

Mapping the Landscape of Disability Research in India: A Scientometric Analysis Highlighting Trends and Future Directions

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ABSTRACT

Research on developmental impairments is more widespread in wealthy countries, but the global rise in developmental disorders reveals an extensive impaired community in India. This study takes a scientometric approach to Indian disability research, focussing on publication patterns and trends in the SCOPUS database. A search retrieved 12,320 research papers from 1945 to 2023, which were analysed using co-citation, coupling, co-authorship, and co-occurrence approaches to explore links between research. India contributed 12,320 publications (2.42 %) to the global total of 509,520, while the United States and the United Kingdom led with 32.83 % and 11.40 %, respectively. India's annual growth rate in disability-related publications was 9.95 %, while international cooperation remained restricted. The most productive and significant Indian institutions were AIIMS, NIMHANS, PGIMER Chandigarh, and Manipal Academy of Higher Education. These findings highlight India's significant contribution to disability research while emphasising the need for greater global alliances and increased efforts to address its specific difficulties.

Keywords: Disabilities; Visualisation tools; Degree of collaboration; Relative growth; Co-citation analysis

1. INTRODUCTION

Research plays a crucial role in the long-term development of nations and in improving the lives of all people, including those with disabilities. The World Health Organisation (WHO) estimates that about 1.3 billion people, or 16 % of the global population, live with some form of disability¹. These individuals face challenges that are 15 times more frequent than those without disabilities. In India, the 2011 Census recorded 26.8 million people with disabilities, making up 2.21 % of the population². Research on disabilities is of utmost importance as it serves as an impulse to understand, address, and improve the lives of disabled persons. Research is vital in various domains, including healthcare, education, policymaking, social inclusion, and empowerment. In 1976, the UN General Assembly proclaimed 1981 the International Year of Disabled Persons³. And in 2006 United Nations adopted the Convention on the Rights of Persons with Disabilities⁴, the first comprehensive human rights treaty of the 21st century. Disability inclusive is a primary agenda of sustainable development goals involving education, growth and employment, inequality, and accessibility of human settlements. The government of India enacted the Rights of Persons with Disabilities (RPwD) Act, 2016, for appropriate governments to take effective measures

to ensure that persons with disabilities enjoy their rights equally with others. Government and non-government organisations and civil society organisations are promoting awareness, sensitisation, and inclusion of persons with disabilities. With the advancement of research in science, technology, and healthcare and global and interdisciplinary collaboration, the contribution of knowledge accelerated very fast. This study seeks to fill that gap by analysing disability-related research publications from India from 1945 to 2023. Using bibliometric methods and visualisation tools, this research maps trends, collaboration patterns, and the evolution of topics in the field. This research is essential for scholars, policymakers, administrators, service providers, and funding agencies. It offers valuable insights into the progress, key areas, and future opportunities for disability research in India. It helps inform evidence-based decisions to guide inclusive development in education, healthcare, social policy, and technology^{5,6}.

2. LITERATURE REVIEW

The literature review serves as a framework for the research process and facilitates finding the gap in the research field. It is an organised, informed discussion of published works to convey the relationship between the study and the published works in the field of study. Van Hoven *et al.*, discussed a participatory project with people with disability in the Netherlands for

