ORIGINAL RESEARCH

Current Trends in Chronic Non-Communicable Disease Management: A Bibliometric Analysis of the Past Two Decades

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Background: In recent years, there has been a growing focus on chronic non-communicable diseases (NCD) and their impact on personal and social health. Effective management of NCD is essential for their prevention and treatment. This study aims to utilize bibliometric methods to analyze and summarize the current development and emerging trends in NCD management.

Methods: A literature search and screening were conducted on the Web of Science Core Collection database from January 1, 2004, to December 31, 2023. VOSviewer and Citespace software was performed to examine publication volume, authors, institutions, countries, journals, citation frequencies, keywords, clustering, and burst terms, and to create a visual map.

Results: A total of 996 valid publications from 464 journals were included in the study. The number of publications exhibited a gradual growth trend over the years. The United States was the most productive and influential country, contributing the highest proportion of both publications and total citations. BMC Health Services Research, Toronto University, and Marshall, Bruce C. were identified as the most productive journal, institution, and author, respectively. Further analysis of keyword co-occurrence and burst detection revealed that the most prevalent keywords were "improving primary care" and "integrated care".

Conclusion: This bibliometric analysis provides a comprehensive overview of the current status and trends in NCD management over the past two decades, providing valuable insights for future research directions. It indicates a potential shift towards enhancing primary healthy care, integrated care, and digital health.

Keywords: non-communicable diseases, bibliometric analysis, management, primary health care, integrated care, digital health

Introduction

Non-communicable Diseases (NCDs) are a group of diseases that develop over time without infectious transmission. Chronic NCDs include congenital disorders (eg, Down syndrome and neural tube defects), degenerative diseases (enlarged prostate, cataracts, and hearing loss), musculoskeletal problems (eg, back pain, arthritis, and gout), genitourinary conditions (infertility and kidney stones), mental health conditions (depression and schizophrenia), and the "big four": cardiovascular disease, diabetes, cancer, and chronic respiratory disease.[1] Unlike infectious diseases, NCDs are influenced by lifestyle, environment, and genetics.[2] According to the Global Burden of Disease study, NCDs contribute to more than 50% of the total disease burden and account for 74% of global deaths.[3] Treating these diseases is a lengthy and challenging process, often requiring comprehensive management. There is growing global attention to NCDs due to

the significant burden on individuals, families, governments, and healthcare systems.[4] NCD management effectively prevents and controls disease progression, reduces medical costs, and improves overall quality of life.[5] Therefore, NCD management is a crucial field in modern medicine and society. However, current publications on this subject are often fragmented, with limited studies exploring the comprehensive knowledge structure of NCD management.

Bibliometrics is an interdisciplinary field that utilizes quantitative methods to analyze the structure and characteristics of publication information. It integrates mathematics, statistics, library science, and information science into a comprehensive quantification-focused knowledge system.[6] With advancements in information technology and the Internet, various visualization tools, such as Citespace and VOSviewer, have emerged. These tools enable researchers to effectively analyze large volumes of publication data to understand development trends and emerging topics.[7,8]

With the strengthening of policy services and the improvement of medical technology, significant progress has been made in NCD management in various countries.[9] However, most current studies rely either on descriptive qualitative analysis or perform quantitative analysis on individual common NCDs. Additionally, there is a lack of reporting on quantitative studies on NCD management from a bibliometric perspective. In 2011, Mony et al conducted a bibliometric analysis of NCD-related research published in Indian journals.[10] However, this study may not accurately reflect the current status, challenges, and future directions of global NCD management due to journal restrictions and incomplete methodologies.

This study aims to systematically review studies on the management of chronic NCD over the past 20 years using bibliometric analysis. The research development process and current status will be visually depicted to provide a clear overview. Additionally, an evaluation of the current research focus and emerging trends will be conducted to offer insights for future research directions.

Method
Data Source and Search Strategy
We searched studies published in the past 20 years from the Web of Science Core (WOS) Collection between January 1, 2004, and December 31, 2023. The search utilized the following terms: (TS= ("Chronic non-communicable disease management" OR "Chronic disease management" OR "Chronic disease management service").

Inclusion and Exclusion Criteria
Publications were limited to articles and reviews published in English. Studies meeting any of the following exclusion criteria were excluded: 1) The main body of the research was not relevant to NCD management; 2) Non-academic paper type data included: meeting abstract, editorial material, early access, letter, book chapters, proceeding paper, correction, and news item. Two reviewers (YQD and SYX) independently assessed the titles and abstracts. Any discrepancies between reviewers were resolved through consensus or referred to a third reviewer (CMA).

Data Analysis and Visualization
Two independent reviewers (HYX and YX) extracted bibliometric data from the studies, including author, institution, country, publishing journal, impact factor, publication year, citation frequency, keywords, citing references, and cited references. Discrepancies between the two reviewers were resolved by a third reviewer (SYX). Microsoft Office Excel, VOSviewer, and Citespace were used to visualize general trends, distributions, and hotspots. Detailed information of the analysis is available in the supplementary material S1–S3.

Results
Study Inclusions
A total of 1371 studies were initially identified through the search process. Of these, 197 studies were excluded for the following reasons: 87 were meeting abstracts, 56 were editorial materials, 16 were early access, 14 were letters, 15 were book chapters, 3 were proceeding papers, 5 were corrections, and 1 was a news item. Additionally, 8 non-English studies were excluded. We carefully reviewed the titles and abstracts of the remaining 1166 studies. Finally, 996 studies were included in the bibliometric analysis (Figure 1).
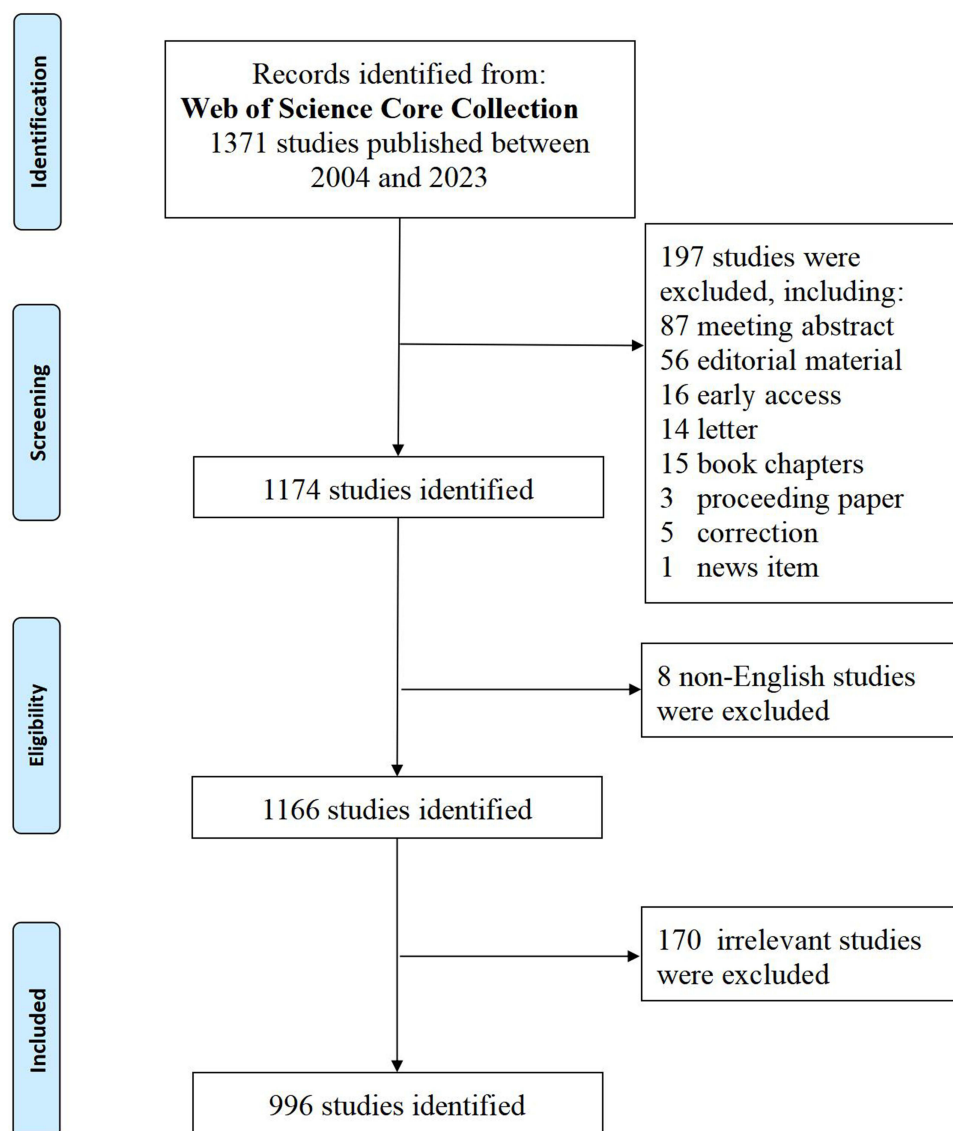
Figure 1 Flow chart of study selection.

