Nepal Publications on Covid-19: A Scientometric Analysis of Research Output, 2020-2023

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ABSTRACT-

The 1157 publications on Covid-19 research from Nepal were examined using various bibliometric methods and indicators. The published Nepal high-cited papers (HCPs) indexed and reported in the Scopus database was evaluated, using bibliometric methods. To visualize the collaborative interaction among leading organizations, authors, and keywords, the software's such as MS Excel, VOSviewer and Biblioshyn were used. The Nepal 1157 Covid-19 HCPs were cited 16326 times (averaging 14.11 citations per publication). The 15.40% and 61.72% of the Nepal's total publications indicated the participation of external funding and involvement of international collaboration. The leading organizations by publication productivity were the Tribhuvan University (n=302), Tribhuvan University Teaching Hospital (n=155) and B.P. Koirala Institute of Health Sciences (n=63) and the most impactful organizations in terms of citations per paper (CPP) and relative citation index (RCI) were Kathmandu Medical College Teaching Hospital (76.54 and 5.42), Lord Buddha Educational Foundation (58.78 and 4.17) and Institute of Medicine, Kathmandu (39.44 and 2.8). The leading authors by publication productivity were K R. Sah, G.S. Shrestha and D.G. Dangal and the most impactful authors were J.M. Chatterjee (54.2 and 3.84), R. Sah (48.68 and 3.45) and B. Rayamajhee (42.14 and 2.99) in terms of CPP and RCI. Medicine, Immunology & Microbiology (9.68%) and Biochemistry, Genetics & Molecular Biology and Social Sciences (8.04% each) contributed the most publications in this area. Epidemiology and clinical studies accounted maximally (24.72% and 14.69%) and "Covid-19" (n=794), "Virus Pneumonia" (n=108), "Vaccination" (n=100) and "Prevention & Control" (n=83), were the most significant keyword appearing in the area. This study gives insight into research status of Covid-19 research in Nepal, including identifying trends, most influential contributions and performance of Nepal organizations and authors. It gives some ideas about past, present, and future hotspots in research. It provided evidence for researchers around the world to strengthen global cooperation to fight the Covid-19 epidemic

Keywords: Covid-19, Nepal high-cited papers, international collaboration, Nepal organizations

INTRODUCTION

The Covid-19 pandemic cases in Nepal are the part of the global spread of coronavirus disease 2019 caused SARS-CoV-2 (COVID-19 Pandemic in Nepal, 2020). Originated in China Wuhan city of China in December 2019, Coronavirus disease 19 showed very fast global spread, with its confirmed cases in more than 200 countries within a short period and has become a new global public health crisis of the 21st century. The World Health Organization (WHO) suggested the term Covid-19 and subsequently declared this novel coronavirus disease as a pandemic on March 11, 2020 (Mohan, 2020). To manage and control the pandemic, morbidity, and mortality due to Covid-19 and its variants, the global efforts could not stop the spread of the virus and causalities. By June 28, 2023, the total confirmed cases worldwide were 767,518,723 cases and 6,947,192 deaths in more than 200 countries as reported by WHO (WHO Coronavirus (COVID-19) Dashboard, n.d.), and in Nepal alone, there are 1,003, 369 confirmed cases and 12,031 deaths (Nepal: WHO Coronavirus Disease (COVID-19) Dashboard With Vaccination Data, n.d.)

Nepal recorded its first Covid-19 case on 23 January 2020 and by 4 April 2020 it diagnosed the first locally transmitted case in Kailali District of Nepal (Bastola et al., 2020; Shrestha et al., 2020). Covid-19 confirmed cases multiplied exponentially since the first case. For generating and sharing new information with the rest of the world on Covid-19, a number of Nepal scholars immediately started publishing articles on Covid-19, which showed exponential growth and as a result the need was felt to track the most relevant and impactful articles and to assess the overall research output.

The global scholars have bibliometrically assessed Covid-19 research (Gupta et al., 2021), but the theme "Covid-19 research in Nepal" has attracted much less attention. Although, bibliometric studies have been published on assessment of global Covid-19 research in South Asia countries (Gupta et al., 2022; Gupta, 2022; Shah & Shaikah, 2020; Gupta et al., May 2023) but less attention has been focused on such bibliometric assessment in Nepal. Among existing studies on Nepal, Raut et al. (2021) examined Covid-19 research publications in Nepal, but it covered only 72 indexed publications from Scopus database published till 17 July 2020. Another study, Gupta et al. (July 2023) recently analyzed the top 100 high-cited papers (with 31 or more citations) on Covid-19 research in Nepal, with an objective to evaluate the characteristics and trends in Covid-19 research.

Keeping the significance of Covid-19 research in Nepal, the author's bibliometrically evaluated the 1157 Covid-19 published papers from Nepal, covered in Scopus database till 15.5.2023. The authors examined their overall Nepal's Covid-19 output and studied the research trends aiming to identify the major players (organizations, authors and journals), major themes being pursued using significant keywords, besides analyzing and constructing visualization network of co-authorship in countries, organizations and authors and co-occurrence of keywords to provide a hints for future research in this field.

