A Bibliometric Analysis Study on Low Back Pain and Chiropractic

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ABSTRACT:

Purpose: This study aimed to analyze scientific articles on low back pain and chiropractic in the Scopus database. The data were downloaded on October 24, 2023. As no previous bibliometric analysis on these keywords was found in the literature, this study was deemed necessary.

Material and Methods: The data were analyzed using VOSviewer and Biblioshiny software. A total of 2,906 articles were examined, of which 254 were strongly interconnected, forming 18 common clusters. However, 1,165 articles were included in the final analysis.

Results: The United States leads in the number of publications, while Denmark is at the forefront of international collaboration efforts. The most cited study, "A Comparison of Physical Therapy, Chiropractic Manipulation, and Provision of an Educational Booklet for the Treatment of Patients with Low Back Pain," by Cherkin et al. (1998), published in The New England Journal of Medicine, has received 499 citations. The most cited journals in this field are the Journal of Manipulative and Physiological Therapy, Chiropractic and Manual Therapies, and the Journal of Chiropractic Medicine. The University of Southern Denmark is the leading institution in terms of research output. The most prolific author is Leboeuf-Yde, with 39 publications. The most frequently used keywords include chiropractic, low back pain, and manipulative.

Conclusion: These findings are valuable not only for researchers studying low back pain and chiropractic but also for anyone interested in potential future developments in the field. Ultimately, this study contributes to the ongoing discourse on the role of chiropractic care in orthopedic rehabilitation and provides a roadmap for future research.

Keywords: Bibliometric analysis; chiropractic; low back pain; maniplative

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INTRODUCTION

Globally, low back pain (LBP) is a significant contributing factor to disability and is both a widespread health and socioeconomic problem. The Global Burden of Disease 2010 survey revealed that low back pain ranked as the most serious disability in terms of years lived with disability (Ann Rheum Dis. 2014). Low back pain is a very common complaint and its lifetime prevalence is reported to vary between 11% and 84% (Walker 2000). In most people presenting with acute low back pain, the cause of pain is not specific, and serious underlying conditions are rare (Hollingworth et al., 2002).

Chronic low back pain is a well-documented, disabling condition with high costs to both individuals and society (Carey et al., 1995; Frymoyer et al., 1991; Maniadakis et al., 2000). Low back pain causes pain localized between the costal margins and the lower gluteal folds and may occur with or without lower extremity pain (Am Fam Physician., 2011).

Chiropractic is defined by the World Federation of Chiropractic (WFC 1999) as a health profession concerned with the diagnosis, treatment, and prevention of mechanical disorders of the musculoskeletal system and the effects of these

disorders on nervous system function and general health. There is an emphasis on manual therapies, including spinal manipulation or adjustment, and this is often combined with physical therapy methods, exercise programs, nutritional advice, orthotics, lifestyle changes, and other patient education (Chapman-Smith 2000).

A method for quantitative analysis of bibliographic data, called bibliometrics, provides a systematic data-driven approach to understanding the research environment. Bibliometric analysis is an effective tool for monitoring research trends and tracking research developments (Demir et al., 2024). As emphasized in recent studies, bibliometric analysis has found wide application in various research fields. For example, Araujo et al. (2023) conducted a systematic review of the literature on biomass and carbon stocks in the Amazon rainforest. The study covers 2042 research studies cataloged in the Scopus database between 2020 (Demir et al., 2024, in their bibliometric analysis, they researched studies on sensitivity, for which the Scopus search engine was preferred and 976 articles were evaluated in VOSviewer, Biblioshiny CiteSpace programs).

All data were downloaded from the relevant search engines with the .csv extension. It was then uploaded to both Voswiever and Biblioshiny. In the second part of our study, the literature is extensively reviewed. In the third part, materials and methods are presented. In the 4th section, the results of the analyses, and in the last section, recommendations and limitations are given and suggestions for future studies are made.