Analysis of Annual Publication Trends

Over the past 20 years, publications on NCD management have steadily increased. From 2004 to 2009, the field experienced slow growth, averaging 15.3 studies per year, with a peak of 26 in 2008. However, from 2010 to 2023, there was a rapid increase in publications, averaging 64.6 studies per year, with the highest number of publications was recorded in 2021 at 120 studies, indicating a growing scholarly interest in this field. Additionally, the publications on NCD management have been cited 19,602 times, with an average of 19.64 citations per study (Figure 2A). The United States of America (USA), Australia, and Canada were early contributors to NCD management research, while China's research started relatively later but has been steadily increasing since 2014 (Figure 2B).

Analysis of Countries

Researchers from 73 countries published a total of 996 studies on NCD management. The USA contributed the most, with 396 studies and 8767 total citations. Among the top 10 countries, there are six European countries, two North American countries, China, and Australia. Although Scotland ranks tenth in the number of publications, it has the highest average citation rate. Canada ranks third in publications, holds the second-highest average citation rate, indicating high
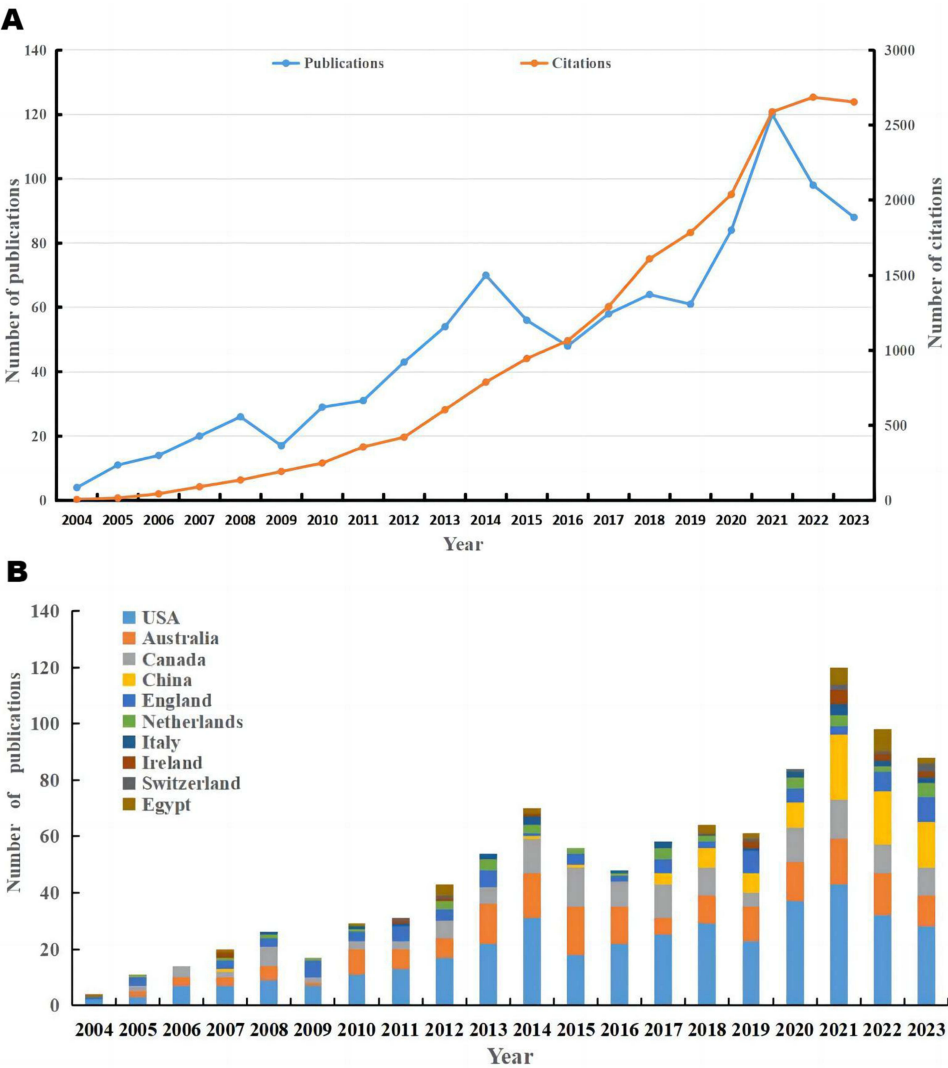
A

B

Figure 2 Analysis of annual publication trends. (**A**) The annual number of publications and citations from 2004 to 2023. (**B**) The distribution trend of the countries by year.

research quality in both Canada and Scotland. Notably, Germany and China exhibit lower average citation numbers compared to the other top countries (Table 1).