METHODOLOGY

Covid-19 publications from Nepal were retrieved from the Scopus bibliographical and citation database till 16.5.2023, using a pre-defined search strategy utilizing various keywords related to Covid-19 in "TITLE-ABS-KEY" tag, limiting to affiliating country tag "Nepal" and limiting the search period till 16.5.2023. The search yielded 1157 records, which were further analysed from different perspectives using advanced features of Scopus

database. From the 1157 records identified, complete bibliographical information was downloaded related to countries, institutions, journals, keywords, citation counts, collaboration, funding, and the document and source type. Data analysis was performed using Microsoft Excel and co-author and co-occurrence data visualization were conducted using VOSviewer and Bibliometrix R software. Bibliometric indicators were used to study the performance of Covid-19 research in Nepal.

TITLE-ABS-KEY ("COVID 19" OR "2019 novel coronavirus" OR "coronavirus 2019" OR "SARS-CoV-2" OR "SARS-CoV 2" OR "coronavirus disease 2019" OR "2019-novel CoV" OR "2019 ncov" OR "COVID 2019" OR "corona virus 2019" OR "nCoV-2019" OR ncov2019 OR "nCoV 2019" OR 2019-ncov OR covid-19 OR "Severe acute respiratory syndrome coronavirus 2" OR "Novel Coronavirus") AND (LIMIT-TO (AFFILCOUNTRY , "Nepal"))

ANALYSIS AND INTERPRETATION OF DATA

Overall Picture

In all, 1157 papers were indexed on Covid-19 in Nepal in Scopus database till 16.5.2023, which received from 0 to 1507 citations. Together these 1157 papers received 16326 citations, averaging 14.11 CPP. Of the 1157 articles, first there is an increase from 290 in 2020 to 382 in 2921 and 387 in 2022 and then decreased to 93 in 2023.

Only 179 (15.47%) out of 1157 Nepal papers, received external funding support from more than 150 research agencies and together received 4675 citations, averaging 26.12 CPP. The major international funding agencies supporting Covid-19 research in Nepal along with their output were: Bill & Melinda Gates Foundation (n=18), The Welcome Trust (n=16), National Institute of Health (n=15), Canadian Institutes of Health Research, Medical Research Council, National Health & Research Council and World Health Organizations (n=10 each), National Institute of Health & Care Research (9 papers), etc..

Amongst 1157 Nepal's papers on Covid-19, 714 (61.71%) involved international collaboration and together received 14379 citations, averaging 20.14 CPP. The leading foreign countries participating in 714 ICPs of Nepal were: USA (312 papers, 43.7% share), India (300 papers, 42.02% share),U.K. (186 papers, 26.05% share), Australia (132 papers, 18.48% share), Pakistan (95 papers, 13.31% share), Japan (91 papers, 12.75% share), China (89 papers, 12.46% share), Bangladesh (88 papers, 12.32% share), Columbia (84 papers, 12.32% share) and Saudi Arabia (80 papers, 11.2% share).

Amongst 1157 Nepal papers, 69.65% (806) appeared as articles, 13.05% (151) as reviews, 8.04% (93) as letters, 3.63% (42) as notes, 2.33% (27) as editorials, 1.56% (18) as book chapters, and the rest received less than 1.0% share: conference papers (0.61%), erratum (0.52%), short surveys (0.35%), data paper (0.17%) and book (0.09%). Except 1 paper each in French and Spanish, all other papers were published in English

By scholars population age groups in Nepal Covid-19 research, adults (321 papers, 24.72% share) were the most studied, followed by child & adolescents (131 papers, 11.32% share), middle-aged (113 papers, 9.77% share) and aged (90 papers, 7.78% share).

By research types in Nepal Covid-19 research, epidemiology (286 papers, 24.72% share) accounts for the largest group, followed by clinical studies (170 papers, 14.69% share), risk factors (79 papers, 6.83% share), pathophysiology (41 papers, 3.54% share), complications (36 papers, 3.11% share),

diagnosis (29 papers, 2.51% share), adverse events (22 papers, 1.9% share) and genetics (18 papers, 1.56% share).

Distribution of Publication by Subjects

Broad Subjects

Scopus subject categories were used for classifying 1157 Nepal Covid-19 papers and it was observed that Medicine contributed the largest share (75.45% papers), followed far behind by Immunology & Microbiology (9.68%), Biochemistry, Genetics & Molecular Biology and Social Sciences (8.04% each), Environmental Sciences and Pharmacology, Toxicology & Pharmaceutics (4.93% and 4.06%), Agricultural & Biological Sciences and Computer Sciences (3.80% and 3.11%), Neuroscience, Psychology, Engineering and Veterinary Sciences (from 1.30% to 2.59%).

Subject Keywords

In all 7752 keywords were identified by computer software from the 1157 Nepal Covid-19 publications. The keywords reported frequency of appearance from 1 to 794. For co-occurrence analysis, the 52 important keywords were select from 7752 keywords, having frequency of 14 or more as presented in Table 1, ranked by the number of occurrences. The leading significant keywords were: “Covid-19” (n=794), “Virus Pneumonia” (n=108), “Vaccination” (n=100), “Prevention & Control” (n=83), “Lockdown” (n=81), “Quarantine” (n=79), “Disease Transmission” (n=69), “Mental Health” (n=68), etc.

A co-occurrence network of selected keywords was created to identify thematic clusters as visualised in Figure 1, for providing insights into the main topics within the research field. Four clusters, represented by different colours, were finally identified, which are indicated below. Table 1 provides the details of the frequency and cluster numbers of these 52 keywords.