collaboration and involvement in community development⁷. Enriquez *et al.*, analysed the state-of-the-art ATs for people with disabilities, identifying research needs and trends in computer science. Analysed 389 primary studies showed 35 ATs versus 22 disabilities are compared, obtaining striking peaks for some disabilities⁸. Muyor-Rodriguez *et al.*, analysed scientific production worldwide on disability using bibliometric techniques and algorithms to detection of communities. Till 2017, a total of 1974 was extracted from the Scopus database, which showed that research into Social Work and Disability has significantly increased, particularly since the 90s⁹. Singh *et al.*, analysed the 105 seminal articles on tourism and disabilities published from 2000 to 2019. It indicated a significantly increased number of publications and was dominated mainly by a few contributors¹⁰. Mengual-Andrés *et al.*, attempted to examine 95 documents in the field of the Internet and people with intellectual disability from the Web of Science using bibliometrics R-Tool. They have shown a recent increase in publications related to the Internet and people with intellectual disability, confirming Price's and Bradford's laws. The studies tend to be published by co-authorship in journals indexed in the Journal Citation Reports (JCR), achieving a global impact⁴. Choi *et al.*, conducted a bibliometric analysis of emergency medicine researchers in South Korea's research publications from 1996 to 2015. One hundred ninety-one journals published 858 articles, with 293 Korean writers as first or corresponding authors. Resuscitation medicine was the most often investigated research topic ($n = 110$), original articles were the most popular publication type ($n = 618$), and original publications had an average impact factor of 2.158¹¹. Khoo *et al.*, did a bibliometric study based on the data collected from the Web of Science from 1980 till 26 June 2017 to identify the top 50 most cited publications in disability sport. The top 50 cited publications were articles and reviews published in English between 1993 and 2014. Most publications were categorised as sociological and psychological, as well as training and competition effects. The most researched events were the Paralympics and Special Olympics¹². Fong *et al.*, studied with a scientometric approach to investigate the main interests in the literature on developmental disabilities conducted in Middle Eastern countries. 1110 documents were analysed using Scite Space software for co-citation patterns¹³. Thangaraj & Ramalingam, (2023) Examining 27,708 papers (2006-2020) on several disabilities found variable growth but strong patterns in cooperation. It tracked co-authorship, both macro and micro, using social network analysis. The most prolific and central author turned out to be Kappos L. The results stress the cooperative and changing research framework of the topic. There are many scientometric studies conducted on disabilities, but no scientometric analysis on disabilities research in India. This study primarily focused on the mapping

and visualisation of research on disabilities in India during the last eight decades.

3. RESEARCH METHODS

The Scopus is a comprehensive multidisciplinary bibliographic database that indexes the research publications of reputed journals, conference proceedings, books, book chapters, etc¹⁴. The publication data was extracted from the Scopus database on 20 April 2024 using advanced search. The search string used for extraction of data was: TITLE-ABS-KEY (disability) AND PUBYEAR > 1944 AND PUBYEAR < 2024 AND (LIMIT-TO (AFFILCOUNTRY, "India")) AND (LIMIT-TO (LANGUAGE, "English")). The selection of documents was limited to those affiliated with Indian institutions, as the study's primary objective was to analyse trends and patterns in disability-related research within the Indian research ecosystem. The publication year range was set from 1945 to 2023, and only English-language publications were considered. A total of 12320 publication records were extracted and analysed: bibliometric, network, and cluster analyses were performed using the Bibliometrix-Biblioshiny R package 16 and visualised using the VOSviewer open-source application¹⁵. The workflow of data collection, analysis, visualisation, and discussion is shown in Figure 1.

4. SCOPE OF THE STUDY

The primary focus of the study is to examine the contributions of research publications on disabilities restricted to authors affiliated with India during the last eight decades, from 1945 to 2023.

5. OBJECTIVES OF THE STUDY

The study primarily aims to analyse the publication pattern and research trend on disabilities using scientometric techniques. The other objectives are:

1. To analyse the trend in the growth of research publications from 1945 to 2023.
2. To analyse the trend of authorship patterns of publications.
3. To find the most preferred sources for publications and document types.
4. To analyse the quality of research by applying the various quality indicators.
5. To visualize the research contributions using the open-source software VOSviewer, etc.

6. SIGNIFICANCE OF THE STUDY

The scientometric study and mapping of research in broader and specific research areas is crucial for developing research and getting insight into it. Visualisation of statistical data is essential for explaining and conveying the results to readers¹⁶. It helps the readers and researchers quickly and efficiently understand and get insight. This study examined the research trends on disabilities in India. Also, it covered the assessment of the authorship pattern, co-occurrence of keywords, bibliographic coupling of countries and