Low Back Pain And Chiropractic: A Brief Overview

Although chiropractic approaches have become widespread in our country in recent years, they are widely used by specialists around the world. For example: In Saskatchewan, Canada, Côté and colleagues found that 29% of people with neck and back pain had seen a chiropractor in the previous four weeks (Côté et al., 2001). It is encountered in various musculoskeletal injuries, general health regulation, and rehabilitation studies on acute or chronic pain.

Low back pain is a type of injury that creates the need for multidisciplinary rehabilitation, which has an increasing impact on our country and the world population. More than 85% of low back pain cases are categorized as nonspecific low back pain (NSLBP) with no identifiable cause or pathology (Deyo RA, Weinstein JN.,2001., Ehrlich GE.,2003). Spinal control, which is necessary to perform functional tasks, is reduced in patients with NSLBP (Shumway-Cook A, Horak FB.,1986). Spinal control is a multi-pathway neuromuscular process that depends on sensory impulses from the visual, auditory-based, and somatosensory systems (Shumway-Cook A, Horak FB.,1986, Chiba R, Takakusaki K, Ota J, Yozu A, Haga N.,2016). Most low back pain patients have impaired neuromuscular control and stable spinal posture (Hlaing et al., 2020). Hlaing and colleagues (2020) recently reported that balance and proprioception are reduced in patients with subacute NSLBP compared to healthy individuals (Brumagne et al., 2019). They also found that proprioception with loss of function is linked to impaired balance. The possible genesis of this may be functional and structural changes affecting sensorimotor control across the nervous system (Brumagne et al., 2019).

Low back pain causes pain that is localized between the edges of the ribs and the lower hip folds and may occur with lower limb pain or painlessly in the area where it occurs (Chou R. Low back pain, 2011). A systematic review revealed that proprioception in patients with chronic low back pain is more impaired than in their healthy counterparts (Tong et al., 2017). Strengthening exercises are a type of exercise mostly used in the treatment of patients with low back pain. Strengthening exercises are suitable for patients with subacute or chronic non-specific low back pain because they activate the superficial trunk muscles that provide shock absorption of loads (Comerford MJ., Mottram SL., 2001, Koumantakis et al., 2005).

Literature Review

No bibliometric analysis study on low back pain and chiropractic was found in the Scopus database. Our study is the first bibliometric analysis study in the field of low back pain and chiropractic. However, 5 articles containing some common keywords are shown in Table 1 below and some article abstracts containing keywords are shown in Table 2.

Table 1. Bibliometric analyses on low back pain and chiropractic

Authors	Year	Keywords	Time Span	Number of Publications Reviewed	Database	Software used
Lin-Man Weng	2020	Co-Occurrence and Burst	2019-2020	1099	Web of Science	Citespace
Fu	2022	Bibliometrics, co-citation network analysis, Occupational low back pain (OLBP), review	2000-2020	4127	Web of Science	Citespace
Bin Wang	2018	back pain, bibliometric analysis, correlation analysis, worldwide research productivity	1995-2016	50970	Web of Science	SPSS
Yu-Dan Liang	2017	acupuncture low back pain bibliometric analysis CiteSpace cocitation	1997-2016	958	Web of Science	CiteSpace
Rui Wang	2018	stability, balance, and gait	1980-2018	1140	Web of Science Core Collection	Citespace

Table 2. Examples of article abstracts containing keywords.

Study summary	Authors	Sources	Year
This randomized controlled trial (RCT) aims to compare the clinical outcomes of patients with low back pain with digital intervention versus evidence-based conventional physiotherapy.	Cui, D., Janela, D., Kosta, F., Yanamadala, V., Correia, F.D.	npj Digital Medicine, 6(1), 121	2023
This study aimed to investigate the morphology and function of the musculus multifidus and to investigate the relationship between low back pain due to multifidus characteristics in male and female circus artists.	Rossini, B., Anstruther, M., Wolfe, D., Fortin, M.	BMC Sports Science, Medicine and Rehabilitation, 15(1), 53	2023
This non-randomized controlled study aimed to compare the effectiveness of whole-body electrical stimulation training and the relationship between electrical stimulation-specific training and passive stretching (Well Back System, [WBS]) on low back pain	Silvestri, A., Ruscello, B., Rosazza, C., Tudisco, C., D'Ottavio, S.	International Journal of Sports Medicine, 44(11), pp. 820-829	2023
The purpose of this study was to evaluate the use and utilisation rates of chiropractic care by gender between chiropractic approaches at the designated clinic and patients receiving care at the veteran health care facilities located there	Graham, S.E., Coleman, B.C., Zhao, X., Lisi, A.J.	Chiropractic and Manual Therapies, 31(1), 29	2023
The study aimed to determine the prevalence of multiple mortality in patients with chronic low back pain in chiropractic practice and to investigate whether multiple mortality affects pain severity, personal health, physical and mental health	Rafn, B.S., Hartvigsen, J., Siersma, V., Andersen, J.S.	Chiropractic and Manual Therapies, 31(1), 8	2023