Cluster 1 (includes 22 keywords), namely Dyspnoea, Coughing, Comorbidity, Artificial Ventilation, Diabetes Mellitus, Headache, Ramdesir, C. Reactive Protein, Hypertension, D.Dimer, Hydroxychloroquine, Immune Response, Angiotensin Converting Enzyme 2, Azithromycin, Adult Respiratory Stress Syndrome, Antiviral Agents, Oxygen Saturation, Antibiotic Agents, Dexamethasone, Immunoglobulin, Favipiravir, Lactate Dehydrogenase and Ferritin;

Cluster 2 (includes 20 keywords), namely Covid-19, Virus Pneumonia, Lockdown, Quarantine, Disease Transmission, Mental Health, Psychology, Anxiety, Depression , Infection Control, Social Distancing, Social Media, Hand Washing, Education, Telemedicine, Infection Prevention, Mental Stress, Deep Learning, Neurosurgery, and Distance Education;

Cluster 3 (includes 7 keywords), namely Vaccination, Prevention & Control, SARS-CoV-2 Vaccine, Drug Safety, Fatigue, Vaccine and Myalgia;

Cluster 4 (includes 2 keywords), namely Pregnancy, Covid-19 Testing

Most Productive & Impactful Organizations

In Nepal Covid-19 research, 534 organizations unevenly participated: 423 contributed 1-5 papers each, 205 contributed 6-10 papers each, 77 contributed 11-20 papers each, 25 contributed 21-50 papers each, 2 organizations each contributed 51-100 and 155-302 papers each. Individually, the top 30 organization contributed 8 to 302 papers. Collectively top 30 organizations published 1070 papers which received 16788 citations, forming 92.48% and more than 100.0% share respectively in Nepal’s total papers and citations from Covid-19 research.

Table 1: Frequency and Cluster Details of Top 52 Significant Keywords

S. N.	Keyword	Frequency	Cluster	S.No.	Keyword	Frequency	Cluster
1	Covid-19	794	2	27	Hypertension	33	1
2	Virus Pneumonia	108	2	28	Telemedicine	33	2
3	Vaccination	100	3	29	D. Dimer	32	1
4	Prevention & Control	83	3	30	Drug Safety	32	3
5	Lockdown	81	2	31	Fatigue	32	3
6	Quarantine	79	2	32	Infection Prevention	32	2
7	Disease Transmission	69	2	33	Vaccine	32	3
8	Mental Health	68	2	34	Hydroxychloroquine	30	1
9	Psychology	59	2	35	Myalgia	30	3
10	Anxiety	58	2	36	Immune Response	29	1
11	Depression	51	2	37	Mental Stress	29	2
12	Dyspnea	51	1	38	Angiotensin Converting Enzyme 2	28	1
13	Infection Control	51	2	39	Azithromycin	28	1
14	Coughing	48	1	40	Adult Respiratory Stress Syndrome	26	1
15	Pregnancy	46	4	41	Antiviral Agents	26	1
16	Comorbidity	41	1	42	Oxygen Saturation	26	1
17	SARS-CoV-2 Vaccine	41	3	43	Antibiotic Agents	23	1
18	Social Distancing	40	2	44	Covid-19 Testing	20	4

19	Artificial Ventilation	38	1	45	Dexamethasone	18	1
20	Diabetes Mellitus	38	1	46	Immunoglobulin	18	1
21	Headache	38	1	47	Deep Learning	16	2
22	Social Media	37	2	48	Favipiravir	16	1
23	Hand Washing	36	2	49	Lactate Dehydrogenase	16	1
24	Ramdesiir	34	1	50	Neurosurgery	16	2
25	C Reactive Protein	33	1	51	Distance Education	14	2
26	Education	33	2	52	Ferritin	14	1