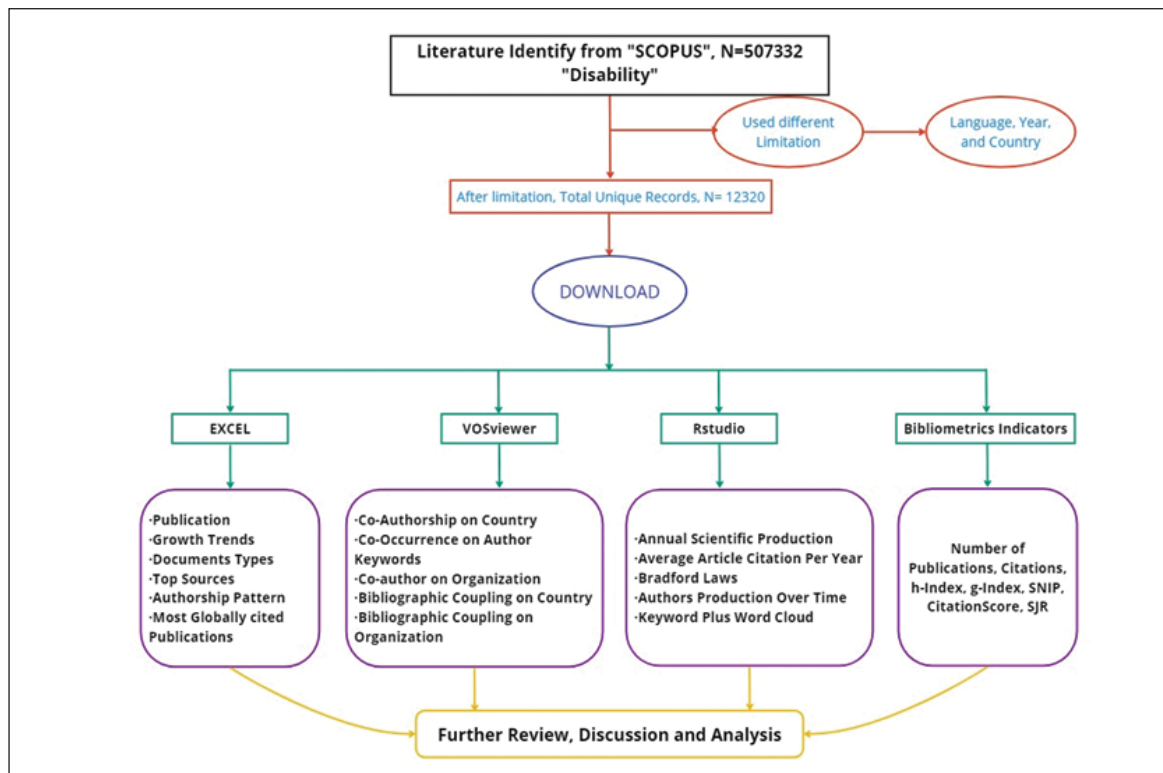


Figure 1. Flow chart of the scientometrics analysis of current study (mine mapping software miro).

organisations, etc., by applying bibliometric techniques using R software and visualising using the VOSviewer. The study results help the researcher, academician, policymaker, administration, and funding bodies to make informed decisions. It also helps to take more initiatives for advanced research in the field of disabilities and inclusive policies by the administrator and government bodies.

6.1 In-Depth Analyses of the Intellectual Research

This study analysed the published literature on disability using various scientometric/bibliometric indicators and other statistical techniques. The literature on disability covered in Scopus bibliographic databases has been considered for quantitative analysis. A total of 12320 records were analysed and interpreted.

7. DATA ANALYSIS

7.1 Distribution of Research Publications

Table 1 represents the distribution of research publications and their citations over different periods, segmented by

“Clusters (Years)”. A total of 12320 publications received total citations of 320578; the average citation is 26.02. Publications and citations have seen exponential growth over the decades. The most significant increases were in 2005-2014 and 2015-2023. The period from 2015 to 2023 dominates in publications and citations, indicating a recent surge in research activity and its impact. The increasing citation trend indicates that more recent research is highly influential and widely recognised in the academic and research community.

7.2 Document Type Analysis

Table 2 presents publications on different types of documents published and the citations received. Articles are the highest documentation type with 66.64 %, followed by conference papers 1494 (12.12 %) and review 1288 (10.45 %); other document types are given in Table 2. The articles are more, and the average number of citations per article is 30.28, whereas reviews are fewer, and the average number of citations per review document

Table 1. Cluster-wise distribution of research publications and their citations

Cluster (Years)	Publications	% of publications	Citations	% of citations
1945-1974	34	0.28	94	0.03
1975-1984	95	0.77	683	0.21
1985-1994	122	0.99	2385	0.74
1995-2004	455	3.69	12039	3.76
2005-2014	2512	20.39	107938	33.67
2015-2023	9102	73.88	197439	61.59
Grand Total	12320	100.00	320578	100.00

is 45.31. It clearly shows that the reviews are widely read by the researcher and receive more citations than other document types. Researchers may prioritize publishing articles and reviews to maximize impact and visibility in the academic community.

7.3 Average Citations Per Year

Figure 2 shows the average citations received by the publications from 1945 to 2023. During the study period, 12320 publications on disabilities received 320578 citations. The average number of citations is highest in the year 2012 at 81.5, followed by 1989(79), 2007(49.92), 2017(49.92), and others, as shown in Fig 2. The average number of citations is low in the initial years and jumps in 1999 and down in the following years. The fluctuations in average citations indicate changing research trends and importance over the years. The increase starting from

Table 2. Document type distribution of research publications.