The cooperative relationships between countries, which are essential for advancing technological development (Figure 3C). The co-authorship network is divided into seven clusters: the dark blue cluster represented by the USA and the United Kingdom (UK), the green cluster represented by China and Australia, the red cluster represented by

Table 1 The Top 10 Countries with the Highest Publications

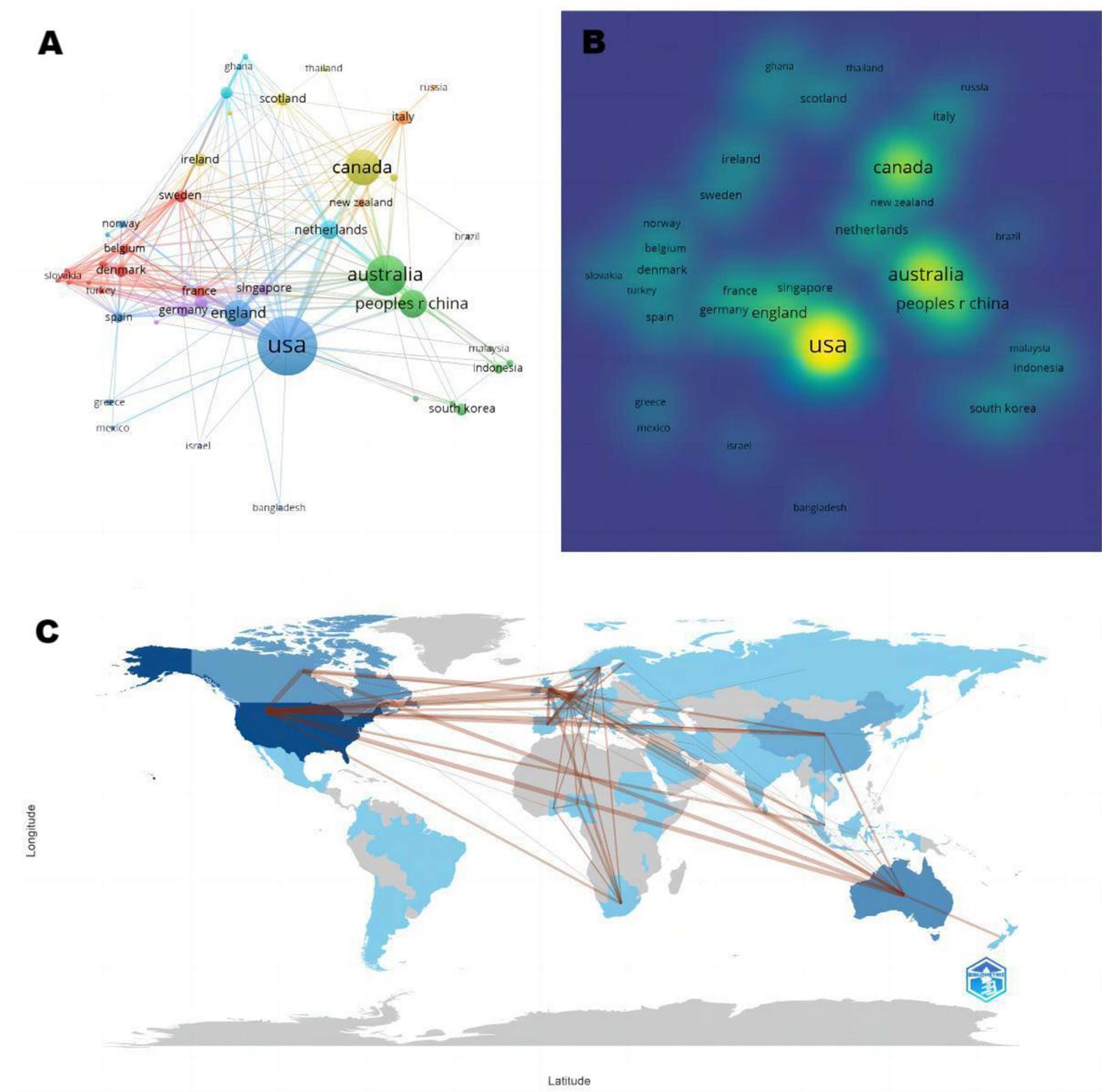| Country	Number of Articles	Total Citations	Average Citations
USA	396	8767	22.14
Australia	185	3963	21.42
Canada	145	4026	27.77
China	87	1035	11.90
England	83	2159	26.01
Netherlands	41	1093	26.66
Italy	22	494	22.45
Ireland	20	542	27.10
Switzerland	20	404	20.20
Scotland	19	789	41.53

Figure 3 The bibliometric analysis of countries. (**A**) The co-authorship network among countries, with the size and color of circles representing publications and clusters. (**B**) The density visualization map among countries, the color depth representing citations. (**C**) The collaboration map among countries.

France, Denmark, and Sweden, the yellow cluster represented by Canada, Scotland, and Ireland, the sky-blue cluster represented by the Netherlands and South Africa, the purple cluster represented by Germany and Switzerland, and the orange cluster represented by Italy and New Zealand (Figure 3A). Figure 3B presents country density overlay, where different colors indicate the frequency of co-authorship between countries. The highest frequency is represented by the color yellow. These findings suggest that the USA, Australia, Canada, and China were the most cooperative countries.

Analysis of Institutions

The top 10 research institutions based on the number of publications are listed in Table 2. The University of Toronto and Monash University have the highest number of publications, with 34 and 31 respectively. In terms of citations, McMaster

Table 2 The Top 10 Institutions with the Highest Publications

Organization	Number of Articles	Total Citations	Average Citations
University of Toronto	34	904	26.59
Monash University	31	822	26.52
McMaster University	28	928	33.14
The University of Melbourne	27	635	23.52
The University of Sydney	25	637	25.48
The University of Queensland	24	325	13.54
University of Washington	19	283	14.89
The University of British Columbia	19	545	28.68
University of Alberta	17	339	19.94
Harvard Medical School	16	329	20.56
The University of Adelaide	15	186	12.40

University and the University of Toronto have the highest citation counts, with 928 and 904 citations, respectively. Furthermore, McMaster University also has the highest average citation count, followed by the University of British Columbia, the University of Toronto, and Monash University. These four institutions have an average of more than 28 citations per study.

The collaboration network analysis among institutions indicates that each point on the graph represents an institution, with the size of the point indicating the number of published studies, and the connections reflecting collaboration between institutions (Figure 4A). Based on the degree of collaboration, we categorized these institutions into four clusters with different colors. The graph indicates that the University of Toronto, Melbourne University, McMaster University, Ottawa University, Monash University, and Calgary University frequently collaborate with other institutions. Furthermore, we analyzed the temporal changes in these collaboration relationships (Figure 4B). The analysis reveals a steady increase in collaboration among institutions over time, positively impacting the development of the field.

Analysis of Authors

The top 20 most influential authors based on the H-index[11] have been listed in Table 3. Among these, six authors are from Canada, four from Australia, three from the USA, two each from China and Switzerland, and one each from England, Germany, and Nigeria. Marshall, Bruce C. has the highest H-index of 50, focusing on pulmonary cystic fibrosis research, with a total of 4 studies and 115 citations. The authors' collaboration network presents more than 4 clusters.
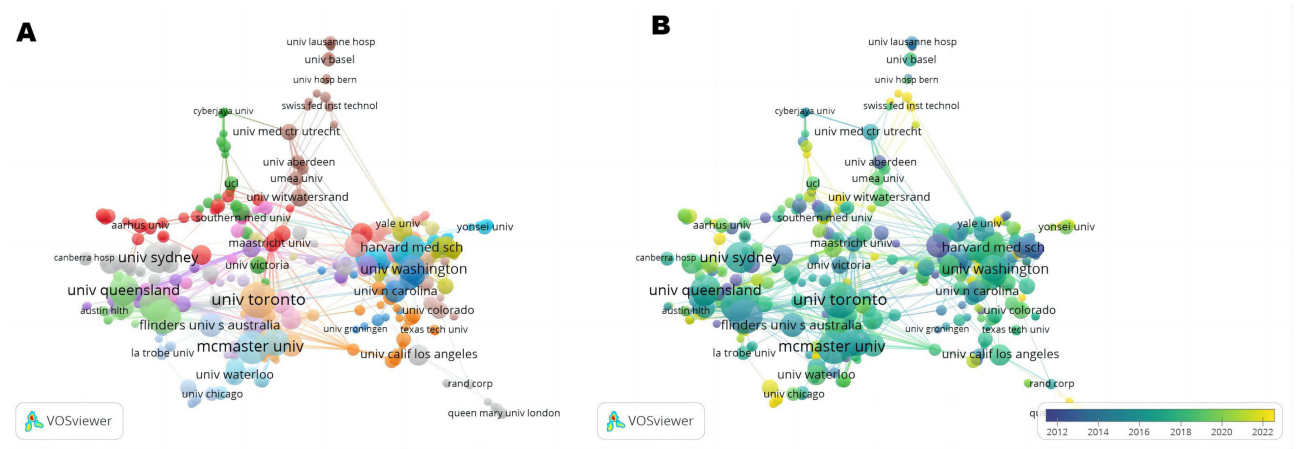

