

Medical and Local Disease-Related Research on Nepal: A Study of Top 100 High Cited Paper During 1994-2003

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ABSTRACT

This study explores medical and local disease research in Nepal from 1994 to 2023, utilising selective publication metrics to reveal the nature, patterns, and trends in the field. A total of 5186 relevant papers were identified from the Scopus database by searching for 'Nepal' in both "Affiliation" and 'Title' tags within the 'medicine' subject category. From these, the top 100 High-Cited Papers (HCPs) were analysed using descriptive analysis and science mapping techniques. The analysis highlighted participation from 120 organisations and 449 authors, with 71 authors from Nepal contributing to a total of 14244 citations (CPP=142.22). Of the HCPs, 36 % received external funding, and 90 % featured international collaborations. Notably, the USA, UK, Switzerland, Netherlands, and India emerged as the most significant contributors to these collaborations. The key research priorities identified included communicable/infectious diseases (33 papers), maternal, newborn, and child health (25 papers), non-communicable diseases (24 papers), and nutrition and food safety (9 papers). The findings emphasize that the current research infrastructure and resources in Nepal are insufficient for independent national research efforts, underscoring the vital role of foreign collaborations in achieving national research objectives in the field of medical studies.

Keywords: Medical research; Nepal; High-cited papers; Bibliometrics; Healthcare; Non-communicable disease; Universal health coverage

1. INTRODUCTION

Nepal is currently undergoing a significant demographic transition, resulting in a growing elderly population due to declining birth and death rates. This shift poses challenges for the healthcare sector, impacting both older and younger individuals in Nepal¹. In response to this issue, the 2019 National Health Policy of Nepal aims to achieve Universal Health Coverage (UHC), with a focus on the well-being of vulnerable groups and the promotion of healthy practices, traditional medicine, and modern healthcare²⁻³. Consequently, Nepal has witnessed notable improvements in key health indicators.

The healthcare budget in Nepal has increased rapidly and is projected to reach 2 % of the GDP by 2024. While the country has made strides in reducing infant and maternal mortality from infectious diseases⁴, it now faces a growing crisis of Non-Communicable Diseases

(NCDs) as the leading causes of death⁵⁻⁶. To achieve its health objectives, Nepal must urgently address the NCD crisis while continuing to combat infectious diseases and malnutrition, particularly in rural areas⁷⁻⁸.

Medical and local health research in Nepal plays a critical role in addressing current healthcare challenges, improving practices, and developing context-specific solutions. It is essential to regularly evaluate and strengthen research efforts to monitor progress towards policy objectives, as emphasised in the national health policy.

Several previous bibliometric studies evaluated the publication output in health and medical sciences in countries such as India⁹⁻¹⁰, Pakistan¹¹, Sri Lanka¹², and Nepal¹³. Only two bibliometric studies, focusing on the UK¹⁴ and Nepal¹⁵, have been published in this area using high citations as the base. The later bibliometric study¹⁵ examined the top 326 HCPs in medical research from Nepal (derived from 16351 papers) covering the period 1994-23. In this study, most of the participating organisations and authors from Nepal played the secondary

role (not as lead authors), 90 % of the papers involved foreign collaboration and research priorities reflected in HCPs were as per global and national priorities of foreign participating nations.

Since this study mentioned above (15) used HCPs as a base and does not reflect the national medical research priorities of Nepal, we decided to improve the search strategy of the previous study by further restricting the search to “Nepal” in ‘Title’ tag, which exclusively resulted in 5238 papers on Nepal medical research, hoping that they will reflect the national and local Nepal medical research priorities. From this sample (5238), the study identified the top 100 papers which have received 94 to 648 citations. The sample, thus, becomes the central focus of bibliometric research in the present study. This search strategy can be considered a novel method of filtering HCPs focusing on national needs from the overall HCPs, with Nepal as one of the participating countries, as no previous bibliometric study has used such an approach.

This study seeks to investigate the nature and trends of Nepal’s top 100 most-cited medical and health-related studies through bibliometric analysis with the following objectives: To examine the role of national infrastructure, resources and players (organisations and authors) involved in medical research; To study the role of foreign players (countries, organisations and authors) in supporting national efforts in medical research; and To analyze the national and local subject research priorities in medical research.

2. METHODOLOGY

The authors developed a search strategy shown below on medical and local disease-related research on Nepal, which have used the phrase: ‘Nepal’ in the “country address field tag” along with “Nepal” in the “paper title field tag” and restricted the search to the Scopus subject category “medicine” on May 17, 2024, in Scopus database. The search produced 5186 records out of 10,772 records in recall on Nepal during the specified time frame. From 5186 records, the top 100

High-Cited Papers (HCPs) with 84 or more citations were identified. The HCPs’ records with field tags such as country, institution, author, author affiliation, funding, and journal were downloaded for further statistical analysis. The study used VOSviewer and MS Excel software for the visualisation of collaborative network relationships across key actors and to discover hotspots in this research field through co-occurrence analysis.

The search strategy was divided into three stages:
Stage 1. Search Strategy: (AFFILCOUNTRY (Nepal) AND PUBYEAR > 1993 AND PUBYEAR < 2024. The search yielded 31734 records;
Stage 2. Search Strategy: (AFFILCOUNTRY (nepal) AND PUBYEAR > 1993 AND PUBYEAR < 2024 AND (LIMIT-TO (SUBJAREA, “MEDI”)). The search yielded 16351 records. In this sample, the top 326 HCPs reported 100 to 8350 citations;
Stage 3. Search Strategy: (AFFILCOUNTRY (nepal)) AND PUBYEAR > 1993 AND PUBYEAR < 2024 AND (LIMIT-TO (SUBJAREA , “MEDI”)) and TITLE (nepal)). The search yielded 5186 records.

From 5186 records yielded by the final search strategy of Stage 3, the present study identified the top 100 HCPs who have reported 94 to 648 citations.