S. No.	Document type	Number of publications	Total citations	Average citations
1	Article	8211	248605	30.28
2	Conference paper	1494	7526	5.04
3	Review	1288	58364	45.31
4	Book chapter	633	1327	2.10
5	Letter	288	746	2.59
6	Note	151	1929	12.77
7	Editorial	140	919	6.56
8	Book	60	160	2.67
9	Short survey	31	791	25.52
10	Retracted	13	187	14.38
11	Erratum	10	23	2.30
12	Data paper	1	1	1.00
Total		12320	320578	26.02

2007 may reflect growing attention to disability studies, possibly due to increased societal awareness and policy focus. The increase in citations in recent years suggests a growing interest in research and interdisciplinary collaborations. The collaborations can further enhance the quality and impact of research in the field of disabilities.

7.4 Bradford Laws

According to Bradford's law of scattering, the number of pertinent articles in each zone equals the core, which can represent a subject as a series of zones beginning with a "core" and expanding outward. Account for those articles of importance; an increasing number of journals are located in each zone. The multiplier was used to determine Bradford's law of verbal formulation by dividing the number of journals in one zone by the number of journals in the zone before it. Three areas were designated for the publications. Fig. 3 reveals that there are 3 Zones, i.e. Zone 1 (92), Zone 2 (661), and Zone 3 (3126). "Neurology India" journal has the highest frequency (192), followed by "Indian Journal of Pediatrics" (166), "Indian Journal of Leprosy" (144), "Indian Pediatrics" (139), and so on. The number of journals has exponentially increased from one zone to the next, proving Bradford's law of scattering.

7.5 Top Ten Sources on Disability Literature

Research on disabilities has been published in various sources. Table 3 lists the top ten journals with the number of publications (NP), CiteScore, SJR, SNIP, coverage status in Scopus, and rank. "Neurology India" is the most prolific journal, with 192 publications, followed by "Indian Journal of Pediatrics", with (166) publications, "Indian Journal of Leprosy" (144), "Indian Pediatrics" (139), "Annals of Indian Academy of Neurology" (133), "Indian Journal of Psychiatry" (113), "Journal of Clinical and Diagnostic Research" (110), "Indian Journal of Public

