the 2020 impact of papers, and the fact that papers have been published under the auspices of a Scientific Society, regardless of the Publisher and the Editor-in-Chief; potentially indicative that this publishing/editing model may have better resist to pressures external to the publishing/editing process itself.

In conclusion, the on-going so-called COVID crisis opened or precipitated a new area in authoring, editing and publishing activities, rapidly upsetting the worldwide editorial background in the field of infectious diseases. In this new area, Eastern countries led by China won the leadership in terms of volume and impact of publications; while sponsoring papers by a Scientific Society was also associated with impact, as a century-old performing model.

In IHU Méditerranée Infection, we will pursue this analysis that can allow to draw some perspectives about the editorial and publication strategies to expand scientific knowledge in a field that is facing a crisis. We already developed our preprint website [12] and will consider organizing our publication activities taking into account of what we have learned and what will we learn about this crisis.

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CONFLICTS ON INTEREST.

GG is employed by Elsevier Limited, a publishing company cited in this manuscript.

YR is employed by Foundation Méditerranée Infection, that runs IHU Méditerranée Infection which is mentioned in this paper.

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TABLES

Table 1. List of 50 journals indexed in the Infectious Diseases category of the Web of Science, here investigated, classified by decreasing 2018-impact factor.

Full Journal Title	Journal Impact Factor (2018)
Lancet Infectious Diseases	27.516
Lancet HIV	14.753
Clinical Infectious Diseases	9.055
Eurosurveillance	7.421
Emerging Infectious Diseases	7.185
Clinical Microbiology and Infection	6.425
Journal of The International AIDS Society	5.192
Journal of Antimicrobial Chemotherapy	5.113
Journal of Infection	5,099
Journal of Infectious Diseases	5.045
Acs Infectious Diseases	4.911
Travel Medicine And Infectious Disease	4.868
Virulence	4.775
Infectious Disease Clinics Of North America	4.757
International Journal Of Antimicrobial Agents	4.615
Aids	4.499
Current Hiv/Aids Reports	4.382
International Journal Of Hygiene And Environmental Health	4.379
Current Opinion In HIV And AIDS	4.268
Journal of Travel Medicine	4.155
Journal of Viral Hepatitis	4.016
Current Opinion In Infectious Diseases	3.752
Aids Patient Care And Stds	3.742

Hiv Medicine	3.734
Journal Of Hospital Infection	3,704
Transboundary And Emerging Diseases	3,554
International Journal Of Infectious Diseases	3,538
Open Forum Infectious Diseases	3,371
Sexually Transmitted Infections	3,365
Epidemics	3,239
Clinical And Vaccine Immunology	3,233
Antimicrobial Resistance and Infection Control	3.224
Infection And Immunity	3,16
Infectious Diseases of Poverty	3,123
Influenza and other Respiratory Viruses	3,094
Ticks And Tick-Borne Diseases	3,055
Infection And Drug Resistance	3
Infection	2.927
Antibiotics-Basel	2.921
Infection Control And Hospital Epidemiology	2.856
Medical Mycology	2.851
Malaria Journal	2.798
Current Infectious Disease Reports	2.755
Microbes And Infection	2.669
Infection Genetics And Evolution	2.611
European Journal Of Clinical Microbiology & Infectious Diseases	2.591
Bmc Infectious Diseases	2.565
Journal Of Infection And Public Health	2.487
Journal of Global Antimicrobial Resistance	2.469
Journal of Microbiology Immunology and Infection	2.455

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Table 2. Total for the 50 journals included in the analysis.

Variable	Year	Total
Number of Publications	2017	14,198
	2018	15,713
	2019	16,179
	2020	15,814
Total citations for each year's publications	2017	139,238
	2018	99,690
	2019	53,846
	2020	57,513
Immediate Citations	2017	10,502
	2018	11,394
	2019	13,140
	2020	56,623

268 **Table 3. Immediate Citations and publications cited more than 10 times in 2020.**