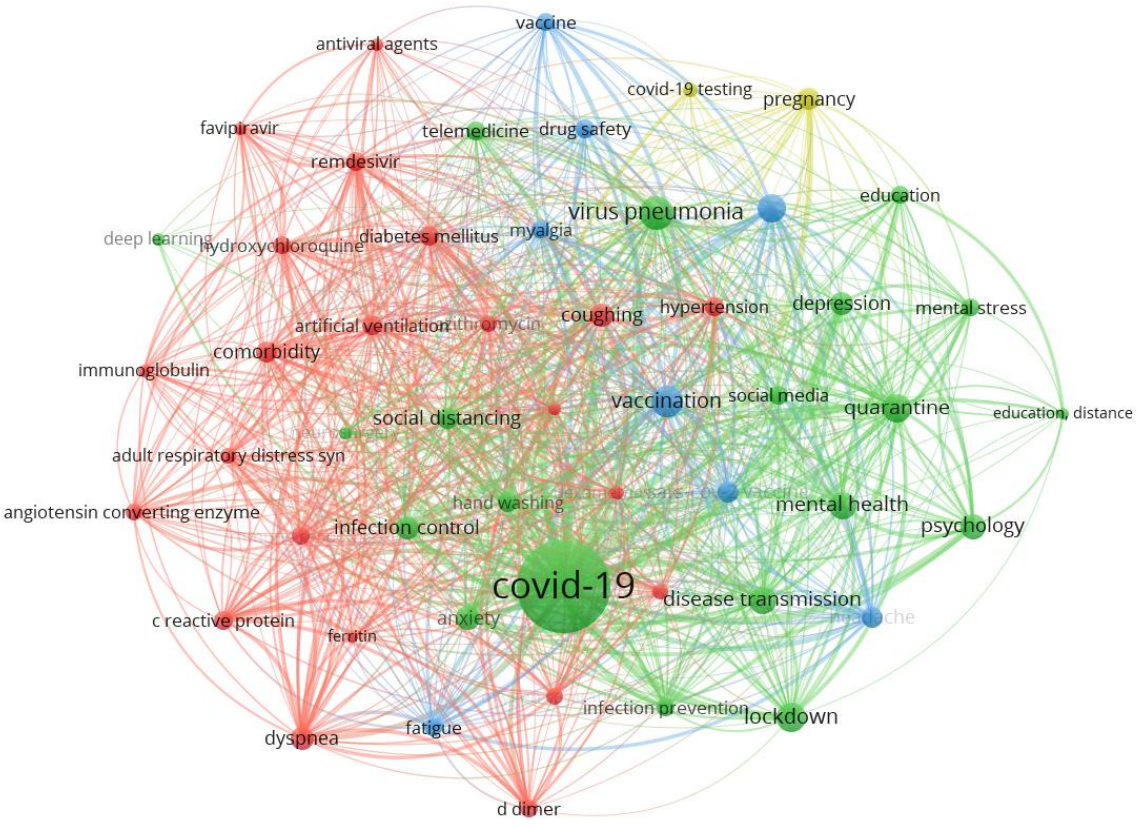

Figure 1. Co-Occurrence Network of 52 Significant Keywords (VOSViewer; n=>14)

The top 5 most productive organizations among top 30 include were Tribhuvan University (n=302), Tribhuvan University Teaching Hospital (n=155), B.P. Koirala Institute of Health Sciences (n=63), Kathmandu University (n=59) and Kathmandu Medical College (n=41) individually contributed more than the average publication productivity (n=35.67) of all organizations. The top 5 most impactful among top 30 include Kathmandu Medical College Teaching Hospital(76.54 and 5.42), Lord Buddha Educational Foundation (58.78 and 4.17), Institute of Medicine, Kathmandu (39.44 and 2.8), National Public Health Laboratory (27.89 and 1.98), International Centre for Integrated Mountain Development, Kathmandu (26.5 and 1.88), Tribhuvan University Teaching Hospital (26.43 and 1.87), Mangalbare Hospital (20.44 and 1.45) and Tribhuvan University (19.97 and 1.42) individually registered CPP and RCI above the average citation impact (15.69 and 1.11) of all organizations. Table 2 presents the publications profile of top 5 most productive and top 5 most impactful organizations.

The total link strength (TLS) of top 30 organizations varied from 15 to 891. The maximum collaborative linkages (n=891) were reported by Tribhuvan University, followed by Tribhuvan University Teaching Hospital (n=481), Dr Imamura Memorial Hospital (n=351), Minister for Health & Population, Nepal (n=226), Kathmandu University (n=219), etc. The bilateral collaborative linkages of top organizations varied from 1 to 107. The largest collaborative linkages (n=107) were reported by institutional pair "Tribhuvan University and Tribhuvan University Teaching Hospital", followed by "Tribhuvan University and Kathmandu University" (n=14), etc.

To further explore the thematic clustering of top 30 organizations, a co-author network was created using VOSviewer software, which can be visualised in Figure 2. This visualization indicates six clusters indicated below, represented by different colours.: (i) Cluster 1. B.P. Koirala Institute of Health Sciences, Kathmandu University School of Medical Sciences, Patan Academy of Health Sciences, Sukraraj Tropical & Infectious Diseases Hospital, Kathmandu, Manipal College OF Medical Sciences, Nepal, Bir Hospital, National Medical College, Birgunj, Nepal Medical College and Nepal Police Hospital; (ii) Cluster 2. Pokhara University, National Public Health Laboratory, Kathmandu Model Hospital, Nepal Health Research & Innovation Foundation, Institute of Medicine, Kathmandu, .Karnali Academy of Health Sciences, Jumla, Grande International Hospital, Kathmandu and KIST Medical College; (iii) Cluster 3. Tribhuvan University, Kathmandu University, Nepal Health Research Council, Minister for Health & Population, Nepal, Purbanchal Universityand International Center for Integrated Mountain Development, Kathmandu; (Iv) Cluster 4. Kathmandu Medical College, Nepalese Army Institute of Health Sciences, Kathmandu Medical College Teaching Hospital and Mangalbare Hospital; (v) Cluster 5. Lord Buddha Educational Foundation; and (vi) Cluster 6. Tribhuvan University Teaching Hospital

Role of Foreign Organizations

Since more than 60.0% of the Nepal papers in Covid-19 involve international collaboration, it will be useful to identify important foreign organizations contributing to Nepal's research output. collaborating most with Nepal organizations. By publication productivity, the largest contribution Among foreign organizations Fundacion Universitaria Autonoma des las Americas, Columbia reported the highest contribution (n=56), followed by Indian Veterinary Research Institute (IVRI), Bareilly, India (n=43), University of Oxford,

Table 2. Publications Profile of Top 5 Most Productive and Most Impactful Nepal Organisations in Covid-19 Research