This study will identify gaps in the field of low back pain and chiropractic and seek answers to the following questions.

a- Who is the most cited and published author on low back pain and chiropractic?

b- Which is the most cited journal, article, university, and country on the subject?

c- What are the most popular topics on the subject?

d- Which countries are working together on this issue?

No bibliometric analyses of low back pain and chiropractic were conducted with this study.

MATERIAL and METHODS

During the analyses, databases such as scopus, web of sciences (WoS) and pubmed were examined. In our study, the data were prepared for downloading by using the scopus database. In this process, some filtering criteria were used while downloading the data. The data were downloaded from the relevant database on 24.10.2023. When performing bibliometric analysis, the processes are applied in three steps (Demir et al., 2024). In the first step, 2906 recorded studies were identified as a result of the search in the database. Although there are additional records in other sources, only the scopus database was included in the study. In the second stage, 2000 of the 2906 scanned data were extracted by registering to the study. In the third stage, it was observed that there were no studies included in the qualitative synthesis. In the last stage, applications were made with 2000 studies included in the quantitative synthesis. According to the flow diagram, a data screening process consisting of four stages was followed: identification, screening, eligibility and inclusion (Demir et al., 2024).

All bibliographic data were downloaded from the Scopus database in both ".csv" and ".ris" file extensions. Initially, R Studio and the Bibliometrix R package were installed. Care was taken to use the Biblioshiny interface without writing any code. Scanner R was searched by typing scanner (bibliometrix) in the command line in the R console. The ".cvs" file was loaded by entering biblioshiny() on the same command page. Excel files (.csv) and portable network graphic files (.png) suitable for the study were downloaded and used in data analysis. After CiteSpace was installed, the ".ris" file extension from Scopus was installed. The data were "transformed" in the "CiteSpace Data Processing Utilities" window of the programme and made suitable for analysis. VOSviewer was used to provide comprehensive details and network maps for research based on sensitivity analysis. VOSviewer software, which is used in the creation and visualisation of bibliometric network maps, has been used to examine the international keyword map (Caputo and Kargina, 2022; Guleria and Kaur, 2021; Demir et. al, 2024).

RESULTS

Findings of Biomyometric of Low Back Pain and Chiropractic

Performance analysis

Bibloshiny data were used for the analysis of publications. For this, the annual number of publications, citations, and citations were analyzed. Using the triple Sankey diagram, the most published author, the most cited journal, and the most frequently used keywords were analyzed. In addition to these, performance analyses including information on the most published author, the most productive country, and the most cited university were also performed.

Descriptive statistics

There were 1165 articles downloaded from Scopus with the keywords low back pain and chiropractic and 3019 authors of the articles examined in the 1979-2023 time period. Of these authors, 130 were single authors. The average annual number of citations to articles is 23.11. In addition, the average age of the articles is 13.7 years (Figure 1).

Annual increase in publications

33 articles were published in 2023, 67 in 2022, and 53 in 2021.

Changes in citations over the years

It can be said that citations differ according to the scans performed. There are 0.33 citations in 2023, 0.65 in 2022, 0.09 in 2021, 1.67 in 2020, 2.60 in 2019, 2.47 in 2018, 1.42 in 2017, 2.12 in 2016, 1.63 in 2015, 2.04 in 2014.