	Immediate Citations in 2020 / Average of 2017 to 2019	Immediate Citations				Number of publications with 10 or more citations
		2017	2018	2019	2020	2020
Journal of Travel Medicine	22,65	0,48	0,54	0,98	15,06	18
International Journal of Antimicrobial Agents	20,81	0,18	0,95	1,13	15,60	30
International Journal of Infectious Diseases	16,10	0,80	0,12	0,40	7,09	68
Eurosurveillance	14,06	1,10	0,97	1,19	15,29	45
Travel Medicine and Infectious Disease	13,42	0,35	0,53	0,69	7,01	39
Microbes and Infection	12,11	0,68	1,00	0,57	9,05	13
Journal of Infection	11,48	0,73	0,76	0,98	9,47	76
Journal of Microbiology Immunology and Infection	10,19	0,52	0,76	1,03	7,83	21
Lancet Infectious Diseases	7,92	1,49	2,11	1,81	14,30	91
Infection	7,85	0,27	0,50	0,40	3,08	8
Infectious Diseases of Poverty	7,31	0,75	0,52	0,51	4,33	5
Journal of Hospital Infection	6,23	0,72	0,66	0,74	4,40	23
Emerging Infectious Diseases	4,83	1,55	0,90	1,08	5,67	60
Journal of Infection and Public Health	3,93	0,34	0,63	0,70	2,19	15

Clinical Infectious Diseases	3,91	1,40	1,69	2,01	6,65	81
infection control and hospital epidemiology	3,45	0,47	0,48	0,69	1,89	16
Open Forum Infectious Diseases	2,87	0,25	0,33	0,53	1,06	5
Influenza and Other Respiratory Viruses	2,74	0,59	0,97	0,57	1,94	6
Infection Genetics and Evolution	2,54	0,78	0,61	0,82	1,88	11
Journal of Global Antimicrobial Resistance	2,41	0,28	0,40	0,67	1,09	3
Journal of Infectious Diseases	2,34	0,97	1,22	1,51	2,89	32
Clinical Microbiology and Infection	2,11	1,55	1,82	1,62	3,52	26
AIDS Patient care and STDs	2,07	0,41	0,40	0,48	0,89	1
Lancet HIV	2,05	1,04	1,24	1,22	2,39	9
European Journal of Clinical Microb. and Infect. Diseases	1,87	0,65	0,59	0,56	1,12	6
Antibiotics Basel	1,85	0,15	0,65	0,67	0,91	7
Sexually Transmitted Infections	1,85	0,15	0,97	0,09	0,75	0
Epidemics	1,68	0,92	0,74	0,87	1,42	0
BMC Infectious Diseases	1,48	0,38	0,31	0,39	0,53	2
international journal of hygiene and environmental health	1,44	0,83	0,85	1,41	1,48	4
Current Infectious Disease Reports	1,42	0,86	0,68	0,32	0,88	0
ACS Infectious Diseases	1,32	1,01	1,06	0,99	1,35	3

Infection and Drug Resistance	1,30	0,28	0,37	0,45	0,48	2
Medical Mycology	1,25	1,19	0,15	1,43	1,16	2
Current HIV/AIDS Reports	1,18	0,42	0,60	0,98	0,79	0
Frontiers in Microbiology	1,13	0,52	0,54	0,69	0,66	13
Antimicrobial resistance and infection control	1,12	0,51	0,37	0,50	0,51	0
Journal of Antimicrobial Chemotherapy	1,09	1,22	1,30	1,18	1,35	7
Ticks and Tick Borne Diseases	1,07	0,87	0,72	1,00	0,93	3
Current Opinion in Infectious Diseases	1,04	0,86	0,85	0,76	0,85	0
Current opinion in HIV and AIDS	1,03	1,27	0,92	0,66	0,98	0
Malaria Journal	0,94	0,62	0,48	0,46	0,49	0
Journal of the International AIDS Society	0,93	0,37	0,19	0,38	0,29	3
Virulence	0,85	1,01	0,85	0,86	0,77	0
Infection and Immunity	0,84	0,79	0,79	0,75	0,65	1
AIDS	0,83	0,97	0,88	0,90	0,76	0
Transboundary and Emerging Diseases	0,63	1,41	1,55	1,00	0,84	4
Journal of Viral Hepatitis	0,57	1,08	0,33	1,03	0,46	0
HIV Medicine	0,46	0,53	0,13	0,07	0,11	1
Infectious Disease Clinics of North America	0,36	0,75	0,30	0,98	0,25	0

Table 4. Highly-cited publications per country, worldwide.