3. RESULTS

3.1 Overview

The top 100 HCPs on Nepal medical and local disease research have received between 88 and 1,391 citations per paper since their publication between 1994 and 2023 (Table 1). The HCPs’ 8-yearly output increased from 25 papers in 1994-2003 to 56 papers in 2004-2012, before decreasing to 19 publications in 2013-2020. The annual output peak showed high growth, with 11 papers in 2006, and then declined to 10 papers in 2010 and further to 4 papers in 2020. Collectively, these 100 HCPs garnered a total of 14,244 citations, averaging 142.44 citations per paper. The bulk of HCPs appeared in article form (94), others were in the form of reviews (3), letters (2), and a note (1). Most HCPs focused on clinical studies (65), followed by epidemiology (25)

Table 1. Growth of high-cited papers on medical and local disease-related research on Nepal during 1994-2023

Year	TP	TC	CPP	Year	TP	TC	CPP	Year	TP	TC	CPP
1994	1	88	88.00	2005	7	852	121.71	2015	2	209	104.50
1995	2	297	148.5	2006	11	1391	126.45	2016	2	231	115.50
1996	1	110	110.00	2007	4	580	145.00	2017	2	273	136.50
1998	3	446	148.67	2008	6	820	136.67	2019	1	122	122.00
1999	1	389	389.00	2009	3	361	120.33	2020	4	796	199.00
2000	8	1218	152.25	2010	10	1281	128.10	1994-03	25	3957	158.28
2001	2	322	161.00	2011	7	800	114.29	2004-12	56	7672	137.00
2002	3	461	153.67	2012	3	356	118.67	2013-20	19	2615	137.63
2003	4	626	156.50	2013	4	542	135.50	Total	100	14244	142.44
2004	5	1231	246.20	2014	4	442	110.50				

TP=Total Papers; TC=Total Citations; CPP=Citations per Paper

and risk factors (21), with fewer on pathophysiology, genetics, and quality of life. The study designs included controlled studies (35), clinical trials (24), randomised controlled trials (23), prospective studies (8), and cross-sectional studies (8), along with a few case studies and observational studies. The populations studied spanned adults (64), children/adolescents (54), the elderly (21), and middle-aged individuals (20), with some overlap between these age groups.

3.2 International Funding

Among the top 100 HCPs, only 36 received extramural funding support from 630 international agencies and collectively received 5698 citations, averaging 158.28 CPP. Eunice Kennedy Shriver National Institute of Child Health & Human Development (NICHD), and United States Agency for International Development (USAID) supported research contributed the largest number of funded papers ($n=7$ each), followed by the Bill and Melinda Gates Foundation ($n=6$), World Health Organisation (WHO), National Institutes of Health (NIH) and Johns Hopkins University ($n=4$ each) etc. Among the top 10 foreign funding agencies, *UK Government, Department for International Development*, UK registered the highest citation impact per paper (365.0 CPP), followed by National Institute of Mental Health (325.0 CPP), WHO (300.0 CPP), National Institute of Health (206.25 CPP), etc. (Table 2).

3.3 International Collaboration

Ninety of the top 100 HCPs collaborated internationally with over 100 foreign countries, resulting in a total of 12,923 citations (143.59 CPP).

3.3.1 Most Productive Foreign Countries

The top 25 out of 100 collaborating foreign countries were analysed in more detail. The USA contributed the most, with 44 papers, followed by the United Kingdom with 26, Switzerland with 10, the Netherlands with 9, India

with 8, Belgium with 6, and Australia, Canada, Japan, and Thailand each contributing 4 papers. Bangladesh and Sweden each contributed 3 papers. In terms of citation impact, the highest average was by Chile at 343.0 CPP, followed by South Africa (208.0 CPP), Bangladesh (178.0 CPP), Sweden (170.67 CPP), China and Columbia (169.0 CPP each), the Netherlands (159.44 CPP), New Zealand (155.0 CPP), Switzerland (150.0 CPP), the USA (148.41 CPP), and Belgium (145.17 CPP).

The map in Fig. 1 illustrates the collaboration network of 25 foreign countries in partnership with Nepal, which are organised and presented into 9 cluster groups with 76 connections and a Total Link Strength (TLS) of 221. The connections between the nodes signify their collaborations, and the width of the links indicates the strength of the collaborative network.

Cluster 1, which includes Bangladesh, Sweden, and Ethiopia, demonstrates moderate collaboration with a TLS of 13 and 8 links. Cluster 2, comprising Switzerland, Belgium, Chile, and Peru, exhibits strong collaboration with a TLS of 50 and 9 links. Cluster 3, involving the United Kingdom (UK), Japan, China, and Colombia, displays robust collaboration with a TLS of 73 and 15 links, showing frequent collaboration, particularly with the UK at its core. Cluster 4, centred on Nepal along with Norway, Germany, and the Philippines, illustrates the highest TLS of 150 and 25 links, emphasising Nepal's extensive international network. Cluster 5, consisting of the United States, Thailand, and New Zealand, has a TLS of 64 and 13 links, highlighting the US's significant collaborative role. Cluster 6, which includes Australia and Sri Lanka, shows moderate collaboration with a TLS of 6 and 3 links. Cluster 7, with India and Malaysia, reflects solid collaboration with a TLS of 22 and 8 links. Lastly, Cluster 8, represented solely by Viet Nam, indicates specific yet significant collaboration with a TLS of 5 and 3 links.

3.4 Significant Keywords

Keywords found in HCPs provide insights into research priorities, researchers' interests, and emerging trends. In 100 HCPs, 1,420 keywords were reported. The

Table 2. List of top 10 funding agencies supporting research in Nepal's high cited papers

S. No.	Funding agency	TP	CPP
1.	Eunice Kennedy Shriver National Institute of Child Health & Human Development (NICHD), USA	7	154.71
2.	United States Agency for International Development (USAID), USA	7	133.86
3.	Bill and Melinda Gates Foundation, USA	6	156.57
4.	World Health Organization (WHO), Geneva	4	300.0
5.	National Institutes of Health (NIH),	4	206.25
6.	Johns Hopkins University, USA	4	131.75
7.	UK Government, Department for International Development, UK	2	365.0
8.	National Institute of Mental Health, USA	2	325.0
9.	Fogarty International Center, USA	2	135.0
10.	Johns Hopkins Bloomberg School of Public Health, USA	2	171.5

TP=Total papers; CPP=Citations per paper

60 keywords were short-listed based on their collaborative links varying from 2 to 31, and their total link strengths from 3 to 73 (Annexure 1). The leading significant keywords are ‘Pregnancy’ (n=17), ‘retinol’ and ‘traditional medicine’ (n=10 each), ‘folic acid’ and ‘medicinal plant’ (n=9 each), ‘health care personnel’, ‘prenatal care’, ‘disease severity’, ‘depression’, and ‘phytotherapy’ (n=8 each). 60 keywords were grouped into five distinct clusters, and labelled by color: 21 keywords in the red cluster, 16 in green, 10 in both blue and yellow clusters, and 3 in purple. The significant keywords that indicate thematic focus and developmental trends represent these clusters. Co-citation analysis was performed to pinpoint trending topics and pressing concerns in medical sciences research, using VOSviewer software, displayed in Fig. 2.