Sankey diagram

The 3 variables to be associated ("low back pain" and "chiropractic", "author", and "country") were set in the options section of the bibliosiny program and the best of each parameter was indicated. According to this diagram, the country with the most work in the field of low back pain and chiropractic is the United States of America. The authors Kongsted a. and Leboeuf-yde c. have written the most works. Finally, chiropractic and low back pain are the most important words in the literature.

The most important journals in the field

In the field of low back pain and chiropractic, "The Journal of Manipulative and Physiological Therapy" with 369 articles, "Chiropractic and Manual Therapies" in second place, and "The Journal of Chiropractic Medicine" in third place.

Universities with the highest number of publications

When the data were downloaded and the results of the biblioshiny application were examined, the university with the highest publication content was determined as "University of South Denmark" with 163 publications, followed by "Palmer College of Chiropractic" in 2nd place with 110 publications and "Notreported" in 3rd place with 86 publications.

The most prolific authors in the field

In the field of "Low back pain and chiropractic," Leboeuf-yde ranks first with 39 articles, Kongsted ranks second with 36 articles and Hurwitz ranks third with 29 articles.

Most broadcasting

In this analysis, a map of the most productive countries and the relationship between these countries is designed. The United States ranks first with 2502 articles, Canada ranks second with 454 articles and Australia ranks third with 306 articles.

The United States has more cooperation with Canada and Hong Kong in terms of cooperation. It has carried out 26 cooperation studies with Canada and 8 with Hong Kong. Denmark, on the other hand, cooperated with Sweden, Norway, Switzerland, and the Netherlands. It has carried out 16 studies with, 10 with Norway, 7 with Switzerland, and finally 6 with the Netherlands.

The relations of countries with each other are given in Table 3.

Timespan	Sources	Documents	Annual Growth Rate
1979:2023	232	1165	8.27 %

Authors	Authors of single-authored docs	International Co-Authorship	Co-Authors per Doc
3019	130	14.68 %	4.18

Author's Keywords (DE)	References	Document Average Age	Average citations per doc
1783	36536	13.7	23.11

Figure 1. Determinant statistics

Table 3. The relations of countries with each other

From	To	Frequency
USA	CANADA	26
DENMARK	SWEDEN	16
AUSTRALIA	DENMARK	13
CANADA	AUSTRALIA	10
DENMARK	NORWAY	10
CANADA	DENMARK	9
USA	HONG KONG	8
AUSTRALIA	UNITED KINGDOM	7
DENMARK	SWITZERLAND	7
DENMARK	NETHERLANDS	6

With the keywords "low back pain and chiropractic", the United States is in cooperation with Canada and Hong Kong. Denmark, in second place, cooperated with Sweden, Norway, Switzerland, and the Netherlands.

Countries with the highest citation richness

The USA ranks first with 13972 citations, the United Kingdom ranks second with 2146 citations and Canada ranks third with 1750 citations.

Most cited author and document status

The most important article is the one with the highest total number of citations. Accordingly, the 10 most important articles are presented in Table 4.

The article "A comparison of physical therapy, chiropractic manipulation, and provision of an educational booklet for the treatment of patients with low back pain" by Cherkin et al. (1998) published in "The New England Journal of Medicine" is the most cited work with 499 citations. The article "The Outcomes and Costs of Care for Acute Low Back Pain among patients seen by primary care practitioners, chiropractors, and Orthopedic Surgeons" by Carey et al. (1995) published in "The New England Journal of Medicine" ranks second with 484 citations. The article "Prognosis in patients with recent onset low back pain in Australian primary care: an inception cohort study" written by Henschke et al. (2008) and published in "The British Medical Journal (BMJ)" ranks third with 420 citations.