Top 20	Population (M)	COVID, cases	COVID, deaths	Highly-cited papers	Publication/100 000 Cases
China	1,393	96,762	3277	634	655,2
USA	328	20,863,132	353,729	600	2,9
Italia	60	2,166,244	75,680	257	11,9
United Kingdom	56	2,713,563	75,431	219	8,1
Germany	83	1,796,216	35,748	107	6,0
France	67	2,659,750	65,415	103	3,9
Canada	37	611,424	16,074	102	16,7
Australie	25	28504	909	90	315,7
Espagne	47	1958844	51078	75	3,8
Pays-Bas	17	827726	11675	67	8,1
Inde	1353	10356844	149850	62	0,6
Suisse	8	461961	7271	58	12,6
Singapour	5	58721	29	48	81,7
Iran	82	1249507	55650	38	3,0
Japon	126	248625	3472	38	15,3
South Korea	51	64979	1007	38	58.5
Brazil	209	7753752	196561	31	0.4
Belgium	11	650887	19750	30	4.6
Sweden	10	437379	8727	28	6,4
Autriche	8	367410	6357	27	7,3

Table 5: Top 32 authors with three or more Hot-papers (excluding duplicates)

Author	Institution	Country	N° Hot-papers
Colson P	IHU/AMU	France	6
Raoult D	IHU/AMU	France	6
Rolain JM	IHU/AMU	France	6
Brouqui P	IHU/AMU	France	4
Lagier JC	IHU/AMU	France	4
Bardossy AC	CDC	USA	3
Baric Rs	CDC	USA	3
Brostrom-Smith C	University of North Carolina	USA	3
Clark S	Public Health Seattle	USA	3
Clark TA	CDC	USA	3
Doudier B	IHU/AMU	France	3
Drosten C	Goethe Universität	Germany	3
Duchin JS	Public Health Seattle	USA	3
Gautam S	Karunya Institute of Technology & Sciences	India	3
Gautret P	IHU/AMU	France	3
Honein MA	CDC	USA	3
Honore S	IHU/AMU	France	3
Ivanov D	Saint Petersburg State Pediatric Medical University	Russia	3
Jacobs JR	CDC	USA	3
Jernigan JA	CDC	USA	3
Kay M	Public Health Seattle	USA	3
La Scola B	IHU/AMU	France	3
Lessler J	Johns Hopkins University	USA	3
Lewis J	University of Pennsylvania	USA	3
Lippi G	University of Verona	Italia	3
Mailhe M	IHU/AMU	France	3
Muller Ma	Charite Medical University of Berlin	Germany	3
Oakley LP	CDC	USA	3
Parola P	IHU/AMU	France	3
Plebani M	University of Padua	Italy	3
Reddy SC	CDC	USA	3
Schmidt Ag	Ragon Institute	USA	3

276 **Table 6. Top 57 institutions according to number of Hot-Papers**

Top Institutions with 7 or more Hot-Papers	Country	Total Hot Papers
Huazhong University Of Science Technology	China	40
University Of Hong Kong	Hongt-Kong	21
University Of California System	USA	20
Harvard University	USA	19
Wuhan University	China	19
University Of London	UK	18
Chinese Academy Of Sciences	China	16
Chinese Academy Of Medical Sciences Peking Union Medical College	China	15
Centre National De La Recherche Scientifique Cnrs	France	13
Columbia University	USA	13
Fudan University	China	13
Harvard Medical School	USA	13
Institut National De La Sante Et De La Recherche Medicale Inserm	France	13
Peking Union Medical College	China	11
University College London	UK	11
University Of California San Diego	USA	11
Zhejiang University	China	11
Aix Marseille Universite	France	10
Capital Medical University	China	10
Tsinghua University	China	10
University Of Toronto	Canada	10
University Of Washington	USA	10
University Of Washington Seattle	USA	10
Imperial College London	UK	9
National Institutes Of Health Nih Usa	USA	9
National University Of Singapore	Singapore	9
Newyork Presbyterian Hospital	USA	9
Peking University	China	9
Shanghai Jiao Tong University	China	9
University Of Oxford	UK	9
Assistance Publique Hopitaux De Marseille	France	8
Assistance Publique Hopitaux Paris Aphp	France	8
Cornell University	USA	8
Johns Hopkins University	USA	8
Peking Union Medical College Hospital	China	8
Sapienza University Rome	Italia	8
Universite De Paris	France	8
University Of North Carolina	USA	8
University Of North Carolina Chapel Hill	USA	8