S.No	Organization name	TP	TC	CPP	RCI	TLS	Cluster
Most Productive Organizations							
1	Tribhuvan University	302	6031	19.97	1.42	891	3
2	Tribhuvan University Teaching Hospital	155	4097	26.43	1.87	481	6
3	B.P.Koirala Institute of Health Sciences	63	304	4.83	0.34	203	1
4	Kathmandu University	59	502	8.51	0.60	219	3
5	Kathmandu Medical College	41	191	4.66	0.33	111	4
Most Impactful Organization							
1	Kathmandu Medical College Teaching Hospital	13	995	76.54	5.42	47	4
2	Lord Buddha Eucational Foundation	9	529	58.78	4.17	26	5
3	Institute of Medicine, Kathmandu	9	355	39.44	2.8	90	2
4	National Public Health Laboratory	18	502	27.89	1.98	202	2
5	International Center for Integrated Mountain Development, Kathmandu	10	265	26.5	1.88	65	3

TP= Total papers; TC=.Total citations; CPP=Citations per paper; RCI=Relative citation index; TLS=Total link strength

U.K. (n=42), Universidad Technologica de Perreira, Columbia and Harvard Medical School, USA (n=39 each), UNSW, Sydney, Australia (n=34), John Hopkins Aramvo Healthcare, Saudi Arabia, University of Toronto, Canada and Universidad Cientifica del Sur, Peru (n=34 each) and Mahidol University, Thailand(n=30).

Most Productive & Impactful Authors

In Nepal Covid-19 research, 1021 authors unevenly participated: 925 contributed 1-5 papers each, 69 contributed 6-10 papers each,

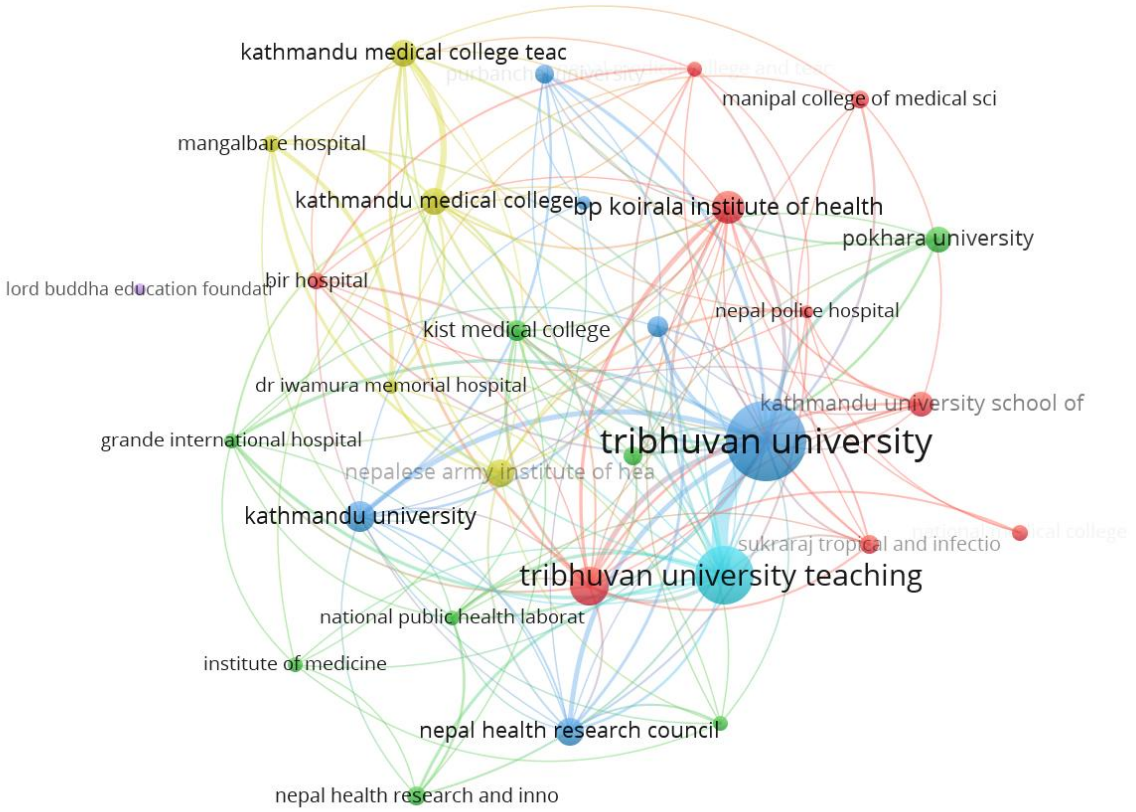

Figure 2: Collaboration Network of 30 Top Organizations (Software VOSviewer; n=>8)

20 contributed 11-20 papers each, 5 contributed 21-50 papers each and 2 contributed 54-88 papers each. Individually, the top 30 authors contributed 7 to 88 papers. Collectively the top 30 together published 409 papers which received 8143 citations, forming 35.35% and 49.88% share respectively in Nepal;s total papers and citations..