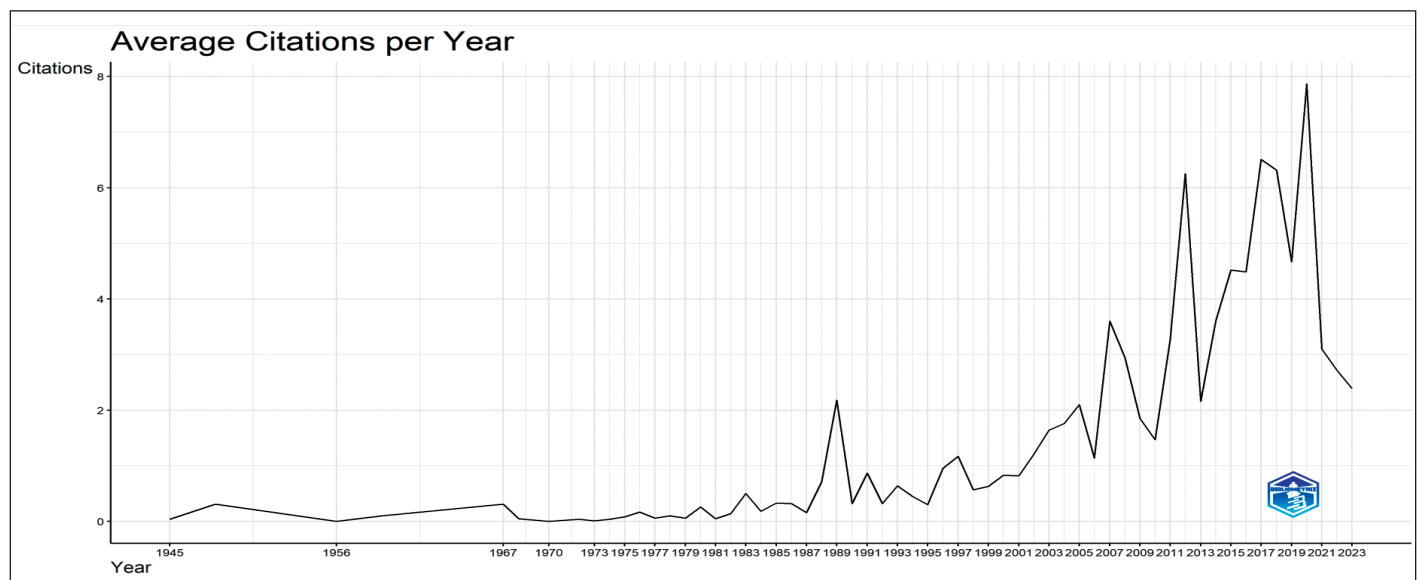


Figure 2. Average article citation per year laws (Figure sources: RStudio).

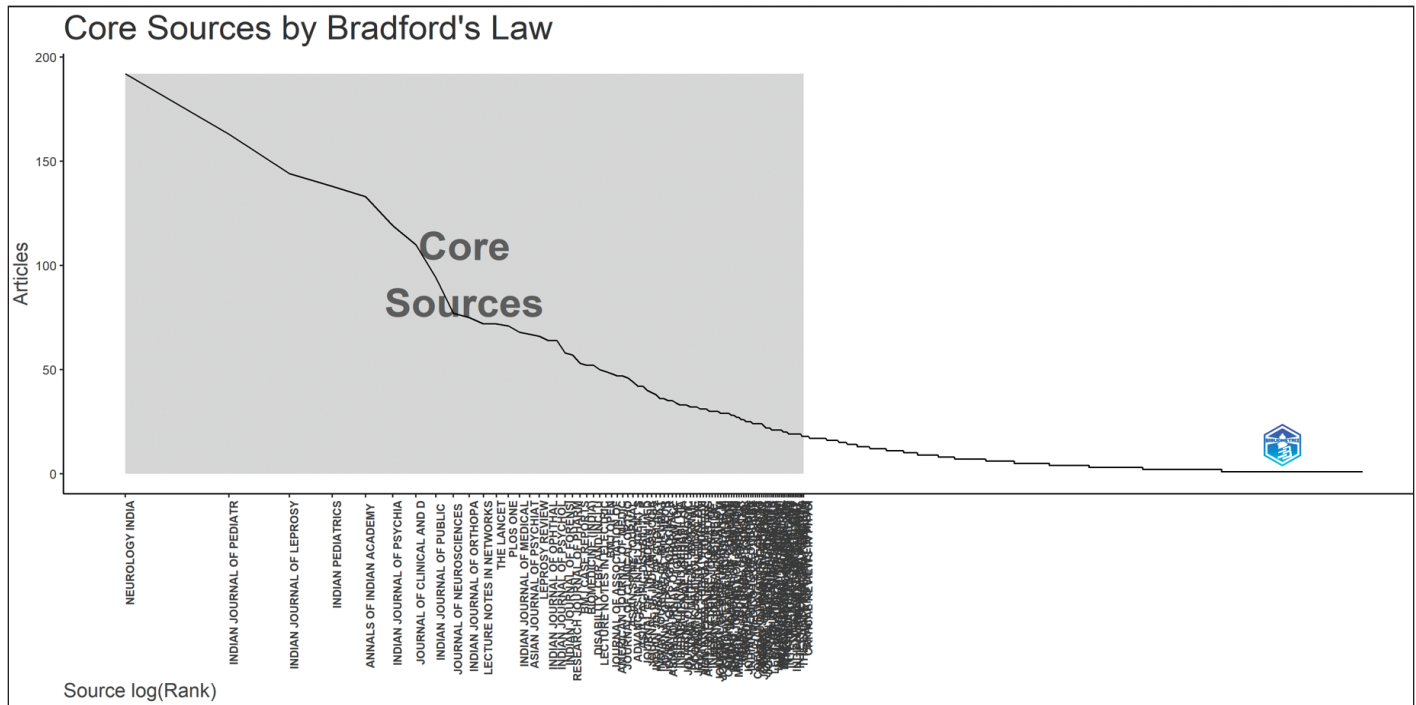


Figure 3. Bradford laws (figure generated with RStudio).

Health Research and Development” (94) and other journal details is given in Table 3. “Neurology India” is having the highest number of documents with moderate CiteScore, SJR, and SNIP. “Indian Journal of Pediatrics” and “Indian Journal of Psychiatry” have high CiteScore, SJR, and SNIP, indicating significant influence and citation in the fields. Educational institutions and research organisations can encourage students and early-career researchers to publish in high-impact journals for their work, enhancing their academic and professional development.