Yeshiva University	USA	8
Brigham Women S Hospital	USA	7
Charite Medical University Of Berlin	Germany	7
Free University Of Berlin	Germany	7
Guangzhou Medical University	China	7
Humboldt University Of Berlin	Germany	7
Icahn School Of Medicine At Mount Sinai	USA	7
Institut De Recherche Pour Le Developpement Ird	France	7
Johns Hopkins Bloomberg School Of Public Health	USA	7
King S College London	UK	7
Le Reseau International Des Instituts Pasteur Riip	France	7
Stanford University	USA	7
University Of Cambridge	UK	7
University Of Milano Bicocca	Italia	7
University Of Texas System	USA	7
Us Department Of Veterans Affairs	USA	7
Utrecht University	Netherlands	7
Veterans Health Administration Vha	USA	7

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Table 7. Top 8 authors who published six or more highly-cited COVID-19 papers in 2020 (excluding duplicates)

Top 8 authors	Institution	Country	Number of highly-cited papers
Lippi G	University of Verona	Italia	11
Henry BM	Cincinnati Children's Hospital	USA	9
Raoult D	IHU/AMU	France	8
Rolain JM	IHU/AMU	France	8
Colson P	IHU/AMU	France	7
Hopkins C	NHS	UK	6
Hsueh PR	National Taiwan University	Taiwan	6
Plebani M	University of Padua	Italy	6

283 **Table 8. Top 61 institutions according to number of Higly-cited papers**

Institutions with 20 or more Highly-Cited Papers	Country	Number of highly-cited papers
Huazhong University Of Science Technology	China	136
Harvard University	USA	89
Wuhan University	China	83
University Of California System	USA	80
University Of London	UK	78
Harvard Medical School	USA	63
Chinese Academy Of Medical Sciences Peking Union Medical College	China	50
Peking Union Medical College	China	46
University Of Hong Kong	Hong-Kong	46
Institut National De La Sante Et De La Recherche Medicale Inserm	France	43
Chinese Academy Of Sciences	China	41
Fudan University	China	41
Capital Medical University	China	40
Columbia University	USA	40
University College London	UK	40
University Of Washington	USA	39
University Of Washington Seattle	USA	39
Assistance Publique Hopitaux Paris Aphp	France	38
Shanghai Jiao Tong University	China	38
University Of Texas System	USA	37
Peking University	China	36
University Of Oxford	UK	35
University Of Toronto	Canada	35
Stanford University	USA	34
University Of Milan	Italia	34
Imperial College London	UK	33
Sun Yat Sen University	China	33
University Of Pennsylvania	USA	32
Zhejiang University	China	32
Johns Hopkins University	USA	31
National University Of Singapore	Singapore	30
Newyork Presbyterian Hospital	USA	29
Yale University	USA	29
Icahn School Of Medicine At Mount Sinai	USA	28
King S College London	UK	28
Centre National De La Recherche Scientifique Cnrs	France	27
Massachusetts General Hospital	USA	27
Brigham Women S Hospital	USA	26

Cornell University	USA	26
Centers For Disease Control Prevention Usa	USA	25
Guangzhou Medical University	China	25
Universite De Paris	France	25
University Of Padua	Italia	25
Chinese University Of Hong Kong	Hong-Kong	24
National Institutes Of Health Nih Usa	USA	24
University Of California San Diego	USA	24
Aix Marseille Universite	France	23
University Of Brescia	Italia	23
University Of California San Francisco	USA	23
Catholic University Of The Sacred Heart	Italia	22
Guy S St Thomas Nhs Foundation Trust	UK	22
University Of Cambridge	UK	22
University Of Michigan	USA	22
University Of Michigan System	USA	22
Irccs Policlinico Gemelli	Italy	21
Emory University	USA	20
Sapienza University Rome	Italia	20
Tsinghua University	China	20
University Of Melbourne	Australia	20
University Of Sydney	Australia	20
Vanderbilt University	USA	20

