Physiotherapeutic Interventions for Sciatica: A Guide through Bibliometric Exploration

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Abstract: Introduction - Sciatica is a term used to describe pain, weakened sensation, numbness, or tingling in the posterior region of the leg. The evidence on the efficacy of physiotherapeutic interventions for sciatica is widely acknowledged. This study endeavours to delineate the global research for physiotherapeutic interventions for sciatica. Exploration through bibliometric analysis on physiotherapeutic treatment for sciatica is scanty.

Methods - Bibliometric exploration was conducted using data sources from Scopus, Web of Science, Pubmed and Google Scholar screening the literatures from 2013 to 2022. The data was analysed through analytical tool VOS Viewer and further Microsoft Excel 2007. VOS Viewer is used for the visualization of databases. The present research investigates the annual growth trends contributing top journals, authors, hotspots related to author – co-author collaboration, co-citation pattern, co-author relationship, prominent keywords and widely used physiotherapeutic interventions for the management of sciatica.

Results - The finding of the study reveals that the most research has been published on the topic of sciatica in the year 2021 and 2022. The author Maher, C.G. was found to have published the highest number of articles on the treatment of sciatica. The organization that topped in publishing literature for sciatica treatment was Syddansk Universitet. The leading countries that contributed were the United States, the United Kingdom and Australia.

Conclusion - The authors dwell at length and concludes the study elucidating the most used physiotherapeutic interventions in sciatica that includes electroacupuncture, lifestyle factor improvement, exercise programs including stretching and strengthening, manual therapy, home program exercises, traction therapy, extracorporal shockwave therapy, electrical stimulation and ergonomic care including positioning and posture control. The outcome of this investigation underscores the importance of raising awareness and promoting the future research endeavors.

Keywords: sciatica, physiotherapy, lumbar disc radiculopathy, bibliometric analysis

I. INTRODUCTION

Physiotherapy treatments are prescribed and advised as first line method of treatment for the population experiencing pain due to sciatica. But there are always controversies about effectiveness of physiotherapy treatment in sciatica pain rehabilitation [1]. The incidence of this pain due to sciatica is in the range of 13%-40% and the major issue in this condition is resolved using pharmacological intervention such as analgesic medications and physiotherapeutic rehabilitation [2, 3]. Lumbar radiculopathy surgeries and other lower back conditions are most related to radiating pain and sciatica either motor or sensory weakness is present or absent. The prevalence of this generally lies between 1.6 and 13% [4, 9]. Psychological factors also cause muscle tension. It is generated as a result of stress on the body. It is the body's attempt to protect itself from pain and injury and is actually a reflex response to stress. Tension in low back muscles leads to low back pain. In the later phases, sciatica symptoms are frequently experienced by patients with musculoskeletal chronic low back pain.

Generally, in the major cases herniated lumbar disc leads to compression of the sciatic nerve root which further causes pain in the area where it supplies [10, 13]. It can also cause inflammation [14]. The combination of immunological procedure along with compression and inflammatory changes leads to the pain caused by sciatica [15, 17]. Sciatica is a syndrome that does not have a particular diagnostic criterion. Absolutely accurate or relevant treatment is still a topic of discussion [14, 18]. There are so many available studies that explain about treatment for sciatica. But there is no relevant bibliometric analysis for the physiotherapeutic treatment for sciatica pain [19, 24]. Bibliometric analysis is an unbiased evaluation of scientific research that can empirically present the research hotspots, patterns of growth, and key institutions of pertinent scientific research endeavours. It can also help scientists better understand their own ideas and serve as a resource for collaborative investigations. In particular we examine the best physiotherapeutic treatments for sciatica based on the published articles, research papers and other studies.
II. METHODS

Data sources

The data collection for the bibliometric study is taken from articles published from 1950 to 2023. The articles are from Pubmed, Scopus, Google Scholar, and Web of Science. The internet search was done from 01 June 2023. The keywords used for the database search are sciatica, physiotherapy, physical therapy, treatment, lumbar disc radiculopathy.

The data was analysed through use of analytical tool VOS Viewer 1.6.19 and Microsoft Excel 2007. VOS Viewer is most commonly used for the visualization of databases including bibliographic data, articles published, references etc. Main features are visualizing maps for co-authors, co-relation between countries, publishers, keywords etc. To extract data from pubmed Microsoft excel was used to tabulate the data. After using the tool to interpret the data, visualized maps were obtained to find co relations between authors, publishers, countries and keywords. Chronological orders of authors according to their citations were also obtained.