Table 4. Most important documents

Paper	DOI	Total Citations
CHERKIN DC, 1998, NEW ENGL J MED	10.1056/NEJM199810083391502	499
CAREY TS, 1995, NEW ENGL J MED	10.1056/NEJM199510053331406	484
HENSCHKE N, 2008, BMJ	10.1136/bmj.a171	420
HURST H, 2004, J MANIP PHYSIOL THER	10.1016/j.jmpt.2003.11.003	420
WETHERELL JL, 2011, PAIN	10.1016/j.pain.2011.05.016	359
MANCHIKANTI L, 2004, BMC MUSCULOSKELETAL DISCORD	10.1186/1471-2474-5-15	351
MEADE TW, 1990, BR MED J	10.1136/bmj.300.6737.1431	332
CLAUW DJ, 2009, AM J MED	10.1016/j.amjmed.2009.09.006	254
IVANOVA JI, 2011, SPINE J	10.1016/j.spinee.2011.03.017	233
CAREY TS, 1996, SPINE	10.1097/00007632-199602010-00018	210

Scientific mapping analysis

Scientific mapping is the application of computational techniques as a whole to visualize, analyze, and model various scientific and technical activities with scientific maps (Demir et al., 2024).

Conceptual structure map

In this section, factor analysis, network map based on the author's keyword, trending topics, tree map and thematic map are presented. Figure 2 shows the map of the factor analysis.

According to the factor analysis, the most important keywords are shown in red clusters (massage, manipulation, acupuncture, chronic pain, chiropractic). The second most frequently used words were grouped in the blue cluster (manipulation, lumbar spine, lumbar vertebrae, clinical trial of care).

Thematic map

The thematic search for the articles "low back pain" and "chiropractic" refers to keywords used by the most important authors in the field. The words "human, article, low back pain" are used as motor themes. Themes that continue to develop are "manipulative medicine, case report, clinical article" are actively used.

Trending topics

The most important articles in the literature between 1979 and 2023 in which the words "low back pain and chiropractic" occur are shown.

The word "low back pain" was repeated 1581 times

in the literature. In the first quarter of 2005, the second quarter of 2013, and the third quarter of 2018, it is the most used word. The word "adult" appeared 1159 times in the literature. In the first quarter of 2002, the middle of 2010, and the third quarter of 2017, it is the most used word. The word "male" is repeated 1128 times in the literature. The first quarter of 2003, the middle of 2011, and the third quarter of 2017 were the most frequently used periods.