Figure 4 The bibliometric analysis of institutions. (**A**) The co-authorship network among institutions, with thicker lines indicate stronger collaborations. Larger circle size indicated more citations. (**B**) The co-authorship among active institutions, with color representing the average publication year.

Table 3 The Top 20 Most Influential Authors According to the H-Index

Author	H-index	Country	Total citations	Number of articles	Average citations
Bruce C. Marshall	50	USA	115	4	28.75
Mark Harris	42	Australia	121	4	30.25
Nicholas Zwar	37	Australia	296	4	74.00
Bernard Burnand	37	Switzerland	123	4	30.75
Scott A. Lear	35	Canada	52	4	13.00
Ping Yu	30	China	115	4	28.75
Richard Lewanczuk	29	Canada	57	4	14.25
Robyn P. Cant	28	Australia	72	5	14.40
Tolu Oni	25	England	30	4	7.50
Robert J. Graham	23	USA	157	4	39.25
Isabelle Peytremann-Bridevaux	22	Switzerland	140	5	28.00
Claire E. Kendall	19	Canada	123	4	30.75
Brodie M. Sakakibara	19	Canada	33	4	8.25
Elizabeth Patterson	15	Australia	131	6	21.83
Kristin J. August	15	USA	86	4	21.50
Limakatso Lebina	13	Germany	30	4	7.50
Soter Ameh	11	Nigeria	129	4	32.25
Mary Kawonga	10	Canada	30	4	7.50
Ning Deng	9	China	122	5	24.40
Julia Lukewich	9	Canada	54	4	13.50

Note: Definition of H-index: A scientist has an H-index of h if h papers have each been cited at least h times. A higher H-index indicates a greater overall citation count and reflects the significant impact of the scientist's research contributions.

Notably, collaborations are prominent among authors such as Presseau, Justin; Abdul-Razak, Suraya; Abdul-Hamid, Hasidah; and Ariffin, Farnaza (Figure 5).

Analysis of Journals

These publications originated from 464 journals. Table 4 lists the top 10 journals with the highest number of publications. Over the past two decades, BMC Health Services Research has published the most studies on NCD management, including 33 studies and 624 citations. Among the top 10 journals with the most studies, five of them have an average of more than 10 citations. Patient Education and Counseling has the highest average number of citations per article (32.57), followed by Journal of Medical Internet Research (25.62), BMJ Quality & Safety (25.55), Health Education & Behavior (20.35), and BMC Health Services Research (18.91).

The double-map overlay of journals shows the relationships between citing and cited journals. The citing journals are displayed on the left, and the colored paths on the right show the cited relationships. Two main reference paths are marked in green and azure. The green path indicates that studies published in medicine, medical, and clinical journals are cited by studies in health, nursing, and medicine journals. The azure path indicates that studies published in psychology, education, and health journals are cited by studies in health, nursing, and medicine journals (Figure 6).

Analysis of Keywords

In scientific articles, keywords play a crucial role in reflecting the research topic and identifying emerging trends in a specific research area. By analyzing the frequency and co-occurrence of keywords, it becomes possible to distinguish important topics and identify the latest developments in the field. Figure 7A illustrates four clusters (red, green, blue, and yellow) representing different research directions. Cluster 1 (red) contains 13 keywords, such as chronic disease management, diabetes, adults, and prevalence. Cluster 2 (green) contains 10 keywords, such as outcomes, self-management, people, and program. Cluster 3 (blue) contains 4 keywords, including healthy care, primary care, chronic illness, and model. Cluster 4 (yellow) contains 3 keywords, including health, quality, and impact.
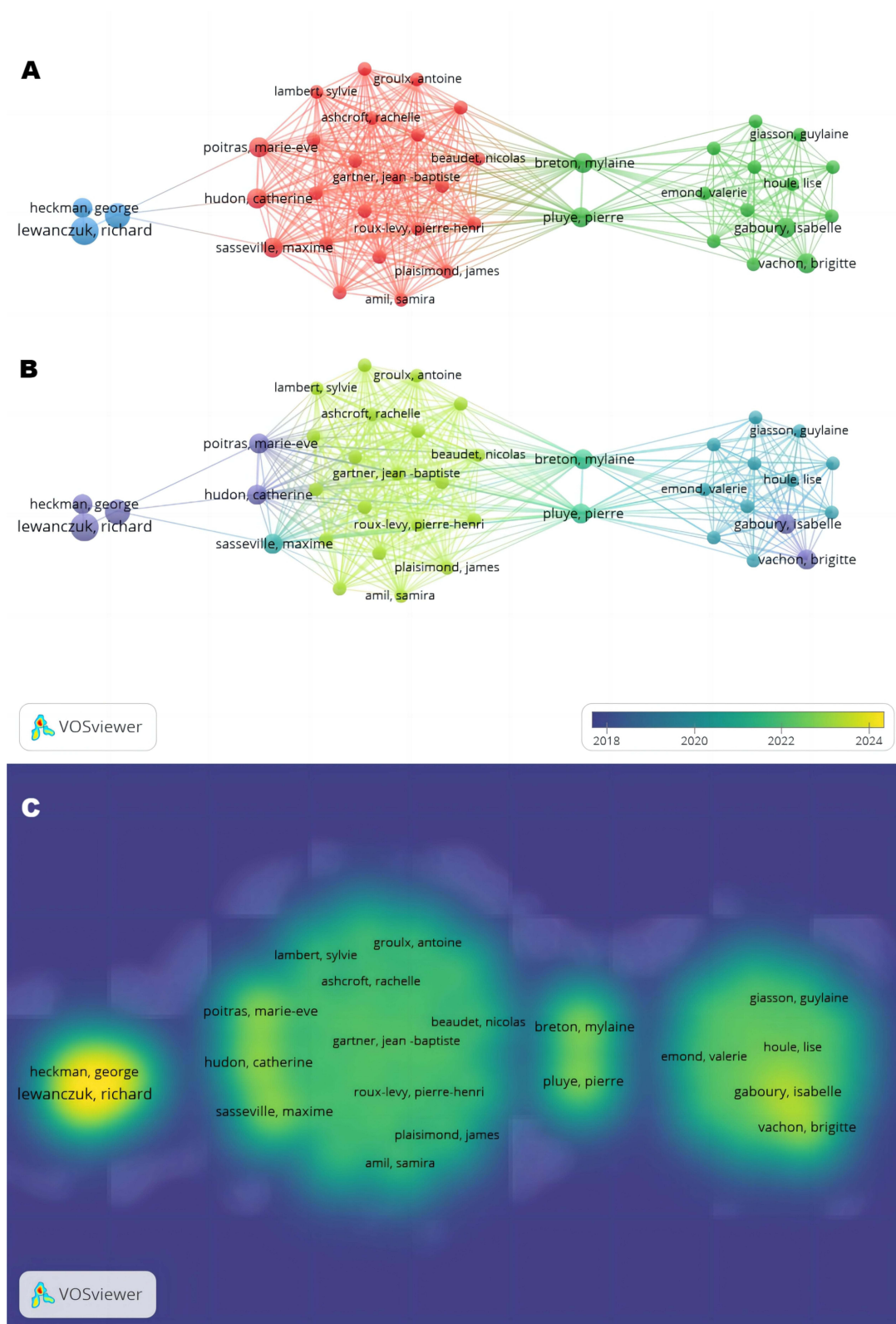
Figure 5 The bibliometric analysis of authors. (**A**) The co-authorship network among authors, with the size of circles representing publications and the color indicating the average citations. (**B**) The overlay visualization map showed that authors were colored according to the mean year the authors appeared in the studies. (**C**) The co-citation density visualization of authors, the color depth representing citations.