7.6 Authorship Pattern

Table 4 represents the authorship pattern distribution. The analysis shows a total publication of 12320 contributed by 103284 (43820 unique) authors. Consequently, the paper

reveals an average of 11.92 authors for each document. Out of 12320 documents, 1025 were contributed by a single author, followed by 2298 by two authors, 2280 by three authors, 1992 by four authors, 4725 by five and more than five authors. This table shows that of the total 12320 papers, double-authored documents make up the most considerable percentage, followed by three-authored documents. The distribution of authors between single and multiple authors is strikingly different, according to the authorship pattern. Multiple authors publish fewer articles. From 1945 to 1974, single-author publications were the most common, but this trend has reversed in recent years. The trend of collaboration has increased over the years. The number of publications with five or more authors has surged from 2 in 1945-1974 to 3777 in 2015-2023.

Table 3. Top 10 most prolific source titles

Sources	No. of doc.	CiteScore 2022	SJR 2022	SNIP 2022	IF (2023)	Coverage status in scopus	Rank
Neurology india	192	1.6	0.448	0.764	0.9	Till Present	1
Indian journal of pediatrics	166	6.7	0.613	1.159	2.1	Till Present	2
Indian journal of leprosy	144	0.4	0.180	0.242	-	1984 to 2023	3
Indian pediatrics	139	3.0	0.450	0.772	1.7	Till Present	4
Annals of indian academy of neurology	133	2.3	0.334	0.654	1.9	Till Present	5
Indian journal of psychiatry	113	4.4	0.771	1.049	1.7	Till Present	6
Journal of clinical and diagnostic research	110	1.2 (2017)	0.289 (2019)	0.409 (2021)	-	2009 to 2018	7
Indian journal of public health research and development	94	0.1 (2018)	0.124 (2019)	0.156 (2022)	-	2010 to 2019	8
Journal of neurosciences in rural practice	77	2.2	0.343	0.717	0.8	Till Present	9
Indian journal of orthopaedics	75	1.6	0.381	0.669	1.1	Till Present	10

7.7 Degree of Collaboration

The degree of collaboration can be measured using the formula given by Subramanyam¹⁷. The Degree of Collaboration in the current study is 0.91.

$$\text{Degree of collaboration DC} = \frac{Nm}{Nm + Ns}$$

$$\text{DC} = \frac{11295}{12320} = 0.92$$

DC = “Degree of collaboration”

Nm = “Number of Multiple authors”

Ns = “Number of Single authors”

Table 5 summarises the Degree of Collaboration (DC) for all of the research data sets from 1945 to 2023 among the six clusters. It measures two essential metrics: Ns (single-author works) and Nm (multi-author works). The sum of these two measurements (Ns+Nm) represents the overall production for each time cluster. This table explicitly states that the overall DC for the entire period is 0.92.

7.8 Co-Authorship on Country Keyword Plus Word Cloud

Figure 4 presents keyword plus in the field of Disability. They have chosen Keyword Plus with 50 words. Word cloud displays that the author’s keyword “Human” has the highest occurrence (7578). In contrast, the words “male” (6786), “female” (6698), “article” (5372), “adult” (5082), “humans” (4458), “India” (3579), “child” (2858), “middle-aged” (2426), and “adolescent” (2273) and so on.

7.9 Authors Productivity Over Time

Figure 5 depicts the researchers’ output over time and lists the ten authors who have contributed to Disability for at least 79 years in the data set. The dot’s size represents the number of papers that have been published, and the colour’s saturation represents the total number of citations every year¹⁸. Despite the fact that the study took the data set from 1945 to 2023 into account, the figure depicts productivity as of 1970. This figure describes only ten author data, namely “GUPTA A”; “GUPTA R”; “GUPTA S”; “KUMAR A”; “KUMAR R”; “KUMAR S”; “SHARMA A”; “SHARMA S”; “SINGH A”; and “SINGH S.” Other descriptive data are attached on annexure.