The size of the rectangles in the treemap indicates the number of keywords used in publications. The treemap of the keywords "low back pain" and "chiropractic" is given in Figure 3.
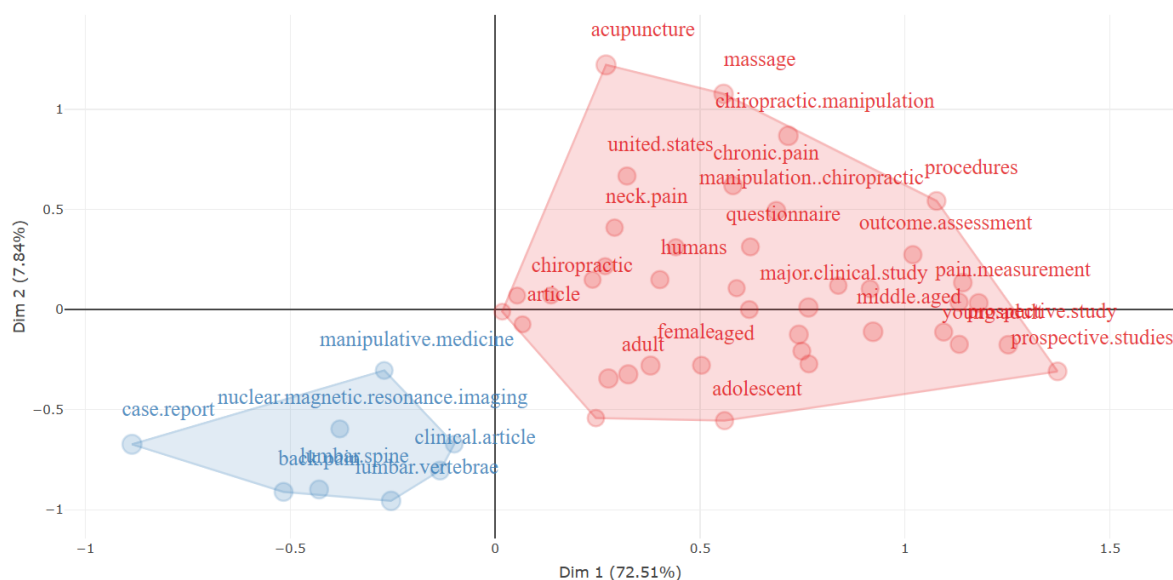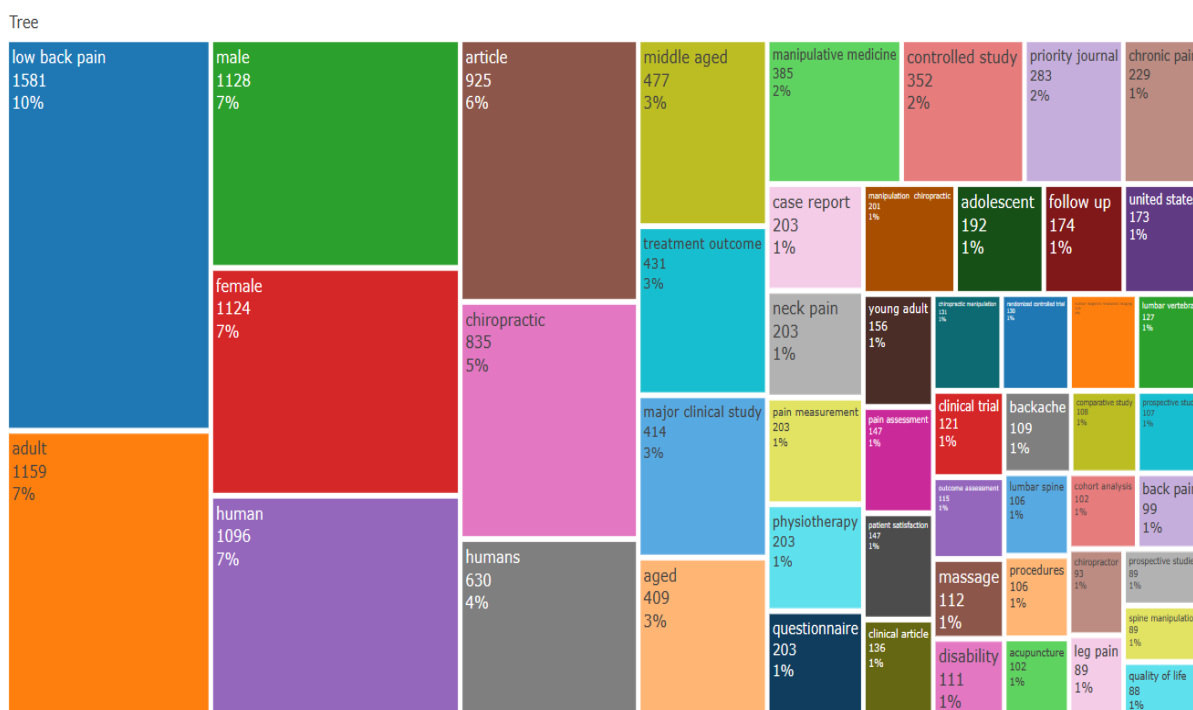

Figure 2. Factor analysis graph

Figure 3. Treemap

According to Figure 3, the rectangle size indicates the frequency of the keyword used. The words "low back pain" (10%), "adult" (7%), "male" (7%) and their ratios were found in the literature.

Keyword analysis

A keyword is defined as a word or group of words in an article. It is presented as a cluster using the most common form of keywords in articles. For this purpose, keyword network map analysis was performed using Voswiever software as given in Figure 4.

"Chiropractic, low back pain, manipulative" are the three most important keywords. The word "chiropractic" ranks first with 1087 links and 489 citations, the word "low back pain" ranks second with 890 links and 395 citations, and the word "manipulation" ranks third with 235 links and 79 citations.