286 **Table 9. Top 24 most-cited papers in 2020**

Authors	Paper Title	Source Title	Publication Date	Publication Year	Volume	Issue
Huang, CL; Wang, YM; Li, XW; et al.	Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China	LANCET	FEB 15	2020	395	10223
Guan, W; Ni, Z; Hu, Y; et al.	Clinical Characteristics of Coronavirus Disease 2019 in China	NEW ENGLAND JOURNAL OF MEDICINE	APR 30	2020	382	18
Wang, DW; Hu, B; Hu, C; et al.	Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China	JAMA	MAR 17	2020	323	11
Zhou, F; Yu, T; Du, RH; et al.	Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study	LANCET	MAR 28	2020	395	10229
Zhu, N; Zhang, DY; Wang, WL; et al.	A Novel Coronavirus from Patients with Pneumonia in China, 2019	NEW ENGLAND JOURNAL OF MEDICINE	FEB 20	2020	382	8
Chen, NS; Zhou, M; Dong, X; et al.	Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study	LANCET	FEB 15	2020	395	10223
Zhou, P; Yang, XL; Wang, XG; et al.	A pneumonia outbreak associated with a new coronavirus of probable bat origin	NATURE	MAR	2020	579	7798
Li, Q; Guan, XH; Wu, P; Wang, XY; et al.	Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia	NEW ENGLAND JOURNAL OF MEDICINE	MAR 26	2020	382	13
Wu, ZY; McGoogan, JM	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	JAMA	APR 7	2020	323	13
Hoffmann, M; Kleine-Weber, H; Schroeder, S; et al.	SARS-CoV-2 Cell Entry Depends on ACE2 and TMPRSS2 and Is Blocked by a Clinically Proven Protease Inhibitor	CELL	APR 16	2020	181	2

Lu, RJ; Zhao, X; Li, J; et al.	Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding	LANCET	FEB 22	2020	395	10224
Chan, JFW; Yuan, SF; Kok, KH; et al.	A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster	LANCET	FEB 15	2020	395	10223
Mehta, P; McAuley, DF; Brown, M; et al.	COVID-19: consider cytokine storm syndromes and immunosuppression	LANCET	MAR 28	2020	395	10229
Yang, XB; Yu, Y; Xu, et al.	Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study	LANCET RESPIRATORY MEDICINE	MAY	2020	8	5
Xu, Z; Shi, L; Wang, YJ; et al.	Pathological findings of COVID-19 associated with acute respiratory distress syndrome	LANCET RESPIRATORY MEDICINE	APR	2020	8	4
van Doremalen, N; Bushmaker, T; Morris, DH; et al.	Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1	NEW ENGLAND JOURNAL OF MEDICINE	APR 16	2020	382	16
Arachchillage, DRJ; Laffan, M	Abnormal coagulation parameters are associated with poor prognosis in patients with novel coronavirus pneumonia	JOURNAL OF THROMBOSIS AND HAEMOSTASIS	MAY	2020	18	5
Tang, N; Li, DJ; Wang, X; Sun, ZY	Abnormal coagulation parameters are associated with poor prognosis in patients with novel coronavirus pneumonia	JOURNAL OF THROMBOSIS AND HAEMOSTASIS	APR	2020	18	4
Wu, F; Zhao, S; Yu, B; Chen, YM; et al.	A new coronavirus associated with human respiratory disease in China	NATURE	MAR	2020	579	7798
Wang, ML; Cao, RY; Zhang, LK; et al.	Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) in vitro	CELL RESEARCH	MAR	2020	30	3
Gautret, P; Lagier, JC; Parola, P; et al.	Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial	IJAA	JUL	2020	56	1
Brooks, SK; Webster, RK; Smith, LE; et al.	The psychological impact of quarantine and how to reduce it: rapid review of the evidence	LANCET	MAR 14	2020	395	10227

Wrapp, D; Wang, NS; Corbett, KS; et al.	Cryo-EM structure of the 2019-nCoV spike in the prefusion conformation	SCIENCE	MAR 13	2020	367	6483
Holshue, ML; DeBolt, C; Lindquist, S; et al.	First Case of 2019 Novel Coronavirus in the United States	NEW ENGLAND JOURNAL OF MEDICINE	MAR 5	2020	382	10