3.5 Most Productive Foreign Organisations

The top 24 foreign organisations (with 3 or more HCPs) that had collaborated with Nepal collectively produced 102 HCPs and received 16,153 citations, accounting for over 100 % of Nepal’s total research output and citation impact in this field. Among top 24 foreign organisations: (i) The top 5 most productive organisations include: Johns Hopkins Bloomberg School of Public Health, Baltimore, USA (n=14), University College London, U.K. (n=8), London School of Hygiene & Tropical Medicine, London, U.K.(n=7), WHO, Switzerland, and Johns Hopkins University, Baltimore, USA (n=6 each) and (ii) The top 5 most impactful organisations include Institute of Development Studies, Brighton, U.K. (274.33 CPP), University College London, U.K. (212.5 CPP), Johns Hopkins Bloomberg

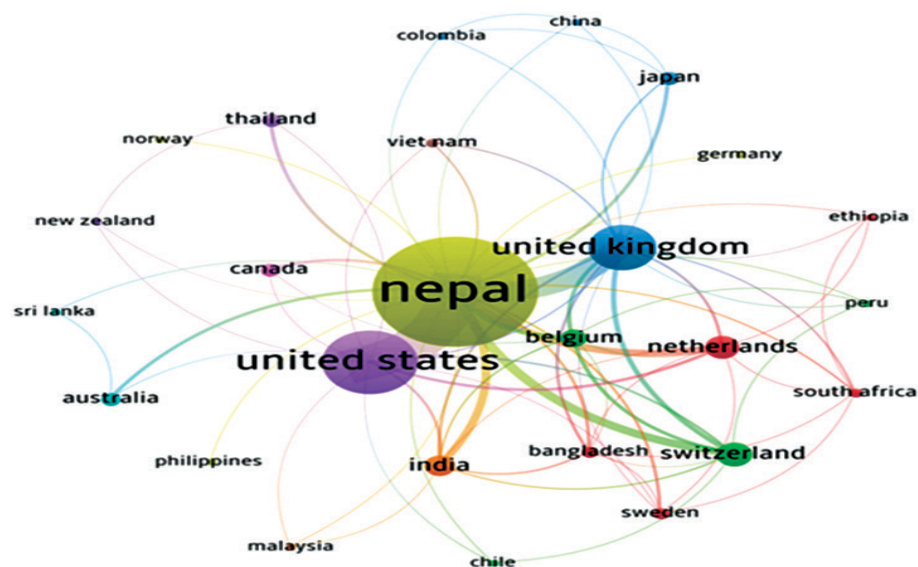


Figure 1. Collaboration network among the top 25 foreign countries with nepal.

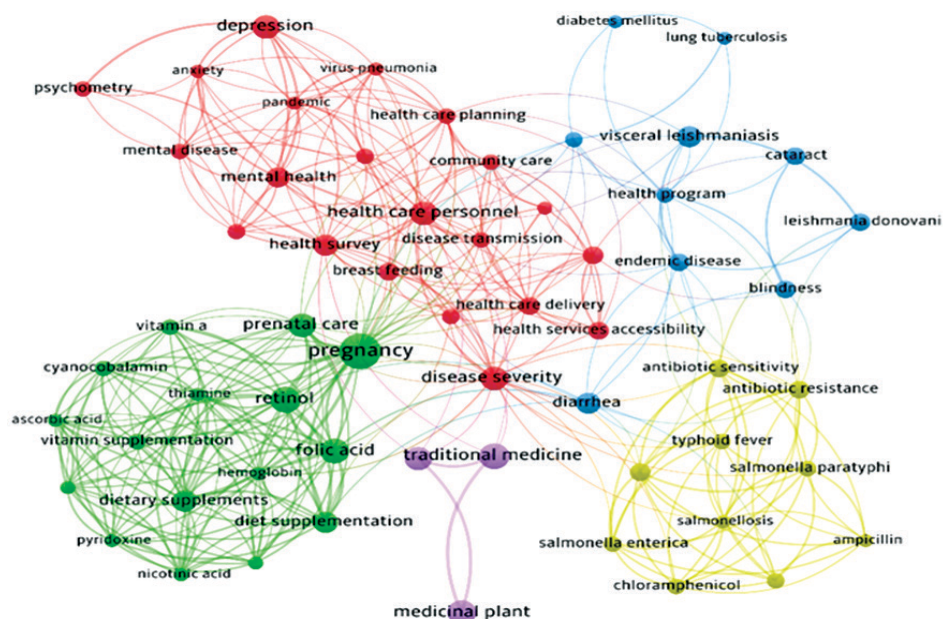


Figure 2. Co-occurrence network among the top 60 significant keywords.

School of Public Health, Baltimore, USA (186.14 CPP), National Eye Institute, Bethesda, USA (185.0 CPP) and Utrecht University, Netherlands (181.33 CPP) (Annexure 2).

3.6 Most Productive Collaborating Foreign Authors

The top 24 foreign authors (with 3 or more HCPs) that had collaborated with Nepal, collectively produced 138 papers and received 24,284 citations, accounting for over 100 % of Nepal's total research output and citations in this field. Among top foreign authors: (i) The top 5 most productive authors include S.C. LeClerq (USA) (n=15), J. Katz (USA)(n=14), P. Christian (USA), K.P. West (USA) and A.M.D.L. Costello (U.K.)(n=8 each) and (ii) The top 5 most impactful authors include N. Mesko (U.K.)(274.33 CPP), H. Standing (U.K.)(274.33 CPP), A. Sommer (USA)(235.25 CPP), E.K. Pradhan(USA) (210.33 CPP) and D. Osrin (203.67 CPP) (Annexure 3).