Table 4 The Top 10 Journals with the Most Publications in NCD Management

Journals	Number of articles	Total citations	Average citations	IF (JCR2023)
BMC Health Services Research	33	624	18.91	2.7
BMJ Open Quality	27	70	2.59	1.3
BMJ Quality & Safety	20	511	25.55	5.6
Health Education & Behavior	20	407	20.35	2.7
Australian Health Review	19	132	6.95	1.4
Int J Environ Res Public Health	17	154	9.06	—
Patient Education and Counseling	14	456	32.57	2.9
Australian Journal of Primary Health	14	105	7.50	1.2
Journal of Medical Internet Research	13	333	25.62	5.8
Frontiers in Public Health	12	44	3.67	3.0

Abbreviations: IF, Impact Factor; JCR, Journal Citation Reports.

In Figure 7B, the co-occurrence map of keywords with the selected time mode provides insight into the years when these keywords appeared. The use of darker colors signifies earlier appearances, while lighter colors indicate later occurrences. This visualization is helpful in identifying the evolving trends in the research themes of NCD management over time. The keyword density maps (Figure 7C) visually represent the distribution of high-frequency keywords. Table S1 presents the keywords sorted by frequency. The top 10 most frequently occurring keywords are chronic disease management (604), care (159), primary care (152), self-management (119), health (104), chronic disease (103), interventions (95), management (93), outcomes (82), and impact (81).

Analysis of Hotspots

Research hotspots indicate topics that receive significant attention within a field over a specific period. By quantitatively analyzing the keyword frequency and conducting clustering analysis, researchers can identify these hotspots. The primary research directions in NCD management include integrated care, healthcare quality improvement, primary health care, chronic care model, cardiovascular disease, chronic obstructive pulmonary disease, chronic disease management, and type 2 diabetes (Figure 8A). The timeline keyword plot reveals that integrated care, healthcare quality improvement, cardiovascular disease, and type 2 diabetes are recent clusters. This suggests that cardiovascular disease and type 2 diabetes are the primary chronic diseases focused on in NCD management. Notably, healthcare quality improvement and integrated care have emerged as significant research hotspots (Figure 8B).

Burst terms, which are keywords that suddenly increase in usage frequency within a short period of time, can help identify research frontiers in different time periods. Figure 9 presents the top 19 keywords with the most citation bursts.
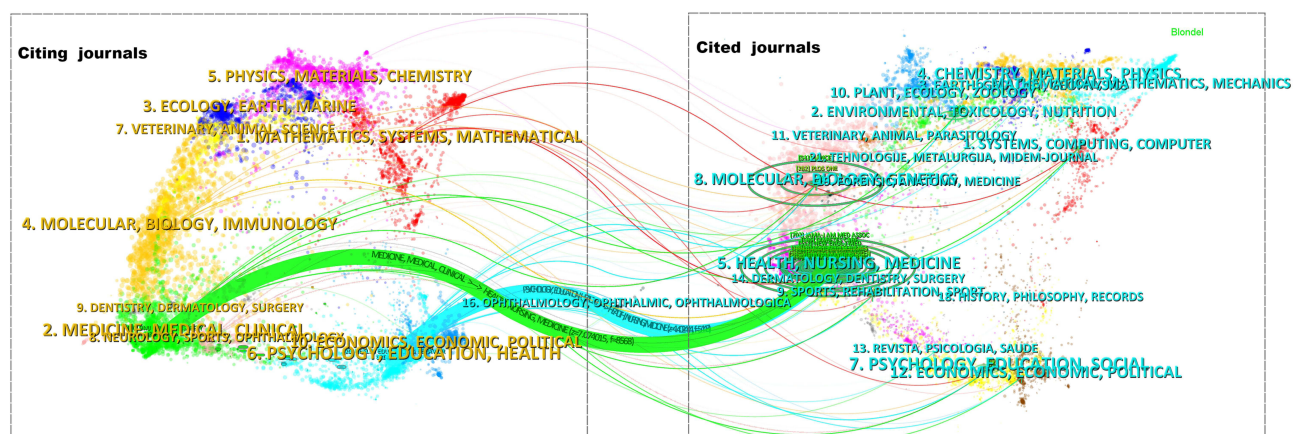