7.10 Co-Authorship on Country

The worldwide interconnection of co-authors is determined based on the number of documents they work together. Co-author on the country selected from “types of analysis” and chosen from a “unit of analysis”; Counting method: full counting/fractional counting, and countries with a minimum of five documents taken for analysis. Of the 254 countries, 103 meet the thresholds. For each country, total strength of co-authorship links with the other country was calculated and sources with the greatest total link strength were selected (Hursen, 2023). Full item found (103), cluster (06). Fig. 6 (a) shows that Cluster 1 have (40) items, Cluster 2 have (31), Cluster 3 have (18), Cluster 4 have (09), Cluster

Table 4. Year-wise authorship pattern

Cluster (Years)	One author	Two author	Three author	Four author	Five=> author
1945-1974	17	11	4	0	2
1975-1984	26	26	27	5	11
1985-1994	31	29	20	17	25
1995-2004	99	94	79	77	106
2005-2014	288	489	483	448	804
2015-2023	564	1649	1667	1445	3777
Grand Total	1025	2298	2280	1992	4725

Table 5. Degree of collaboration

Cluster (Years)	Ns	Nm	Ns+Nm	DC
1945-1974	17	17	34	0.50
1975-1984	26	69	95	0.73
1985-1994	31	91	122	0.75
1995-2004	99	356	455	0.78
2005-2014	288	2224	2512	0.89
2015-2023	564	8538	9102	0.94
Grand Total	1025	11295	12320	0.92

(08), Cluster 5 have (07), Cluster 6 have (07), Cluster 7 have (06), Cluster 8 have (06), Cluster 9 have (06), Cluster 10 have (06), Cluster 11 have (04) and Cluster 12 have (02).

Total Links: 193

Total Link Strength: 417

7.13 Bibliographic Coupling of Country

The bibliographic coupling of the countries that are covered in Disability is shown in Fig. 6(d). When two publications cite another publication from a third country, this is known as a bibliographic coupling of countries. The data shows how frequently nations like the UK, Spain, England, Germany, and the Netherlands couple. 103 of the 254 nations satisfy the requirements. The overall strength of the bibliographic coupling linkages between each of the (103) countries was calculated, and the nations with the highest total link strength were chosen. Cluster (5), total item discovered (102). Fig. 6(d) reveals that Cluster 1 have (41) items, Cluster 2 have (31), Cluster 3 have (13), Cluster 4 have (09), Cluster 5 have (08). This data reveals that India significantly impacts Disability and is interconnected with other nations. Total Links: 4655

Total Link Strength: 2259209

7.14 Bibliographic Coupling on Organisation

When publications from two institutions cite publications from a third standard institution, this is referred to as a bibliographic coupling of institutions. Fig 6(e) shows the intricate connections between the institutions seen in Disability. (179) of the (29118) organisations meet the requirements. The (179) organisations' total link strength with the other organisation was calculated for each organisation, and the one with the highest total link strength was chosen. Cluster (14), whole item (175)

discovered. Fig. 6(e) reveals that Cluster 1 have (62) items, Cluster 2 have (28), Cluster 3 have (25), Cluster 4 have (11), Cluster 5 have (10), Cluster 6 have (08), Cluster 7 have (07), Cluster 8 have (06), Cluster 9 have (05), Cluster 10 have (05), Cluster 11 have (02), Cluster 12 have (02), Cluster 13 have (02) and Cluster 14 have (02).

Total Links: 3055

Total Link Strength: 47014

7.15 Most Globally Cited Publications

The top 10 highly cited papers are given in Table 6. "A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: A systematic analysis for the Global Burden of Disease Study 2010" (20) received the highest citations (8877), followed by "Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: A systematic analysis for the Global Burden of Disease Study 2013"(8397 citations) (21), and paper "Global, regional, and national incidence, prevalence, and years lived with disability for 354 Diseases and Injuries for 195 countries and territories, 1990-2017: A systematic analysis for the Global Burden of Disease Study 2017"(6899 citations)²⁴.

8. CONCLUSION AND CRITICAL FINDINGS

The study thoroughly explained the quantitative analysis of data gathered on disability topic literature found from the bibliographic databases SCOPUS using VOSviewer and Rstudio's visualisation tools. The literature produced by global studies on disabilities has been examined in the context of Indian research output. The study's findings were provided to ascertain the growth in publication trends for literature by