3.7 Most Productive Nepal Organisations

A total of 120 organisations, 71 of which were from Nepal, had participated in the publication of the top 100 HCPs for Nepal. The top 22 out of 71 organisations published between 2 and 28 papers each, collectively publishing 115 papers with 16,891 citations, accounting for over 100 % of the total HCP papers and citations. Among top 22: (i) Six Nepali organisations had productivity levels exceeding the average (5.23): Tribhuvan University, Kathmandu, Nepal (n=28), Nepal Nutrition Intervention Project-Sarlahi, Kathmandu, Nepal (n=16), B.P. Koirala Institute of Health Sciences, Dharan, Nepal (n=9), Mother and Infant Research Activities, Kathmandu, Nepal and Transcultural Psychosocial Organisation Nepal, Kathmandu, Nepal (n=6 each); (ii) Seven organisations registered citation impact (CPP and RCI) above their respective averages (146.881 and 1.03): Nepal Administrative Staff College, Kathmandu, Nepal (274.33 CPP), Mother and Infant Research Activities, Kathmandu, Nepal (203.67 CPP), Center for Victims of

Torture, Kathmandu, Nepal (194.0 CPP), Foundation Eye Care Himalaya, Kathmandu, Nepal (185.0 CPP) and Nepal Nutrition Intervention Project-Sarlahi, Katmandu, Nepal (172.19 CPP) (Annexure 4).

Regarding the strength of their collaborative links, Tribhuvan University in Kathmandu, Nepal, holds the highest score (84 TLS), followed by B.P. Koirala Institute of Health Sciences, Dharan, Nepal (29 TLS), Friends of Patan Hospital (27 TLS), Transcultural Psychosocial Organisation (26 TLS), and Nepal Nutrition Intervention Project-Sarlahi (25 TLS). Minister for Health and Population in Nepal and Mother and Infant Research Activities in Kathmandu, Nepal (18 TLS each).

Figure 3 depicts the collaboration network among the top 22 organisations, each contributing at least two HCPs. These 22 organisations were organised into 12 groups, with a total of 19 links and a combined link strength of 32. Groups 1 and 2 consist of four organisations each, Group 3 consists of three organisations, while Groups 4 and 5 each have two organisations. The remaining groups, from 6 to 12, each have one organisation.

In terms of link strength, the maximum (84 TLS) collaborative strength is depicted by Tribhuvan University, Kathmandu, followed by B.P. Koirala Institute of Health Sciences, Dharan (n=29), Friends of Patan Hospital, Nepal (n=27), Transcultural Psychosocial Organisation, Kathmandu (n=26), Nepal Nutrition Intervention Project-Sarlahi, Kathmandu and Minister for Health and Population, Nepal (n=25 each), and Mother and Infant Research Activities, Kathmandu (n=18).

Regarding collaborations between different institutions/universities, the largest number of collaboration links (n=6) was observed between “Tribhuvan University, Institute of Science, Kathmandu and the Nepal Nutrition Intervention Project-Sarlahi. This was followed by “Manipal College of Medical Sciences, Pokhara and Manipal Teaching Hospital, Pokhara (n=4), “Manipal College of Medical Sciences Pokhara and the Regional Tuberculosis Centre, Pokhara”,

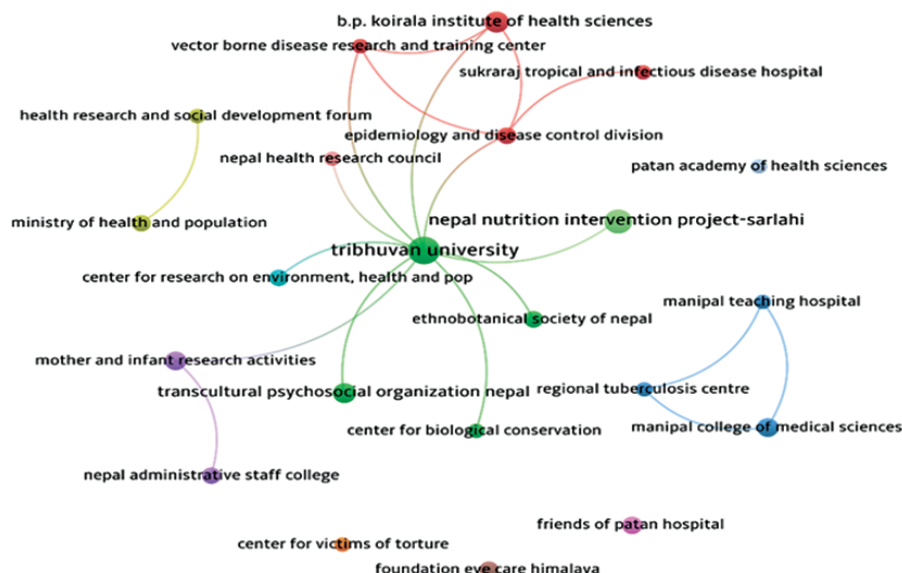


Figure 3. Collaboration network among the top 30 nepal organisations.

“Vector Borne Disease Research & Training Center” and the “Disease Control Division under the Ministry of Health, Kathmandu”, “Minister for Health and Population of Nepal and Tribhuvan University, “Tribhuvan University, Institute of Science, Kathmandu and the Ethnobotanical Society of Nepal”, “Tribhuvan University, Institute of Science in Kathmandu, and the Vector Borne Disease Research and Training Center” (n=2 each), etc.

The collaboration network among the top 22 organisations, each contributing 2 or more documents, was studied and visualised using VOSviewer software Fig. 3. The software categorised the top 22 organisations into 12 clusters, comprising 19 links and TLS of 32. Clusters 1 and 2 contain 4 organisations each, Cluster 3 includes 3 organisations, Clusters 4 and 5 each have 2 organisations, and the remaining clusters, 6 to 12, each consist of 1 organisation

3.8 Most Productive Nepal's Authors

Among 100 HCPs, 449 authors participated, of which 227 were from Nepal. The top 30 Nepal authors individually published between 2 and 17 papers, collectively publishing 116 papers that received 19,066 citations (Annexure 5). This accounts for over 100 % of the total HCP papers and citations. Among the top 30 Nepal authors: (i) Eleven Nepali authors exceeded the average productivity (3.87): S.K. Khatri (n=17), S.S. Manandhar and R.Adhikari (n=7), S. Rijal (n=6), S.R. Shrestha, S. Koirala, B. Basnyat and B.P.Shrestha (n=5 each); (ii) Eleven Nepali authors registered citation impact (CPP and RCI) higher than the group's average of 142.44 and 1.15: D. Shrestha (367.50 and 2.58), S. Tamang (367.5 and 2.58), M. Manandha (274.33 and 1.93), S.M. Dali(257.0 and 1.80) and S.R. Shrestha (228.6 and 1.60).