Among the top 30 authors, the top 5 includes R. Sah (Tribhuvan University)(n=88), G.S. Shrestha (Tribhuvan University Teaching Hospital) (n=29), G. Dangal (Kathmandu Model Hospital) (n=18), D.B. Shrestha (Mangalbare Hospital) (n=17) and M. Dhimal (Nepal Health Research Council) individually contributed more than the average publication productivity (n=13.63) of all authors. Also, the top 5 including J.M. Chatterjee (Lord Buddha Education Foundation)(54.2 and 3.84), R.Sah (Tribhuvan University)(48.68 and 3.45), B. Rayamajhee (Kathmandu Research Institute for Biological Sciences, Kathmandu, Nepal)(42.14 and 2.99), P.Sharma (Patan Academy og Health Sciences)(33.44 aand 2.37) and A.Bastola (Sukraraj Tropical & Infectious Diseases Hospital, Kathmandu)(25.08 and 1.78) individually registered CPP and RCI above the average citation impact (19.91 and 1.41) of all organizations. Table3 presents the publications profile of top 5 most productive and top 5 most impactful authors.

Collaboration network of these 30 authors was constructed using VOSviwer software, leading to the formation of 11 clusters, with only six clusters having three or more members as explained below. First cluster was having five members with G.S. Shrestha in lead (TP= 29; TLS=190). Second cluster and third clusters were also having five members with M. Dhimal (TP=16; TLS=180) and G. Dangal (TP=18; TLS=44) in lead respectively. The fourth group had four author5 with D.B. Shrestha as leader

Table 3. Publication Profile of Top 5 Most Productive and Most Impactful Nepal Authors in Covid-19 Research

S.No	Name	Affiliation	TP	TC	CPP	RCI	TLS	Cluster
Top 5 Most Productive Authors								
1	R. Sah	Tribhuvan University	88	4284	48.68	3.45	486	6
2	G.S. Shrestha	Tribhuvan Universuty Teaching Hospital	29	362	12.48	0.88	190	1
3	G. Dangal	Kathmandu Model Hospital	18	49	2.72	0.19	44	3
4	D.B. Shrestha	Mangalbare Hospital	17	202	11.88	0.84	132	4
5	M. Dhimal	Nepal Health Research Council	16	39	2.44	0.17	180	2
Top 5 Most Impactful Authors								
1	J.M.Chatterjee	Lord Buddha Education Foundation	10	542	54.2	3.84	44	9
2	R. Sah	Tribhuvan University	88	4284	48.68	3.45	486	6
3	B. Rayamajhee	Kathmandu Research Institute for Biological Sciences, Kathmandu, Nepal	7	295	42.14	2.99	48	1
4	P. Sharma	Patan Academy of Health Sciences	16	535	33.44	2.37	87	11
5	A.Bastola	Sukraraj Tropical & Infectious Diseases Hospital, Kathmandu	12	301	25.08	1.78	151	5

TP= Total papers; TC=.Total citations; CPP=Citations per paper; RCI=Relative citation index; TLS=Total link strength

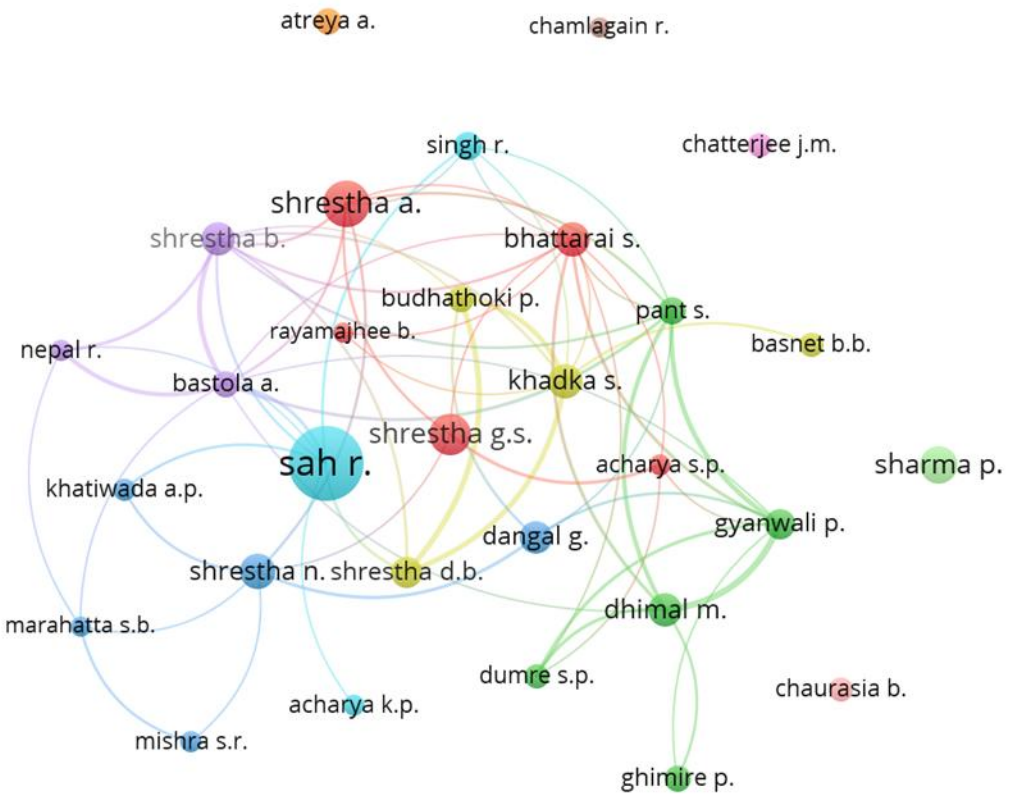

Figure 3. Collaboration network of Top 30 Authors (software VOSviewer; n=>7)

(TP= 17; TLS =132) in lead. The fifth and sixth cluster had three members each and were led by A. Bastola (TP=12; TLS=151) and R. Sah (TP=88; TLS= 486) in lead respectively. Five authors namely A. Atreya, R. Chamlagain, J.M. Chatterjee, B. Chaurasia, and P. Sharma could not find a collaborator among these thirty authors and hence allotted single member cluster. Collaboration network of these 30 authors is presented in Figure 3.