In this section, the words electromyography, lumbar vertebrae, and biomechanics were used more by the authors in the field from 2006 to 2008. Again, in 2012, authors in the field focused on the terms chiropractic, low back pain, and neck pain. Today, it is seen that chiropractic approach, musculoskeletal system pain, and manipulation applications are preferred.
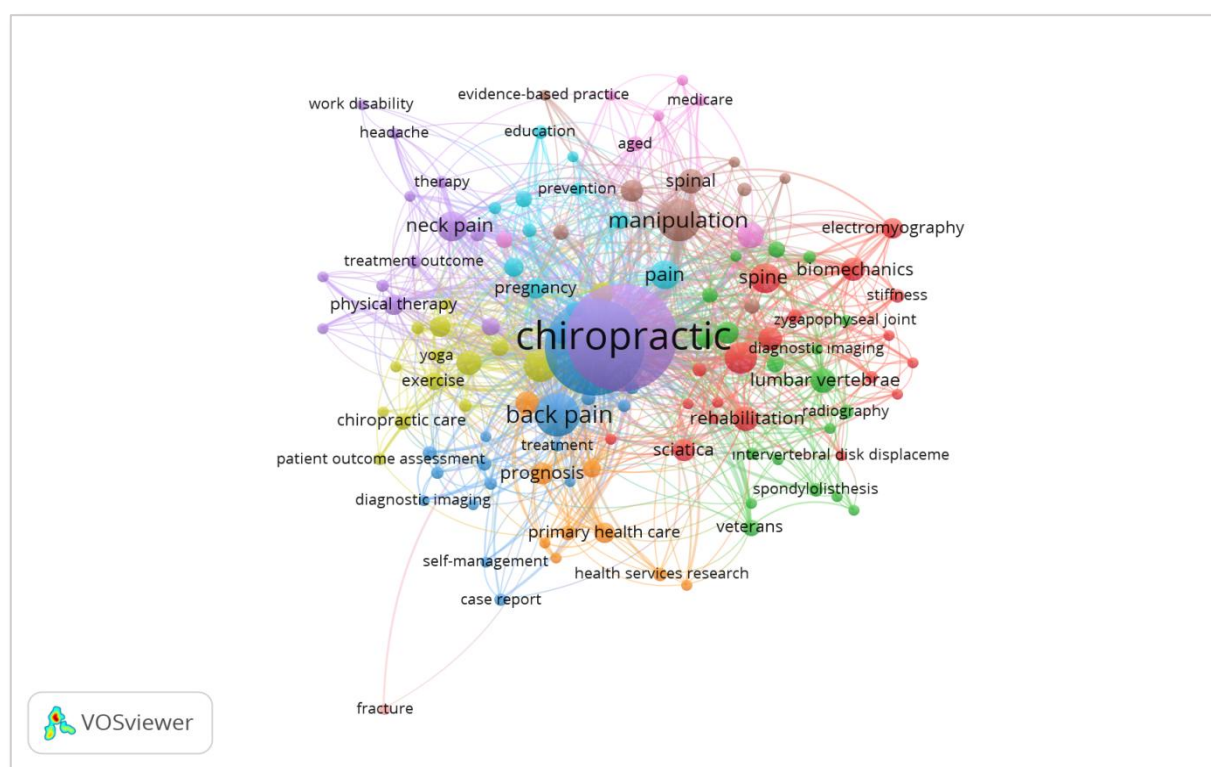

Figure 4. Keyword network map

DISCUSSION

Publications on low back pain and chiropractic are constantly increasing. The Scopus database was used to perform a bibliometric analysis of these studies. Initially, 1165 journal articles in English were filtered and downloaded from the database.

The annual growth rate of publications is 8.27%, the average age of articles is 13.7 years and the average citation per document is 23.11. 130 out of 3019 authors published as single authors. In terms of collaboration of authors in documents, international co-authorship is 14.68%.

According to the Sankey diagram, the most published country is "United States of America", the most published author is "long et al.", the most used word is "chiropractic".