Data was rectified by application of terms ‘sciatica’ and ‘physical therapy’, which resulted as 1334 articles. 216 duplicate articles were excluded, further generating 1107 reports. 54 reports unrelated to sciatica treatment were later excluded and 963 reports were acquired.

Statistical analysis

The statistical analysis was based on the number of authors who collaborated on the majority of the documents and had the strongest links, the number of organizations who contributed on the majority of the research papers, and the keywords that were often used in the article database. The educational organization and nation of the author were chosen as the first author's organization and country details (in instances in which there were numerous instructions, we chose the first detail that was given). For the comparison of literature uploaded by countries the United States, United Kingdom, Australia, Netherlands, Denmark, Canada, Norway, Germany, Sweden and Switzerland were included. The publishing date of the reports and articles for analysis was taken from the published date on Scopus and Pubmed. Other details including co-authors, country, publishing journal and organization was taken from article itself.

To have a better understanding of sciatica trends and treatments statistical analysis was done on the basis of published article trends per year, authors, organizations, keywords, countries and the final conclusion of the best treatment.

III. RESULTS

According to published data as per articles, 963 articles have been published in which uploaded articles of the last ten years include 2022 (n=121, 12.56%), 2021 (n=128, 13.29%), 2020 (n=113, 11.73%), 2019 (n=86, 8.93%), 2018 (n=82, 8.51%), 2017 (n=46, 4.77%), 2016 (n=50, 5.19%), 2015 (n=51, 5.29%), 2014 (n=34, 3.53%) and 2013 (n=43, 4.46%). In year 2021 and 2022 most documents related to sciatica have been published as shown in Fig.1.

Table 1 Number of documents published per year

<table>
<thead>
<tr>
<th>Year</th>
<th>Documents</th>
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<tbody>
<tr>
<td>2022</td>
<td>121</td>
</tr>
<tr>
<td>2021</td>
<td>128</td>
</tr>
<tr>
<td>2020</td>
<td>113</td>
</tr>
<tr>
<td>2019</td>
<td>86</td>
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</tbody>
</table>
Analysis of authors

After using the information of first author the analysis explained that Maher, C.G. worked on topic of treatments for sciatica with the highest published articles (n = 26, 2.69%). Koes, B.W. (n = 20, 2.07%), Fritz, J.M. (n = 16, 1.66%), Grotle, M. (n = 16, 1.66%), Foster, N.E. (n = 15, 1.55%), Harvigsen, J. (n = 14, 1.45%), Oberg, B. (n = 14, 1.45%), Karppinen, J. (n = 13, 1.34%), Kongsted, A. (n = 13, 1.34%) and Konstantinou, K. (n = 13, 1.34%) also worked with high document numbers on the topic of sciatica as shown in Fig.2.

![Figure 2 Graphical representation of top ten contributing authors](image)

The graph in Fig.3 provides useful knowledge about teams for research on sciatica management based on the maximum work done by co-authors with the highest total link strength. It is based on two major components including total link strength and number of published papers. 963 publications were published by 687 authors. Van Tulder and Maurits W. worked together the most with 13 articles and total link strength of 9.

![Figure 3 Density graph for knowledge maps of co cited authors.](image)

The maximum network of publications was observed between Van Tulder, Maurits W. and Koes, Bart W. representing cluster 1. Another Cluster with second highest total link strength was cluster 6 that was between (Konstantinou, Kika) and (Foster, Nadine E.) as shown in Fig.4.
Analysis of organizations
The main organizations who published literature for sciatica treatment were Syddansk Universitet (n = 52), The University of Sydney (n = 47), Vrije Universiteit Amsterdam (n = 38), Keele University (n = 35), Curtin University (n = 35) and The University of Sydney School of Public Health (n = 30) as shown in Fig.5.

Analysis of keywords
The bibliometric analysis reveals that human word was used most frequently in relevant published articles with a frequency of 89, followed by the keywords sciatica, back pain, female and pregnancy with frequency of 67, 54, 52 and 24 respectively as shown in Fig.7.
Country distribution of literature related to sciatica treatment

According to information of first authors in the analytical data more than 120 countries and regions participated in publication of treatments related to sciatica. The leading countries in literature were United States (n = 257, 26.68%), United Kingdom (n = 239, 24.81%), Australia (n = 167, 17.34%), Netherlands (n = 100, 10.38%), Denmark (n = 75, 7.78%), Canada (n = 57, 5.91%), Norway (n = 55, 5.71%), Germany (n = 48, 4.98%), Sweden (n = 46, 4.77%) and Switzerland (n = 45, 4.67%) as shown in Fig.8.