Regarding the collaborative links among the top 26 authors, the highest strength (130 TLS) was exhibited by S.K. Khatri, followed by S.S. Manandhar and S.R.

Shrestha (41 TLS each). In addition, S. Rijal, B. Basnyat, B.P. Shrestha, B.A. Kohrt, M. Manandhar, R.K. Adhikari, and S. Shrestha showed 23 TLS each. The top 26 authors were organised into 10 distinct clusters, with 25 links and a total link strength (TLS) of 49, as illustrated in Figure 4. Group 1 consisted of 5 authors, while Groups 2 and 3 had 4 authors each. Groups 4 and 5 had 3 authors each, Groups 6 and 7 had 2 authors each, and Groups 8 through 10 had a single author each. In total, these 10 clusters exhibited a combined link strength of 49, as depicted in Fig. 4.

3.9 Most Productive Journals

All 50 journals contributed to Nepal's medical and local disease research (Annexure 6). Among the most prolific journals in the top 19 include The Lancet and Journal of Ethnobiology & Ethnomedicine (n=10 each), followed by the American Journal of Tropical Medicine and Hygiene and the British Journal of Ophthalmology (n=5 each). Additionally, the British Medical Journal, Clinical Infectious Diseases, and the Journal of Nutrition each published four papers, while JAMA, BMC Psychiatry, and PLOS Neglected Tropical Diseases contributed three papers each. Collectively, the top 19 journals published between 2 and 10 papers each, amounting to a total of 69 papers and 10111 citations, which constitutes 69 % and 70.98 % of the top 100 HCPs and citations in Nepal medical research, respectively. By Citations Per Paper (CPP), the leading journals were: American Journal of Ophthalmology (274.0 CPP), British Medical Journal (222.0 CPP), JAMA (206.0 CPP), The Lancet (200.0 CPP), The Lancet Infectious Diseases (168.5 CPP), Clinical Infectious Diseases (149.5 CPP), etc. Among top 19 journals, the impact factor (IF) varied from 0.6 to 168.9, and among these journals receiving impact factor 8 and above were The Lancet (n=10) (IF=168.9), JAMA (n=3) (IF=120.7),

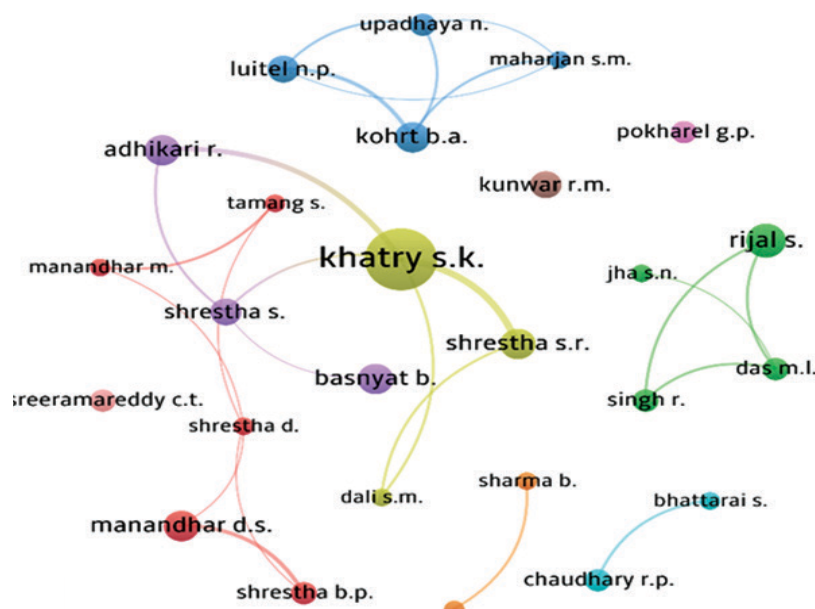


Figure 4. Network collaboration among the top 30 Nepal authors.

British Medical Journal (n=4) (IF=105.7), The Lancet Infectious Diseases (n=2) (IF=56.3), Clinical Infectious Diseases (n=4) (IF=20.99) and Pediatrics (n=2) (IF=8.0).

A co-citation analysis of the top 19 journals, each with two or more documents, was undertaken using VOSviewer software Fig. 5. The resulting co-citation network comprised 13 links with a TLS of 20, forming 12 clusters.

3.10 Broad Subject Areas

Using the policy document of the Nepal Government¹⁶, this study classified 100 HCPs into 8 broad subject areas Table 3. Many HCPs were classified under multiple subject areas. Communicable/infectious diseases have been the most sought area of research (33 HCPs), followed by maternal, newborn and child health including reproductive health (25), non-communicable diseases (24), other areas (12), nutrition and food safety (9), environment/climate change/occupational health (3), accidents/injuries/violence (3), and health systems (1).

The subject area with the highest citation impact per paper (160.96 CPP) was maternal, newborn and child health including reproductive health, followed by nutrition and food safety (153.55 CPP), accidents/injuries/violence (143.00 CPP), non-communicable diseases (141.29 CPP), communicable/infectious diseases (137.97 CPP), environment/climate change/occupational health (137.33 CPP), other areas (123.25 CPP), and health systems (93.00 CPP).

Within the domain of communicable/infectious diseases, the most neglected tropical diseases were leprosy, dengue, and visceral leishmaniasis (11 HCP papers), tropical diseases like tuberculosis, malaria, and Japanese encephalitis (6 papers), and emerging/re-emerging infections like COVID-19 (4 papers). Other areas included bacterial/fungal infections, diarrhoea, and enteric/typhoid fever. For non-communicable diseases, the emphasis was on psychiatric disorders (13 papers), followed by eye/ENT diseases (9 papers), and cardiology/metabolic diseases (1 each).