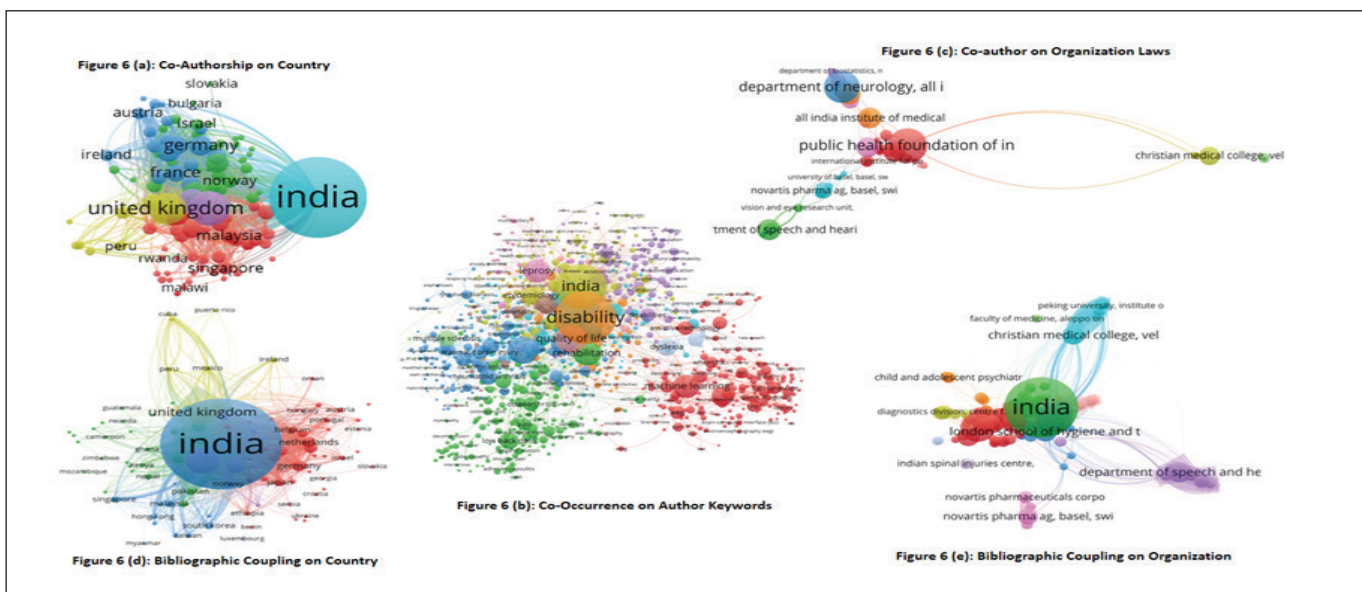


Figure 6. (a) Co- authorship on Country; (b) Co-Occurrence on author keywords; (c) Co- author on organisation laws; (d) Bibliographic coupling on country; (e)Bibliographic coupling on organisation.

Table 6. Most globally cited publication

Title	Year	Citation	Journal name
“A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: A systematic analysis for the Global Burden of Disease Study 2010” (20)	2012	9253	The Lancet
“Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: A systematic analysis for the Global Burden of Disease Study 2013” (21)	2014	8868	The Lancet
“Global, regional, and national incidence, prevalence, and years lived with disability for 354 Diseases and Injuries for 195 countries and territories, 1990-2017: A systematic analysis for the Global Burden of Disease Study 2017” (22)	2018	8377	The Lancet
“Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019” (23)	2020	7540	The Lancet
“Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990-2010: A systematic analysis for the Global Burden of Disease Study 2010” (24)	2012	6838	The Lancet
“Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990-2010: A systematic analysis for the Global Burden of Disease Study 2010” (25)	2012	6141	The Lancet
“Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015” (26)	2016	5359	The Lancet
“Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990-2013: A systematic analysis for the Global Burden of Disease Study 2013” (27)	2015	5046	The Lancet
“Global Burden of Cardiovascular Diseases and Risk Factors, 1990-2019: Update From the GBD 2019 Study” (28)	2020	4314	Journal of the American College of Cardiology

country, year, block year, language, and document type. In this study, Publications data included in the Scopus database alone have been taken up for the study. Furthermore, 12320 data have been identified from the Scopus database listed from 1945 to 2023 only taken up.

According to the study, a total of 320578 citations were received. Enamurately, the study reveals that 3879 sources covered 12320 publications from 1945 to 2023, with a 9.95 % annual growth rate, 7.37 is the document average age, and the Average citations per document is 26.02. It also reveals that 8.39 are Co-Authors per Document, with 22.53 % of international co-authorships in the study. The article document types produced the highest publications and citations among the various research contributions (8211, 248605). In the authorship pattern of collaboration, 1025 publications are single, and two authors contributed a maximum number of publications (2298). In the year 2017 received, the highest number

of citations was 35340. This study shows that Indian researchers have a strong collaboration worldwide and a robust bibliographic coupling. The study’s results will help the researcher, academicians, policymakers, and administrators.

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