Figure 6 The dual-map overlay visually of journals that focus on NCD management. Each label on the map represents a different research subject covered by these journals. Different colored lines indicate different reference paths, starting from the citing journals on the left to the cited journals on the right.
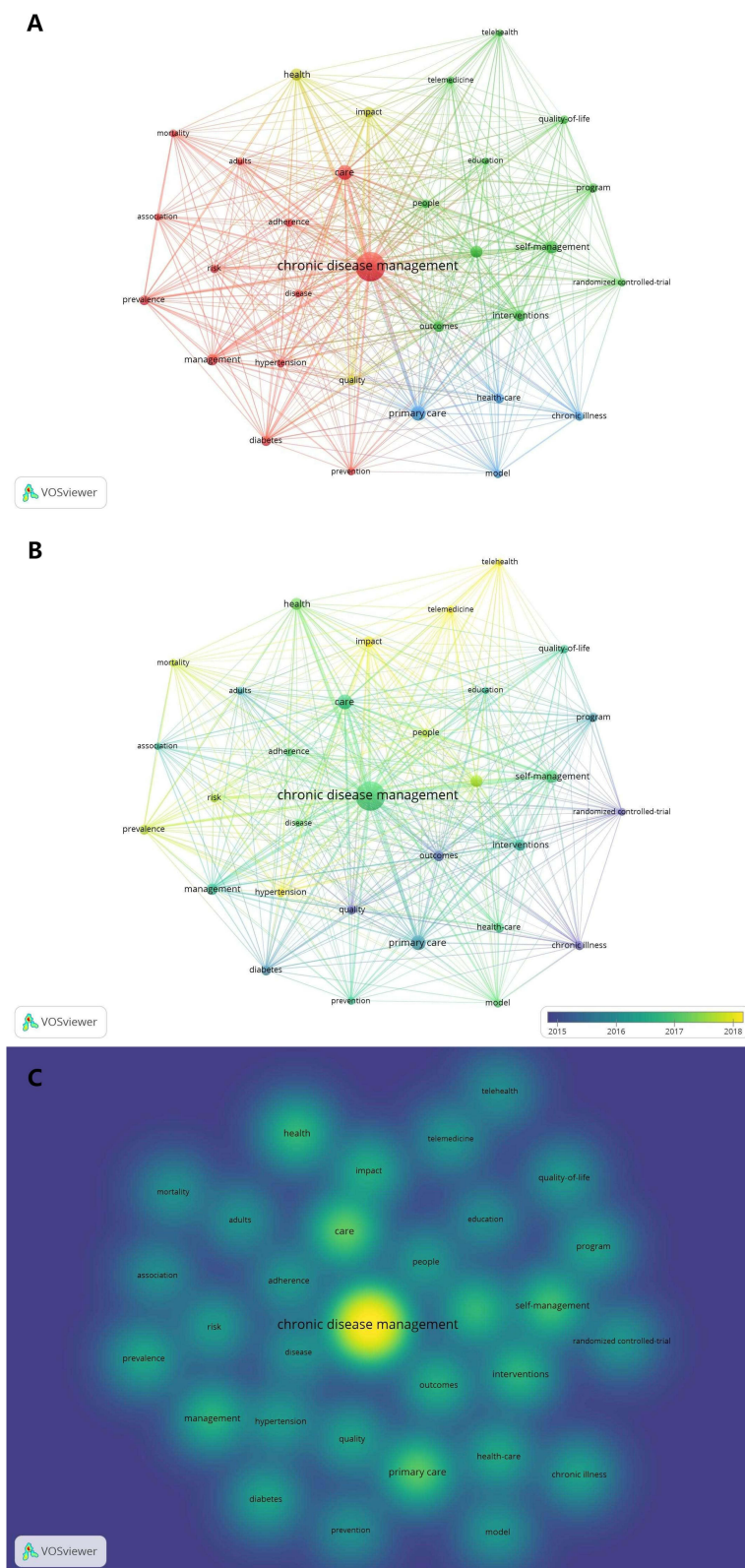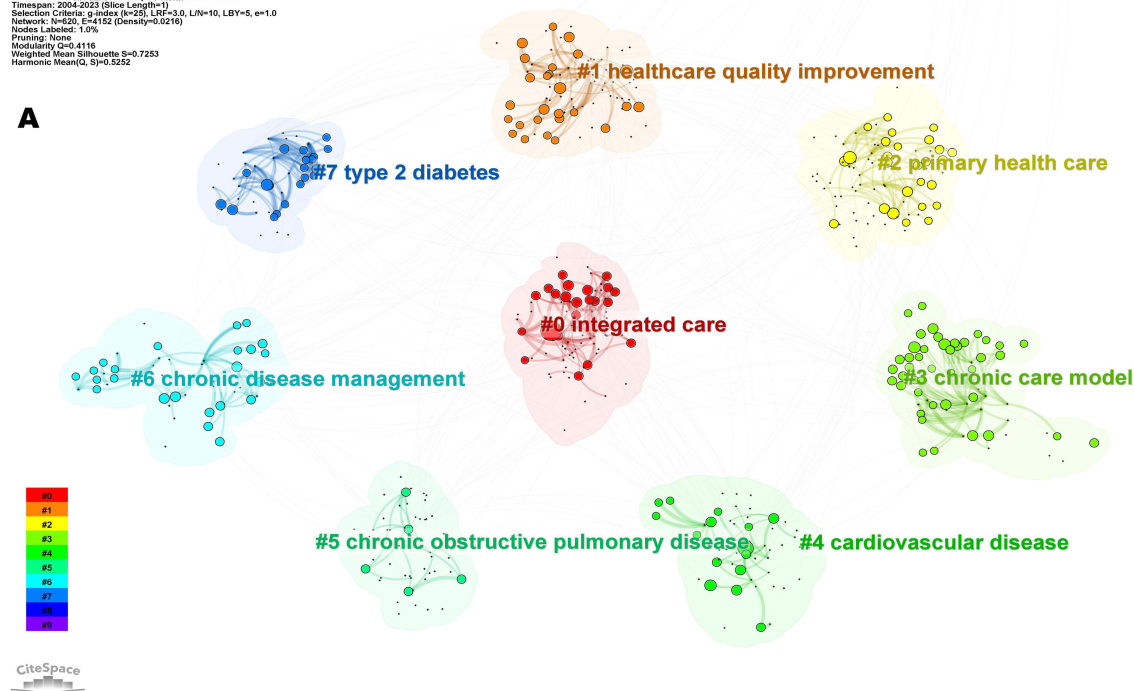
Figure 7 The bibliometric analysis of the keywords. (**A**) The co-occurrence network map of keywords. Those keywords with strong correlation were grouped into four clusters as indicated by different colors. (**B**) The overlay visualization map showed that keywords were colored according to the mean year the keywords appeared in the studies. (**C**) The density visualization of keywords. More intense colors indicate higher keyword frequency.
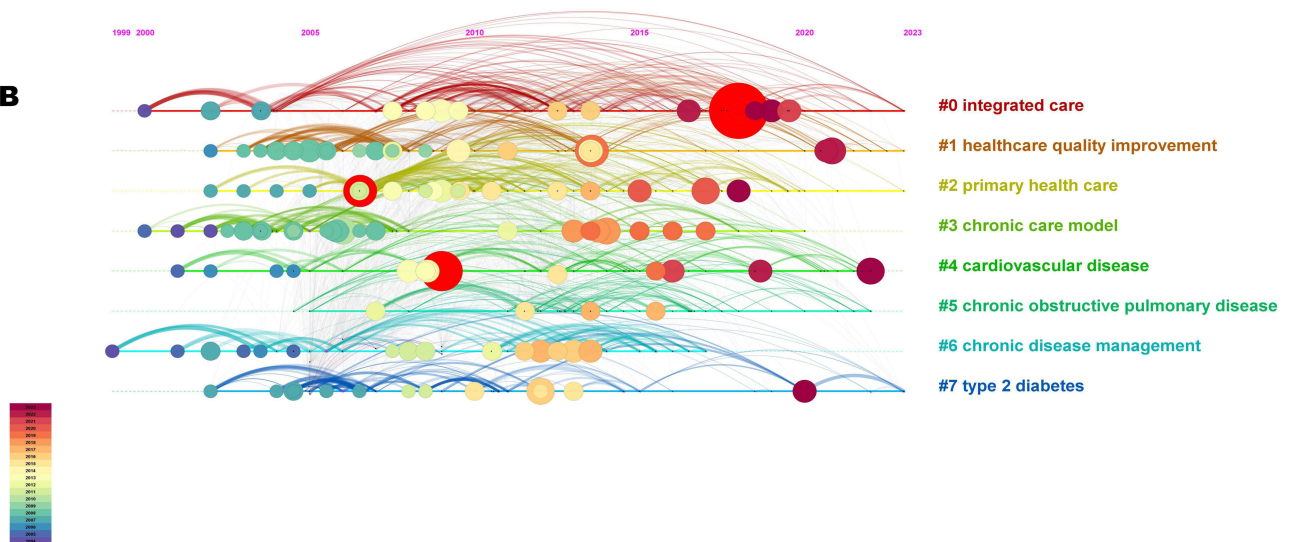
Figure 8 The bibliometric analysis of the trend topics. (**A**) Analysis of keywords cluster. (**B**) The timeline scope of co-citation analysis of author keywords, with each node on the same line representing different years and red nodes representing keywords in (**A**).