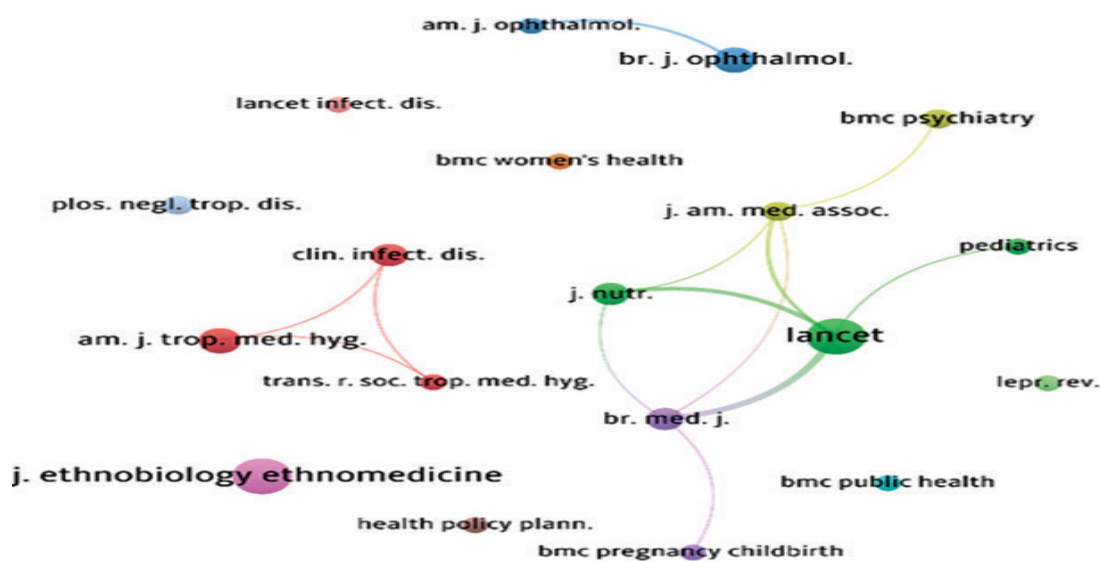


Figure 5. Co-citation network among the top 19 journals.

Table 3. Broad subject areas of medical and local disease-related research on Nepal as reflected in the top 100 HCPs

S. No.	Broad medical subject areas	TP*	TC	CPP
1.	Health systems	1	93	93.0
2.	Non-communicable diseases	24	3391	141.29
3.	Communicable/infectious diseases	33	4553	137.97
4.	Maternal, newborn and child health, including reproductive health	25	4024	160.96
5.	Accidents, injuries and violence	3	429	143.0
6.	Nutrition and food safety	9	1382	153.55
7.	Environment, climate change and occupational health	3	412	137.33
8.	Other areas	12	1479	123.25
9.	High altitude/mountain illness sickness	1	102	102.0
10.	Medicinal plants	10	1124	112.4
11.	Self-medication/non-doctor prescription	1	253	253.0
Total (all combined)		110*	15763	143.3

TP=Total papers; TC=Total citations; CPP=Citations per Paper

* Many papers are classified under more than one subject category

3.11 High-Cited Papers

The top 10 HCPs on medical and local disease research in Nepal were published as articles between 1998 and 2020, but most (6 out of 10) appeared from 1998 to 2004. They received 206 to 632 citations each, with a total of 3,119 citations (averaging 311.90 CPP) Table 4.

Five of the top 10 HCPs Table 4 were published based on external funding support from 11 different agencies, including the World Health Organisation, the National Institutes of Health, the Bill and Melinda Gates Foundation, the UK government, and others.

Nine of the top 10 HCPs involved international collaboration, with Nepal as the lead country in 6 of them, followed by the USA (3) and the UK (1). The top collaborating

countries were the USA (5 papers), the Netherlands and the UK (2 each), and several others (1 each).

The top 10 HCP papers were published across 7 journals, with The Lancet, British Medical Journal, and American Journal of Ophthalmology each publishing 2 papers, and the remaining 4 journals publishing 1 paper each.

The most HCP, with 632 citations, was “Effect of a Participatory Intervention with Women’s Groups on Birth Outcomes in Nepal”, published in The Lancet in 2004. The second most cited paper, with 389 citations, was “Double-blind, cluster randomised trial of low dose supplementation with vitamin A or β carotene on mortality related to pregnancy in Nepal” published in the British Medical Journal in 1999.

Table 4. Top 10 HCPs on medical and local disease research on nepal

S. No.	Name of authors	Title of the papers	Source	Citations
1.	Manandhar, P.D.S., Osrin, D., <i>et al</i>	Effect of a participatory intervention with women’s groups on birth outcomes in Nepal: Cluster-randomised controlled trial	Lancet 2004, 364(9438), pp. 970-979	632
2.	West Jr., K.P., Katz, J. <i>et al</i>	Double-blind, cluster randomised trial of low-dose supplementation with vitamin A or β carotene on mortality related to pregnancy in Nepal	BMJ 1999, 318(7183), pp. 570-575	389
3.	Pokharel, G.P., Negrel, A.D <i>et al</i>	Refractive error study in children: RESULTS from Mechi Zone, Nepal	American Journal of Ophthalmology 2000, 129(4), pp. 436-444	343
4.	KC, A., Gurung, R., <i>et al</i>	Effect of the COVID-19 pandemic response on intrapartum care, stillbirth, and neonatal mortality outcomes in Nepal: a prospective observational study	The Lancet Global Health 2020, 8(10), pp. e1273-e1281	314
5.	Christian, P., Khatry, S.K. <i>et al</i>	Effects of alternative maternal micronutrient supplements on low birth weight in rural Nepal: Double-blind randomized community trial	British Medical Journal 2003, 326(7389), pp. 571-574	279
6.	Shankar, P.R., Partha, P., <i>et al</i>	Self-medication and non-doctor prescription practices in Pokhara Valley, Western Nepal: A questionnaire-based study	BMC Family Practice 2002, 3,17, pp. 1-7	253
7.	Rijal, S., Ostry, B <i>et al</i>	Increasing failure of miltefosine in the treatment of kala-azar in Nepal and the potential role of parasite drug resistance, reinfection, or noncompliance	Clinical Infectious Diseases 2013, 56(11), pp. 1530-1538	252
8.	Shrestha, N.M., Sharma, B., <i>et al</i>	Impact of torture on refugees displaced within the developing world: Symptomatology among Bhutanese refugees in Nepal	JAMA 1998, 280(5), pp. 443-448	234
9.	Mullany, L.C., Darmstadt, G.L <i>et al</i>	Topical applications of chlorhexidine to the umbilical cord for prevention of omphalitis and neonatal mortality in southern Nepal: A community-based, cluster-randomized trial	Lancet 2006, 367(9514), pp. 910-918	217
10.	Ruit, S., Tabin, G., <i>et al</i>	A prospective randomised clinical trial of phacoemulsification vs manual sutureless small-incision extracapsular cataract surgery in Nepal	American Journal of Ophthalmology 2007, 143(1), pp. 32-38.e2	206