It is the first bibliometric study to examine works related to low back pain and chiropractic to identify the most prolific authors, reference works, universities, countries and academic disciplines. Since most of the articles are open access, a large number of authors emerge as the topic progresses and contributions are disseminated rapidly and widely. According to previous research, the United States, Canada and Australia have the largest number of publications in this field. The most important document is "A Comprasion of Physical Therapy, Chiropractic Manipulation, and Provision of an Educational Booklet for the Treatment of Patients with Low Back Pain" by Cherkin et al (1998), published in The New England Journal of Medicine. The journal with the most publications is "journal of manipulative and physiological therapy". According to the research, "University of southern denmark" has the highest number of publications among the organisations or universities to which the authors are affiliated. "Leboeuf-yde" is the most published author.

The results of the study showed that different colours for keywords created different keyword clusters. The words "Chiropractic, Low Back Pain and Manipulative" are the most commonly used words in the literature. In this study, scientific maps were used to provide a detailed overview of the main trends and results in research linked to low back pain and chiropractic using main themes, trending topics and conceptual constructs (factor analysis) that classify how an author's work is influenced. The most important keywords according to the factor analysis are shown in the red clusters (massage, manipulation, acupuncture, chronic pain, chiropractic). The second most frequently used words were grouped in the blue cluster (Manipulation, lumbar spine, lumbar vertebrae, care clinical study). As a result of the analysis performed to determine the themes in the literature where keywords are used, the words "human, article, low back pain" are used as the motor theme. The themes that continue to develop are "manipulative medicine, case report, clinical article". The word "low back pain" was repeated a lot in the literature. In the first quarter of 2005, the second quarter of 2013 and the third quarter of 2018, it is the most used word.

To the authors' knowledge, this is the first bibliometric analysis of the literature on low back pain and chiropractic published between 1979 and 2023. This study focussed on publications indexed in the Scopus database related to low back pain and chiropractic used in the field of spine health.

CONCLUSION

This study investigated and evaluated worldwide scientific achievements in research on low back pain and chiropractic using data from the Scopus database. The top researchers available in the literature were identified and publications were mapped according to regional distribution and keywords. The most productive country in terms of the number of articles is the United States of America. "Leboeuf-yde" appears to be the most prolific author as a result of bibliometric analyses. The most cited journal for publications on low back pain and chiropractic is "Journal of manipulative and physiological therapy". Chiropractic, Low Back Pain and Maniplative are the most important keywords used by the authors.

By summarising the research with low back pain and chiropractic in depth, we hope that our findings will lead to additional research directions and perspectives in the rapidly expanding field of orthopaedic rehabilitation. Administrative implications for future studies can be listed as follows.

This research provides valuable data on the evaluation of low back pain and chiropractic approaches in relation to the most influential sources, most influential authors, most influential links, most influential countries and most influential works in the available literature. Researchers and practitioners have the option to choose which article to reference, which article is most relevant, and which articles have had the most impact on low back pain and chiropractic.

This bibliometric review of studies on low back pain and chiropractic in the field of spine health can help provide a comprehensive overview of past and current research and identify future research directions for low back pain and chiropractic.

The findings of the study reflect the state of research on low back pain and chiropractic. Also as a

reference point, this study provides researchers with a comprehensive understanding of low back pain and chiropractic approaches.

By making use of citation analyses, researchers can identify the different research streams or fields that make up their intellectual structure. It allows them to identify themes and knowledge.Depending on the research area, it is possible to identify gaps in the literature and potential research directions.

As a result, it provides professionals, academics and students with important up-to-date information that they can apply to their future work in the context of low back pain and chiropractic. Although the Scopus database was the main focus of this study, other sources such as Dimesions, Web of Sciences, Cochrane Library and Pubmed are also available. A potential next step is to design and build graphical tools that present more data and cover more domains.

LIMITATIONS

The limitation of this article was the scanning of articles up to October 2023 and the interpretation of the results. New analyses can be made by including studies from recent years. Rehabilitation studies could also be investigated in patients with lower back pain.

Conflict of Interest

The authors declare no conflict of interest.

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