The primary research areas from 2004 to 2009 include improving primary care, randomized controlled trial, and chronic illness. Among these, chronic illness stands out as the strongest burst keyword (strength: 6.69), followed by improve primary care (strength: 4.61). From 2010 to 2014, the major research focuses are knowledge, quality improvement, health promotion, meta-analysis, quality of care, glycemic control, and disability. Among these, quality of care emerges as the strongest burst keyword (strength: 6.22), followed by knowledge (strength: 4.74). From 2015 to 2019, health behavior, cost effectiveness, systematic review, services, support, and disparity are the the primary areas of focus. Among these, services stand out as the strongest burst keyword (strength: 4.91), followed by cost effectiveness (strength: 4.21). From 2020 to 2023, the research hotspots shift towards chronic diseases, telehealth, and digital health. The strongest burst keywords in this period are telehealth (strength: 3.35) and digital health (strength: 3.14).
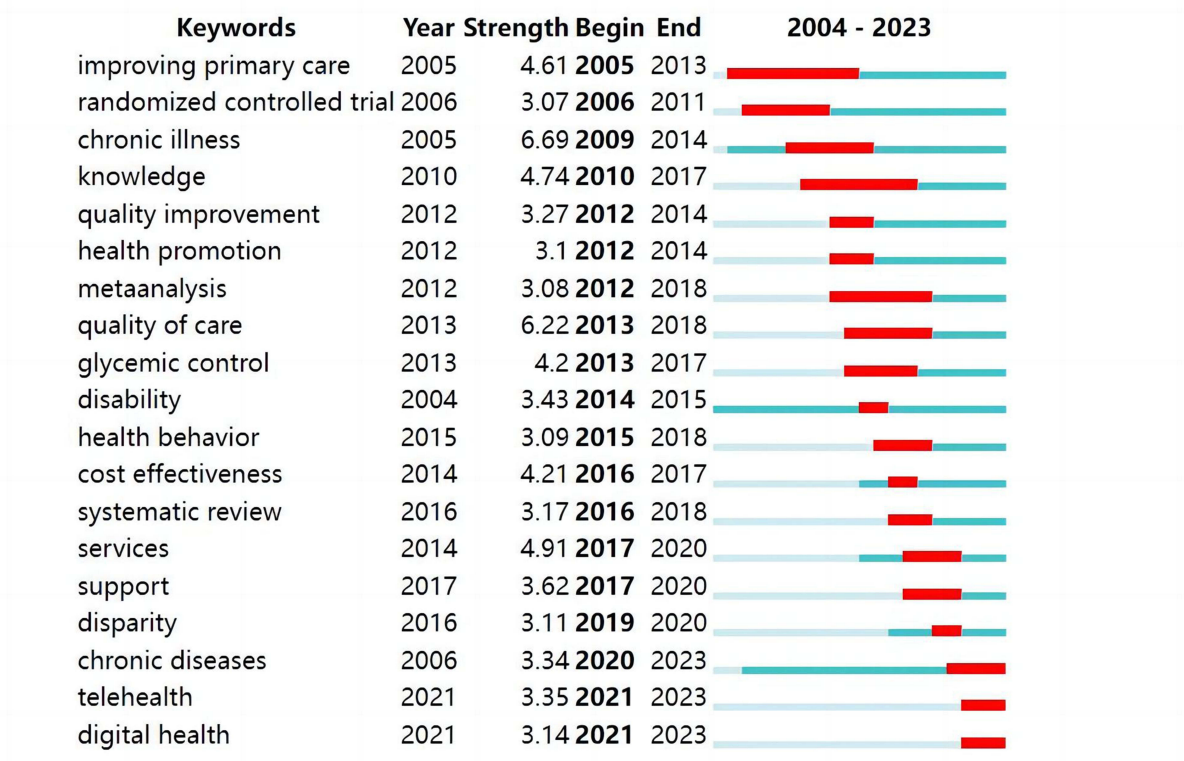
Top 19 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2004 - 2023
improving primary care	2005	4.61	**2005**	2013	
randomized controlled trial	2006	3.07	**2006**	2011	
chronic illness	2005	6.69	**2009**	2014	
knowledge	2010	4.74	**2010**	2017	
quality improvement	2012	3.27	**2012**	2014	
health promotion	2012	3.1	**2012**	2014	
metaanalysis	2012	3.08	**2012**	2018	
quality of care	2013	6.22	**2013**	2018	
glycemic control	2013	4.2	**2013**	2017	
disability	2004	3.43	**2014**	2015	
health behavior	2015	3.09	**2015**	2018	
cost effectiveness	2014	4.21	**2016**	2017	
systematic review	2016	3.17	**2016**	2018	
services	2014	4.91	**2017**	2020	
support	2017	3.62	**2017**	2020	
disparity	2016	3.11	**2019**	2020	
chronic diseases	2006	3.34	**2020**	2023	
telehealth	2021	3.35	**2021**	2023	
digital health	2021	3.14	**2021**	2023	

Figure 9 The top 19 keywords with the strong citation bursts from 2004 to 2023.

Discussion

General Information

This bibliometric analysis provides an overview of trends and hotspots in NCD management from 2004 to 2023. Despite extensive efforts to promote the prevention and treatment of NCDs, some low- and middle-income countries face limitations due to financial and resource constraints.[12] Additionally, factors such as population aging, societal stress, and the COVID-19 pandemic have significantly impacted policy implementation in high-income countries.[13] Overall, research publications demonstrate a fluctuating upward trend, indicating the development potential of NCD management.

As the number of studies in NCD management increases, research institutions and fields are becoming more diversified. However, among the top ten cited authors, only one is from China, and no organizations from developing countries appear among the top ten high-yield institutions. This suggests that China and other developing countries lack research institutions and influential researchers within these fields. The limited number of research institutions and authors presents challenges for developing countries.

The USA has the highest number of publications and total citations in NCD management. The most prolific journal (BMC Health Services Research) is from England, and the top-producing university (Toronto University) is in Canada. The most influential author (Marshall, Bruce C) is from the USA. These findings indicate significant inequalities in NCD management across various regions and socioeconomic groups. Developing countries should prioritize research quality over quantity and localize successful practices from other countries.