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289 **Table 10**. Results of Principal Component Analysis (PCA)

290 (Results of PCA. Signif. codes: 0 '***' **0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1).**

	Corrélation	**p. Value**
Number of published manuscripts (2020)	0.2948001	3.768524 e- 10**
Number of published COVID manuscripts (2020)	0.7550898	2.366365e-02*
Percentage of COVID published manuscripts	0.3366865	1.681269 e- 02*
Scientific society	0.1234876	0.04789*
If Ranking	0.7374651	1.006415
Publisher country Switzerland	-0.4418922	1.31470
Publisher country USA	-0.875332	1.76370
Publisher country Netherland	-0.875332	1.76370
Publisher country UK	0.075071	0.86370
MD/PharmaD/VetD	0.0922350	0.941275

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Figure 1: Top 20 countries by number of highly-cited papers

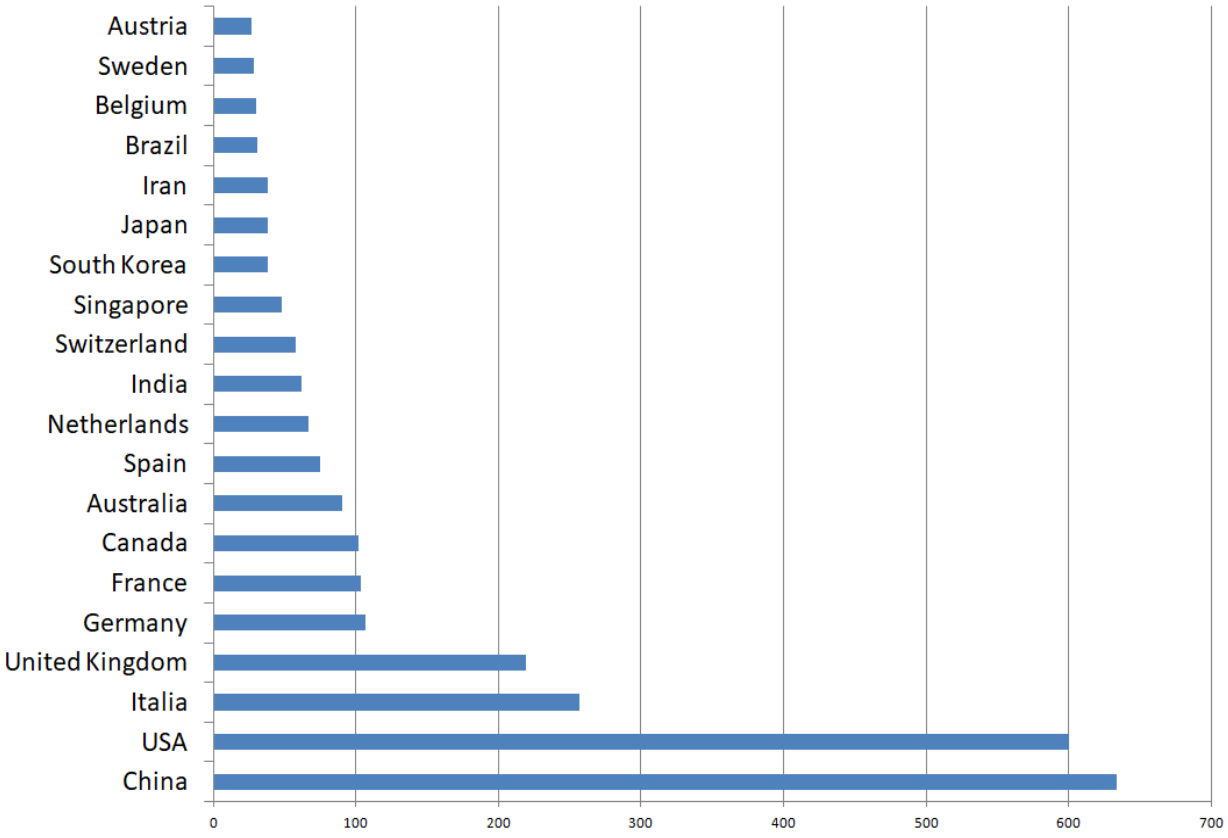

Figure 2: The variables are represented according to the square values of their correlation coefficient (cos2).