4. DISCUSSION

The bibliometric analysis of research conducted on 100 HCPs on medical and local disease research in Nepal from 1994 to 2023 revealed a thriving landscape of Nepal medical research. An impressive 90 % of HCPs were the result of foreign collaborations involving more than 100 countries. Also, 90 % and 10 % of the 100 HCPs are the lead authors and organisations from foreign countries and Nepal. It is generally believed that HCPs involving foreign authors and organisations as active players received their funding from their parent countries, if not mentioned in external funding sources. In addition, 36 % of the 100 HCPs reported the use of external funding sources in 100 HCPs. It is therefore concluded that a very small number of 100 HCPs received their funding from the national research agencies of Nepal.

The 449 authors affiliated with 120 organisations (227 and 71 from Nepal) participated in 100 HCPs. It means that compared to national players, the active participation of foreign organisations and authors also played a significant role by way of participation in 90 out of 100 HCPs.

On examining the role of Nepal national players (organisations and authors) participating in 100 HCPs, it was observed that only 22 organisations and authors each out of 71 and 27 played the most significant role as they have contributed 2 or more papers. Among them: (i) Tribhuvan University, Kathmandu, Nepal (n=28), Nepal Nutrition Intervention Project-Sarlahi, Kathmandu, Nepal (n=16), B.P. Koirala Institute of Health Sciences, Dharan, Nepal (n=9), Mother and Infant Research Activities, Kathmandu, Nepal, Transcultural Psychosocial Organisation Nepal, Kathmandu, Nepal and Minister for Health and Population, Nepal (n=6 each), Manipal College of Medical Sciences, Pokhara, Nepal and Friends of Patan Hospital, Nepal (n=5) in organisations and (ii) S.K. Khatry (n=17), S.S. Manandhar and R.Adhikari (n=7), S. Rijal (n=6), S.R. Shrestha, S. Koirala, B. Basnyat and B.P.Shrestha (n=5 each) in authors played the key role in supporting national high-cited medical research.

On examining the role of foreign players (organisations and authors) from Nepal participating in 100 HCPs, it was observed that only 12 countries, 24 organisations and 24 authors out of 100, 49 and 222 participating players played the most significant role as they have contributed 3 or more papers. Among them: (i) USA(n=44), United Kingdom (n=26), Switzerland (n= 10), the Netherlands (n=9) and India(n=8) among countries; (ii) Johns Hopkins Bloomberg School of Public Health, Baltimore, USA (n=14), University College London, U.K. (n=8), London School of Hygiene & Tropical Medicine, London, U.K.(n=7) and WHO, Switzerland among organisations and (ii) S.C. LeClerq (USA)(n=15), J. Katz (USA)(n=14), P. Christian (USA), K.P. West (USA) and A.M.D.L. Costello (U.K.)(n=8 each) among authors played the most significant role in supporting national high-cited medical research.

On examining the national and local subject research priorities in Nepal medical research as reflected in 100

HCPs, it was observed that the most high-ranked and priority research area was communicable/infectious diseases (33 % share), followed by maternal, newborn and child health (including reproductive health) (25 % share) and non-communicable diseases (24 % share). Among other priorities, subject areas, medicinal plants (10 % share), nutrition and food safety (9 % share), environment, climate change and occupational Health and accidents, injuries and violence (3 % share each) contributed to the remaining research output.

The Nepalese government appears to have limited resources devoted to R&D in medical sciences. Foreign funding, instead of national funding, has played a key role in supporting highly cited and quality research included in the top 100 HCPs. In future, the Nepal government should build a strong infrastructure, create a better research environment and provide much more funding to support R&D in medical research to generate high-cited research. To effectively address national and local health challenges, creating a national research fund devoted to specific priority research areas in medical sciences and fostering national research partnerships among organisations and authors is paramount. This shift can lead to the development of more home-grown, cost-effective solutions tailored to Nepal's specific needs. Nepal's medical research thrives on international collaboration and funding, but to bolster its impact, nurturing domestic research networks is the key to success. The analysis hopes to identify the strengths and weaknesses of current research, providing policy-makers with guidance to refine research priorities and enhance medical research in Nepal.

5. CONCLUSION

Over the last three decades, Nepal has seen a significant increase in its medical and local disease research output of Nepal. A large part of this research, about 90 %, has resulted in working in partnership with other countries, highlighting the vital importance of international collaboration in bringing out quality research. Only a small fraction of the research is done in Nepal exclusively through independent research. Nepal is dependent on extramural funding for pursuing medical research studies and enabling meaningful research. Almost half of its research projects have been funded by outside sources. High-priority research topics included communicable/Infectious diseases, maternal, newborn and child health, including reproductive health, non-communicable diseases, medicinal plants, nutrition and food safety, among others. It is important to mention that Nepal's leading medical institutions, although they have played a significant role in medical research, need to be strengthened further through improved training of the existing manpower and larger funding support to Research & Development. The present study offers crucial insights for directing future research efforts and partnerships in the area of medical and local disease studies in Nepal. Policymakers must prioritize sustained domestic investment in research infrastructure and human resources, while simultaneously developing strategic

frameworks to facilitate and diversify international funding and collaborative partnerships, particularly for high-impact clinical trials. Furthermore, targeted funding and dedicated research programs are crucial to address under-researched areas like rare diseases, mental health, and health economics, thereby aligning research efforts with national public health priorities.