Role of Foreign Authors

Since more than 60.0% of the Nepal papers in covid-19 involve international collaboration, it will be useful to identify top 10 foreign authors collaborating most with Nepal organizations. By publication productivity, the largest contribution (n=54) is made by A.J. Rodriquez-Morales (Columbia) , followed by K. Dhama (India) (n=42), A.A. Rabaan (Saudi Arabia) (n=30), S. Shrestha (Australia) (n=23), R. Tiwari (India)(n=22), D.K. Bonilla – Aldana (Columbia) (n=20), S. Shah (USA)(n=15), A. Mohanty (India) and Y.S. Malik (India)(n=13 each) and U.N. Yadav (Australia)(n=12

Most Productive and Impactful Journals

Amongst 1157 Nepal papers on Covid-19 research, 1130 were in journals, 15 in books, 7 in conference papers, and 5 in book articles. The 1130 Nepal journal articles were reported in in 475 journals: 462 journals published 1-5 papers each, 5 journals 6-10 papers each, 7 journals 11-50 papers each, and 3 journals 57-128 papers each.

The top 25 journals published in publication range, 5 to 128 papers. Collectively they published 494 papers and 618846 citations,

Table 4. Publication Profile of Top 5 Most Productive and Most Impactful Journals in Nepal Covid-19 Research

S.No	Name f the journal	TP	TC	CPP	%TP
Top 5 Most Productive Journals					
1	Journal of the Nepal Medical Association	128	236	1.84	11.33
2	Journal of the Nepal Health Research Council	69	201	2.91	6.11
3	Kathmandu University Medical Journal	57	118	2.07	5.04
4	Annals of Medicine & Surgery	40	54	1.35	3.54
5	PLOS One	32	336	10.50	2.83
Top 5 Most Impactful Journals					
1	Travel Medicine & Infectious Diseases	14	2138	152.71	1.24
2	Infezioni in Medicina	9	709	78.78	0.8
3	Psychiatry Research	5	311	62.2	0.44
4	The Lancet	6	257	42.83	0.53
5	Lancet Global Health	6	248	41.33	0.53
TP= Total papers; TC=.Total citations; CPP=Citations per paper					

accounting for 43.72% share in Nepal total papers in Covid-19. Among the top 25 journals, the Journal of the Nepal Medical Association emerged as the most productive journal (n=128), followed by Journal of the Nepal Health Research Council (n=69), Kathmandu University Medical Journal (n=57), Annals of Medicine & Surgery (n=40), PLOS One (n=32), Frontiers in Public Health (n=22), etc. In terms of citation impact, Travel Medicine & Infectious Diseases registered the highest 152.71 CPP, followed by Infezioni in Medicina (78.78 CPP), Psychiatry Research (62.2 CPP), The Lancet (42.83 CPP), The Lancet Global Health (41.33 CPP), Frontiers in Public Health (25.91 CPP), Asian Journal of Psychiatry (25.50 CPP), etc. Table 4 presents the publication profile of top 5 most productive and top 5 most impactful journals.

High-Cited Papers

Amongst, 1157 Nepal Covid-19 papers, only few, namely 33 (2.85%) registered 100 to 1507 citations and assumed as high-cited papers (HCPs) in this study. Collectively, 33 HCPs registered 8403 citations, averaging 254.64 citations per paper (CPP). The citation range of 33 HCPs were as follows: 21 papers in citation range (103-188), 5 papers in citation range (205-253), 5 papers in citation range (326-456) and 2 papers in citation range (916-1507). The 33HCPs (comprises of 17 articles, 10 reviews, 4 letters and 2 editorials) involved the

participation of two or more organizations: 2 national collaborative and 31 international collaborative. Only 14 out of 33 HCPs received external funding support from international agencies. Amongst the 31 international collaborative papers (ICPs) from Nepal, the strongest foreign country participation (21 papers) came from India, followed by UK (16 papers), USA (15 papers), Saudi Arabia (13 papers), Columbia (12 papers), China (11 papers), Australia (9 papers), Brazil and Japan (7 papers each), etc.

Various Nepal organizations participated in these 33 HCPs, of which Tribhuvan University contributed 14 papers, followed by Tribhuvan University Teaching Hospital (n=8), Nepal Public Health Laboratory and Nepal Medicity Hospital, Lalitpur (n=3 each), Epidemiology & Disease Control Division, Govt of Nepal, Lord Buddha Educational Foundation, Nepal intensive Care Foundation, Sukraraj Tropical & Infectious Disease Hospital, Patan Academy of Health Sciences (n=2 each), etc. Similarly, a large number of Nepal authors participated in 33 HCPs, of which R. Sah contributed 8 papers, followed by D. Aryal (3 papers), B.K. Lal, H.C.Ojha, R.M. Mehta and J.M. (n=2s each), etc.