Analysis of physiotherapeutic treatments for Sciatica

On analyzing the published articles, mostly used physiotherapeutic interventions included electroacupuncture (n = 38), lifestyle factor improvement (n = 9), exercise programs including stretching and strengthening (n = 20), manual therapy (n = 26), home program exercises (n = 4), traction therapy (n = 4), extracorporal shockwave therapy (n = 3), electrical stimulation (n = 17) and ergonomic care including positioning and posture control (n = 11) as shown in Fig.9.
IV. DISCUSSION AND CONCLUSION

This study comprehensively analyzes the current trends in the fields of physiotherapeutic treatment of sciatica. It is using data sources from Scopus, Web of science, Pubmed and Google scholar to provide a better outlook on combined physiotherapeutic treatment for sciatica.

Sciatica is a leading problematic symptom with multiple causing factors

Sciatica is a term used to describe pain, weakened sensation, numbness, or tingling in the leg. It occurs when brought on by stress or damage to the sciatic nerve. Sciatica is a symptom of a musculoskeletal health condition. Beginning in the lower back, this nerve travels down the posterior region of each leg. The muscles in the lower leg and posterior knee are under the control of this nerve. Additionally, it gives sensation to the plantar region of the foot, the posterior part of the thigh, and the anterior and posterior region of the lower leg. Generally, herniated lumbar disc leads to compression of the sciatic nerve root which further causes pain in the area where it supplies. It can also cause inflammation. The combination of immunological procedures along with compression and inflammatory changes leads to the pain caused by sciatica. Other causing factors includes loss of ergonomic care that leads to uneven posture and further causes low back pain and symptoms of sciatica.

Current trends in the field of physiotherapy for the treatment of Sciatica

According to published data as per articles, 963 articles have been published. In year 2022 (n = 121, 12.56%) and 2021 (n = 128, 13.29%) most documents related to sciatica have been published. It signifies that rate of studies for better physiotherapeutic treatment has increased as compared to past years. After using the information of first author the analysis explained that Maher, C.G. worked on topic of treatments of sciatica with highest published articles with (n = 26, 2.69%). The main organization who published literature for sciatica treatment was Syddansk Universitet (n = 52). According to information of first authors in the analytical data more than 120 countries and regions participated in publication of treatments related to sciatica. The leading countries that participated in literature were United States (n = 257, 26.68%), United Kingdom (n = 239, 24.81%) and Australia (n = 167, 17.34%).

Better overview of combined physiotherapeutic treatment for sciatica

Most commonly used physiotherapeutic interventions included electroacupuncture, lifestyle factor improvement, exercise program including stretching and strengthening, manual therapy, home programme exercises, traction therapy, extracorporal shockwave therapy, electrical stimulation and ergonomic care including positioning and posture control. Sciatica can be effectively treated with acupuncture without the negative effects of pharmaceutical painkillers like NSAIDs and muscle relaxants. Additionally, it is a secure, non-invasive therapy option that can ease sciatica discomfort. Manual therapy treatment involves the patient gently contracting their muscles as the therapist moves the problematic
joints through a predetermined range of motion. This method could lessen pain while regaining functionality. Decompression therapy, such as spinal traction, reduces the stress on the vertebral column. It can be carried out through modalities or manually. Herniated discs, sciatica, and numerous additional back conditions are all treated with spinal traction. For managing sciatic nerve pain, ESWT that combines concentrated and circular shockwaves generates outstanding outcomes. Additionally, it benefits the facet joints located throughout the spine and is efficient in reducing trigger points in the muscles, which are frequently a factor in the development of back pain. Electrical stimulation majorly helps in decreasing the pain. Exercises help in improvement of symptoms while home programs and ergonomic care including good posture and breaks between long sitting tasks helps in improvement and prevention of reoccurrence of the symptoms [25-27]. Further research aspects can include more detailed study about benefits of ergonomic care in prevention and elimination of symptoms of sciatica caused by musculoskeletal conditions like low back pain.

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REFERENCES