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Annexure 1. Top 15 significant keywords in Nepal's top 100 highly cited papers HCPs on medical and local disease

S. No.	Keyword	Occ.	TLS	Links	Cluster
1	Pregnancy	17	73	31	2
2	Retinol	10	60	18	2
3	Traditional medicine	10	18	5	5
4	Folic acid	9	56	9	2
5	Medicinal plant	9	15	2	5
6	Health care personnel	8	33	24	1
7	Prenatal care	8	31	21	2
8	Disease severity	8	29	26	1
9	Depression	8	23	11	1
10	Phytotherapy	8	17	5	5
11	Diet supplementation	7	52	17	2
12	Dietary supplements	7	47	15	2
13	Health survey	7	26	19	1
14	Diarrhea	7	13	12	3
15	Visceral leishmaniasis	7	12	7	3

Annexure 2. Top 10 foreign organisations (with 3 or more papers) collaborating with Nepal on medical and local disease research on Nepal

S.No.	Name of the organisation	TP	TC	CPP
1	Johns Hopkins Bloomberg School of Public Health, Baltimore, United States	14	2606	186.14
2	University College London, United Kingdom	8	1700	212.50
3	London School of Hygiene and Tropical Medicine, London, United Kingdom	7	981	140.14
4	World Health Organisation, Geneva, Switzerland	6	988	164.67
5	Johns Hopkins University, Baltimore, United States	6	853	142.17
6	HealthNet TPO, Amsterdam, Netherlands	5	748	149.60
7	Emory University, Atlanta, United States	4	612	153.00
8	Geneva University Hospital, Geneva, Switzerland	4	498	124.50
9	Institute of Development Studies, Brighton, United Kingdom	3	823	274.33
10	National Eye Institute, Bethesda, United States	3	555	185.00

Annexure 3. Top 10 foreign authors (with 3 or more papers) collaborating with Nepal on medical and local disease research on Nepal

S.No.	Name of the Foreign author	Affiliation of the foreign author	TP	TC	CPP
1	LeClerq S.C.	Johns Hopkins Bloomberg School of Public Health, Baltimore, United States	15	2593	172.87
2	Katz J.	Johns Hopkins Bloomberg School of Public Health, Baltimore, United States	14	2513	179.50
3	Christian P.	Johns Hopkins Bloomberg School of Public Health, Baltimore, United States	8	1510	188.75
4	West K.P.	Johns Hopkins Bloomberg School of Public Health, Baltimore, United States	8	1510	188.75

5	Costello A.M.D.L.	University College London, London, United Kingdom	8	1508	188.50
6	Tielsch J.M.	Johns Hopkins Bloomberg School of Public Health, Baltimore, United States	8	1251	156.38
7	Mullany L.C.	Johns Hopkins Bloomberg School of Public Health, Baltimore, United States	7	1049	149.86
8	Pradhan E.K.	Johns Hopkins Bloomberg School of Public Health, Baltimore, United States	6	1262	210.33
9	Osrin D.	University College London, London, United Kingdom	6	1222	203.67
10	Jordans M.J.D.	HealthnetTPO, Amsterdam, Netherlands	6	836	139.33

Annexure 4. Top 10 Nepal organisations (with 2 more papers) participating in Top 100 HCPs on medical and local disease research on Nepal

S. No.	Affiliation of the organisation	TP	TC	CPP	RCI	TLS-NL	TLS-FL	TLS-TL
1	Tribhuvan University, Kathmandu, Nepal	28	3504	125.14	0.88	22(14)	62	84
2	Nepal Nutrition Intervention Project-Sarlahi, Katmandu, Nepal	16	2755	172.19	1.21	12(9)	13	25
3	B.P. Koirala Institute of Health Sciences, Dharan, Nepal	9	1220	135.56	0.95	3(3)	26	29
4	Mother and Infant Research Activities, Kathmandu, Nepal	6	1222	203.67	1.43	3(2)	15	18
5	Transcultural Psychosocial Organization Nepal, Kathmandu, Nepal	6	836	139.33	0.98	2(2)	24	26
6	Minister for Health and Population, Nepal	6	920	153.33	1.08	12(9)	13	25
7	Manipal College of Medical Sciences, Pokhara, Nepal	5	713	142.60	1.00	6(2)	7	13
8	Friends of Patan Hospital, Nepal	5	610	122.00	0.86	8(7)	19	27
9	Manipal Teaching Hospital, Pokhara, Nepal	3	516	172.00	1.21	3(2)	4	7
10	Nepal Administrative Staff College, Kathmandu, Nepal	3	823	274.33	1.93	3(1)	7	10

Annexure 5. Top 10 Nepal authors (with 2 or more papers) participating in top 100 HCPs in on medical and local disease research on Nepal

S.No.	Name of the author	Affiliations of the author	TP	TC	CPP	RCI	TLS
1	Khatry S.K.	Nepal Nutrition Intervention Project-Sarlahi, Katmandu, Nepal	17	2880	169.41	1.19	14
2	Manandhar D.S.	Maternal and Infant Research Activities, Kathmandu, Nepal	7	1339	191.29	1.34	12
3	Adhikari R.	Tribhuvan University, Kathmandu, Nepal	7	1130	161.43	1.13	9
4	Rijal S.	B. P. Koirala Institute of Health Sciences, Dharan, Nepal	6	816	136	0.95	6
5	Shrestha S.R.	Nepal Nutrition Intervention Project-Sarlahi (NNIPS), Nepal	5	1143	228.6	1.6	8
6	Koirala S.	Transcultural Psychosocial Organization Nepal, Nepal	5	622	124.4	0.87	5
7	Basnyat B.	Patan Hospital, Kathmandu, Nepal	5	609	121.8	0.86	4
8	Shrestha B.P.	Mother Infant Research Activities, Kathmandu, Nepal	5	590	118	0.83	8
9	Luitel N.P.	Transcultural Psychosocial Organization Nepal, Nepal	4	566	141.5	0.99	3
10	Shrestha S.	Patan Hospital, Kathmandu, Nepal	4	550	137.5	0.97	5

Annexure 6. Top 10 journals (with 1 or more papers) participating in top 100 HCPs on medical and local disease research on Nepal

S. No.	Name of the journal	TP	TC	CPP	TLS	IF	Cluster	Links
1	The lancet	10	2000	200.00	16	168.9	2	8
2	Journal of ethnobiology and ethnomedicine	10	1124	112.40	0	3.60	24	0
3	American journal of tropical medicine and hygiene	5	635	127.00	3	3.918	3	3
4	British journal of ophthalmology	5	591	118.20	3	4.10	5	2
5	British medical journal	4	888	222.00	10	105.7	4	7
6	Clinical infectious diseases	4	598	149.50	2	20.99	3	2
7	Journal of nutrition	4	596	149.00	8	4.20	2	5
8	Jama	3	618	206.00	12	120.7	1	10
9	Bmc psychiatry	3	378	126.00	3	4.4	1	3
10	Plos neglected tropical diseases	3	349	116.33	0	3.80	28	0