The 33 HCPs were reported in 27 journals: 3 papers were published in Travel Medicine & Infectious Disease and Critical Care, 2 papers each in Infezioni in Medicine, The Lancet Psychiatry and New England Journal of Medicine and 1 paper each in other journals, namely American Journal of Tropical Medicine & Hygiene, Globalization & Health, JMIR Public Health & Surveillance, Journal of Critical Care, The Lancet, The Lancet Global Health, The Lancet Infectious Disease, The Lancet Respiratory Medicine, etc.

FINDINGS AND CONCLUSION

The present study examined 1157 papers on Nepal Covid-19 research, with an objective to understand the trends and characteristics of research, using quantitative and qualitative methods. The leading subject areas contributing to Covid-19 research and their distribution by type of research and population age groups are identified. More than 60% of 1157 Nepal publications on Covid-19 resulted from foreign collaboration and as a result the study identified the leading foreign organizations and author's participating in Nepal Covid-19 research from Nepal. The leading research players (organizations and authors) and identification of core journals publishing research publishing in Covid-19 in Nepal are also identified in this study. The study also presented an analysis of high-cited papers, examining the bibliometric characteristics of research papers in this area.

For significant foreign participation in Nepal Covid-19 ICPs, the strongest role is played by USA (43.7% share), followed by India (42.02% share), U.K. (26.05% share), Australia (18.48% share), Pakistan (13.31% share), Japan (12.75% share), China (12.46% share), etc. Similarly, among foreign organizations participating in ICPs of Nepal, the largest contribution was made by Fundacion Universitaria Autonoma des las Americas, Columbia (n=56) , followed by Indian Veterinary Research Institute (IVRI), Bareilly, India (n=43), University of Oxford, U.K. (n=42), Universidad Technologica de Perreira, Columbia and Harvard Medical School, USA (n=39 each), UNSW, Sydney, Australia (n=34), John Hopkins Aramvo Healthcare, Saudi Arabia, University of Toronto, Canada and Universidad Cientifica del Sur, Peru (n=34 each) and Mahidol University, Thailand(n=30). Also among foreign authors participating in ICPs of Nepal, the stromgst contribution (n=54) is made by A.J.Rodriquez-Morales (Columbia) , followed by K.Dhama

(India) (n=42), A.A. Rabaan (Saudi Arabia) (n=30), S. Shrestha (Australia) (n=23), R. Tiwari (India)(n=22), Bonilla - Aldana, D.K.(Columbia) (n=20), S.Shah (USA)(n=15), A. Mohanty (India) and Y.S. Malik (India)(n=13 each) and U.N. Yadav (Australia)(n=12).

The analysis of HCPs on Nepal Covid-19 indicated that the epidemiology and clinical studies were the most researched areas (with 25.0% and 19.0% publication share) . The priorities were also studies through their distribution by population age groups. Here the most researched groups were Adults and Middle aged (23.0% and 13.0%).

At the institution level, Tribhuvan University (n=302), Tribhuvan University Teaching Hospital (n=155), B.P. Koirala Institute of Health Sciences (n=63), Kathmandu University (n=59), Kathmandu Medical College (n=41) were the most productive organizations (n=301, 155, 63 and 41) and Kathmandu Medical College Teaching Hospital (76.54 and 5.42), Lord Buddha Educational Foundation(58.78 and 4.17), Institute of Medicine, Kathmandu (39.44 and 2.8), National Public Health Laboratory (27.89 and 1.98) received the highest citation per paper (CPP) and relative citation index (RCI).

At the author level, R. Sah (Tribhuvan University), G.S. Shrestha , G. Dangal (Kathmandu Model Hospital) and D.B. Shrestha (Mangalbare Hospital) were the most productive authors (n=88, 29, 18 and 17) and J.M. Chatterjee (Lord Buddha Education Foundation)(54.2 and 3.84), R.Sah (Tribhuvan University)(48.68 and 3.45), B. Rayamajhee (Kathmandu Research Institute for Biological Sciences, Kathmandu, Nepal)(42.14 and 2.99), P.Sharma (Patan Academy og Health Sciences)(33.44 aand 2.37) registered the highest CPP and RCI.

At the journal level, Journal of the Nepal Medical Association, Journal of the Nepal Health Research Council, Kathmandu University Medical Journal and Annals of Medicine & Surgery (n=40) were the most productive journals (n=128, 69, 57 and 40), while The Lancet Psychiatry (286.0), Travel Medicine and Infectious Disease (260.87), Frontiers In Public Health (111.75) and Psychiatry Research (100.67) were the most impactful journals in terms of citations per paper (CPP).

The analysis of HCPs on Nepal HCPs on Covid-19 suggests that the epidemiology and clinical studies were the most researched areas (with 24.72% and 14.69 publication share). The priorities were also studies through their distribution by population age groups. Here the most researched groups were adults and child & adolescents (24.72% and 11.32%).

The study used only one database (Scopus), which may lead to missing of be possible some potentially valuable information. At the same time, use of multiple databases may leads to other difficulties of merging existing data in different databases, which pose significant problems.

In this bibliometric study, 1157 publications on Nepal Covid-19 research as covered in the Scopus database since the origin if Covid-19 virus till beginning of May 2023 were examined. The research is unevenly scattered across few organizations and authors contributing the most. Most of the funding (15.4%) received came from foreign agencies and 61.71% of total research involved international collaboration. For increasing the research output, improving research impact and research environment, the government needs to invest more in R&D and also increase substantially national collaboration among various participating organizations and authors.

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