Development Trends of NCD Management

Over the past few decades, epidemiology has shifted from focusing on infectious diseases to NCDs in most countries. From 2004 to 2009, developed countries were the main contributors, conducting prospective research on the importance

of primary care in preventing NCDs, particularly cardiovascular diseases[14] and type 2 diabetes.[15] Additionally, Australia and the USA implemented policies to support national NCD strategies in primary care.[16] In contrast, developing countries primarily conducted retrospective studies and cross-sectional surveys during this period. These studies explored associations between various NCDs,[17] risk factors,[18] interventions for specific diseases,[19] and health surveys.[20] Notably, China, as the largest developing country, experienced an epidemiological transition toward NCDs during this time and gradually initiated relevant actions.[21]

During the period from 2010 to 2014, there was an increasing focus on the "quality of care" for NCDs. Trish Groves emphasized the need to enhance the quality of care in NCDs as early as 2005.[22] These studies encompassed the following areas: 1) Exploring the relationship between Primary health care (PHC) improvement and quality of care enhancement, with practical methods identified.[23,24] 2) Evaluating the impact of health policies such as reimbursement,[25] payment,[26] and accountability[27] on the quality of care in developed countries like the USA, the UK, and Japan. 3) Developing new indicators or methodologies to assess the quality of care.[28,29] 4) Enhancing the quality of care for specific NCDs, such as inflammatory bowel disease,[30] decompensated cirrhosis,[31] heart failure,[32] and cancer.[33] Another important burst keyword is "knowledge", primarily focusing on patient education[34] and the enhancement of knowledge and skills among medical staff.[35]

Between 2014 and 2019, the keyword 'services' experienced significant growth. This included not only medical services from various healthcare institutions,[36] but also the roles of public health services[37] and social services[38] in NCDs. Another significant burst keyword was "cost effectiveness", which primarily related to analyses in three areas: NCD screening,[39] treatment interventions,[40] and government policy implementation.[41] These keywords emphasize the need for collaboration among governments, communities, commercial entities, and educational institutions in NCD management. The management of NCDs has expanded beyond clinical research to encompass multidisciplinary fields such as public health and economics.

We must emphasize the potential increase in the burden of NCD in many countries due to the COVID-19 pandemic. The pandemic disrupted services for NCD prevention and treatment, impacting the implementation of related policies. A major challenge has been the interruption of medical services for NCD patients requiring regular follow-up or long-term care.[42] Additionally, widespread lockdown measures hindered the progress of NCD policies.[43] The disruption in access to NCD medications, food shortages, and confined lifestyles had immediate detrimental effects on NCD policies.[44] Therefore, the burst keywords from 2020 to 2023 in the context of the COVID-19 are "telehealth" and "digital health".

With advancements in communication technology, the use of telehealth is rapidly increasing. Telephone and video conferences are the most common telehealth technologies in PHC for remote patient assessments, allowing evaluations at home without in-person visit. This approach not only prevents the spread of infections among patients and healthcare staff but also saves time.[45] Additionally, the rapid development of big data and artificial intelligence will enable more precise, comprehensive, and efficient research on NCDs. These studies will enhance understanding of factors influencing NCDs, support the formulation of health policies aligned with social development, and promote breakthroughs in healthcare systems for quality improvement.[46]

Hotspots and Frontiers of NCD Management

Based on bibliometric analysis, we hypothesize that improvement of PHC, integrated care, and digital health are potential future research areas in NCD management.

PHC provides accessible essential health services to individuals, families, and communities, including initial treatment for acute and chronic conditions, preventive measures, and health promotion services.[47] It serves as the foundation for preventing and controlling NCDs. Increased PHC visits are associated with fewer specialist visits, reduced hospitalizations, and lower medical costs.[48]

Further improvements in PHC are necessary to address several persistent challenges: 1) Social disadvantages, racial discrimination, regional variations, health disparities (equity and inequality), communication barriers, and a lack of social connectedness with indigenous cultures affect the accessibility, acceptability, and quality of PHC.[49] 2) The effective management of NCD in low-income areas relies heavily on primary care physicians, who often have limited medical education and training. Therefore, enhancing the quality of training for these PHC providers is essential.[50] 3) PHC facilities

primarily rely on government funding; however, many governments currently lack sufficient financial investment. Additionally, the economic strain caused by the COVID-19 pandemic has further limited investment in NCD management.[51]

Integrated care emphasizes a "multidimensional" approach in NCD management. It envisions a healthcare system where various components, including medical specialties (doctors, nurses, medical management), systems (local, regional, national), and types of care (primary, secondary, tertiary, social care), work together seamlessly.[52] This integration aims to bridge boundaries between domains and create a comprehensive approach to healthcare.

The challenges of integrated care in the future: 1) Effective governance arrangements are essential for successful NCD management. The optimal structuring of these arrangements, which should include accountability, oversight, and distributed leadership, remains a topic of ongoing discussion, particularly regarding national, regional, and local contexts. 2) There are still methodological challenges in evaluating complex care measures. Current methodologies inadequately address the complexities of these initiatives and their interaction with national, regional, and local contextual factors.[53] 3) Elderly individuals represent an important demographic requiring integrated care, as their care pathways are intricate, involving the management of multiple chronic diseases, psychological care, and environmental considerations.[54,55]

In recent years, digital health interventions have shown positive outcomes in preventing NCDs. Unlike traditional health management, which depends on patient self-discipline, digital health enhances NCD management by influencing patient lifestyles, promoting medication adherence, and improving patient self-care and compliance.[56,57] During public health crises, such as the COVID-19 pandemic, digital health plays a critical role in effectively managing high-risk populations with chronic conditions, particularly in regions with limited medical resources.[58]

Digital health also has challenges in the future: 1) Many patients are unable to benefit from digital health due to inadequate infrastructure, lack of policy support, and low socioeconomic status.[59] 2) There is still a need to enhance education and training for the elderly, focusing on applications that they can use independently.[60] 3) The commercialization of digital health services and the use of telehealth applications increase privacy and cybersecurity risks.[61] Digital health institutions need to monitor patient data handling to ensure data security and patient privacy.

Strengths and Limitations

This bibliometric study provides a comprehensive, intuitive, and objective overview of the current status and trends in NCD management over the past two decades. It has the potential to serve as a valuable resource for scholars and clinicians in this field. Notably, this study contributes a new perspective to NCD management in several ways. Firstly, unlike previous research that focused on specific countries or similar income levels, this study analyzes NCD management from a global perspective. It explores variations and trends among countries, offering hypotheses and explanations to enhance understanding the forefront of global research. Secondly, it adopts a 5-year interval over a span of 20 years, allowing for a more comprehensive understanding of developments in this field. Lastly, NCD management research has expanded its scope, encompassing disciplines beyond clinical medicine and public health. It now includes bioethics, sociology, economics, and environmental science.

This study has several limitations. Firstly, it exclusively utilized the WOS database due to its comprehensive data, high quality, and convenience for bibliometric analysis. However, other databases such as PubMed, Medline, and Google Scholar were not included in this analysis. Future research could consider incorporating data from these additional databases into the bibliometric analysis. Secondly, this study focused solely on English literature, which may introduce language bias and potentially overlook high-quality studies published in other languages. Thirdly, there may be some inconsistencies in the information obtained from the included literature; for example, an author might be affiliated with different institutions at different time points.

Conclusion

Our study conducted a bibliometric analysis of research on NCD management published from 2004 to 2023. This analysis revealed trends related topics, institutions, countries, authors, and citations related to NCD management over the past two decades. The findings highlighted dynamic changes in the field, with research trends and hotspots continuously evolving. Future research on NCD management is expected to focus on improving primary health care, integrated care, and digital health.

Abbreviations

COVID-19, Corona Virus Disease 2019; NCD, Non-communicable Disease; PHC, Primary Health Care; UK, United Kingdom; USA, United States of America WOS, Web of Science.

Data Sharing Statement

The original contributions presented in the study are included in the article/Supplementary Material, further inquiries can be directed to the corresponding author.

Ethics Approval and Informed Consent

Not applicable.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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