

Mapping of Research on Knee Osteoarthritis to Analyse the Trends and Collaborations: Bibliometric and Content Analysis

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ABSTRACT

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This study employed bibliometric and text analysis techniques to identify collaboration patterns, trends, and key themes in research related to knee osteoarthritis. The keywords used in this study were "knee osteoarthritis", "pain", and "management". Two main databases were used, namely Scopus and WoS. The literature search obtained 191 (56.80%) articles from Scopus and 145 (43.20%) articles from WoS related to the given keywords. Duplicate analysis was carried out, and 123 duplicates were obtained from the combination of the two databases. After that, the data collected consisted of 213 articles, with details from 143 (67.10%) articles in WoS and 70 (32.90%) in Scopus. The dataset identifies Indonesia and Malaysia as the primary contributors, with 93 and 121 publications, respectively. Other countries, such as China, India, the Netherlands, Thailand, and Pakistan, also participated in the collaborative effort. Key Malaysian institutions driving this research include the University of Malaya, Universiti Sains Malaysia, Universiti Kebangsaan Malaysia, Universiti Teknologi Malaysia, International Islamic University Malaysia, Sunway University, and the University of Kuala Lumpur. In Indonesia, the University of Indonesia stands out with 17 publications, accompanied by Universitas Gadjah Mada. In conclusion, both Malaysia and Indonesia have established themselves as key players in the field of knee osteoarthritis research, demonstrating their commitment to advancing scientific knowledge and fostering international collaboration.

KEYWORDS: Pain, Management, Knee Osteoarthritis, Trends, Collaborations, Mapping, Network Visualization, Trend analysis

INTRODUCTION

Osteoarthritis (OA) of the knee is a common degenerative joint disease that can significantly affect quality of life. The disease is particularly prevalent in older adults and can cause pain, limited mobility, and a large economic burden^{1,2}. In Indonesia, osteoarthritis of the knee is a health issue that requires special attention, given the increase in life expectancy, which has resulted in a growing elderly population. While this condition has attracted medical attention in recent years, there are still few studies that focus on the collaborative landscape and research patterns regarding knee osteoarthritis in Indonesia in a comprehensive manner³.

Bibliometric analysis provides an effective method for systematically evaluating the literature, helping to identify patterns of collaboration between countries, dominant research themes, and journals that have significant influence in this field⁴⁻⁷. By analyzing citation data, bibliometric analysis can reveal the impact of specific researchers or institutions within a

particular research area. This information can be valuable for funding agencies, policymakers, and researchers looking to understand the landscape of a specific field^{8,9}.

Joint discomfort, stiffness, and dysfunction are hallmarks of knee osteoarthritis (KOA), a prevalent chronic degenerative illness that is frequently linked to synovitis and increasing cartilage damage. Knee osteoarthritis-associated pain affects approximately 22% of the general population, with older individuals being more likely to experience it¹⁰. A vital component of the knee joint, the meniscus is connected by ligaments to maintain joint congruity¹¹. The meniscus distributes mechanical loads on the articular cartilage and uses proteoglycans and a fluid layer to lubricate the joint¹².

This study embarks on a bibliometric journey to fill these gaps and sheds light on the unique dimensions of knee OA research. The research questions (RQs) set the stage for an in-depth exploration of the field, aiming to unravel collaborative dynamics, prominent institutions, influential journals, prevailing research themes, and potential avenues for future investigation. By employing rigorous bibliometric analysis, this study not only offers a comprehensive snapshot of knee OA research but also guides researchers, healthcare practitioners, and policymakers in shaping effective strategies to better address the challenges posed by knee OA in these regions. This study aimed to identify

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trends, collaboration patterns, and key research topics in knee osteoarthritis studies using a bibliometric approach and content analysis. Novelty in research methods and analysis techniques was utilized to provide a comprehensive overview of the current landscape in knee osteoarthritis research, shedding light on potential areas for future investigation. This study provides valuable insights for researchers, clinicians, and policymakers seeking to advance knowledge and enhance patient outcomes in this field.

METHODOLOGY

Scopus and Web of Science (WoS) were chosen as the primary databases for data collection during a search conducted in September 2024. The search procedure was modified, and keywords were employed in conjunction with search terms, such as title on Scopus and topics on WoS. The keywords used included "knee osteoarthritis," "pain," and "management".

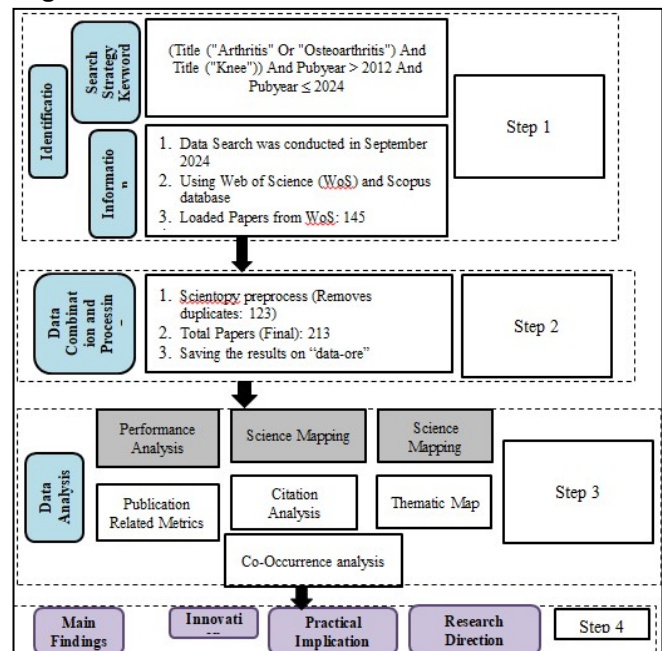
Figure I represents the outcomes of a systematic process for analyzing and refining datasets related to knee osteoarthritis research. The initial dataset consisted of 363 papers. However, during the preliminary analysis, 27 papers (7.40%) were excluded due to issues related to the document type, resulting in a refined dataset of 336 papers.

The data were sourced from two primary databases, Web of Science (WoS) and Scopus. The loaded papers were divided into 145 (43.20%) from WoS and 191 (56.80%) from Scopus. The analysis further addressed potential duplications within the dataset.

After conducting a duplicate removal procedure, 123 duplicate papers were identified, accounting for 36.60% of the dataset. Of these duplicates, two papers (1.40%) were removed from WoS, and the remaining 121 papers (63.40%) were eliminated from Scopus. Notably, 73 of the duplicated papers had different cited-by counts, emphasizing the importance of removing these duplicates to ensure data accuracy. After removing the duplicates, the dataset was refined to 213. Of these, 143 papers (67.10%) were sourced from WoS, while the remaining 70 papers (32.90%) were sourced from Scopus. This analysis highlights the importance of ensuring the integrity of the dataset by addressing duplications and discrepancies between the two databases.

In essence, the data and procedure analysis undertaken in this study highlight the meticulous approach to refining the dataset for knee osteoarthritis research. The rigorous elimination of duplicate entries, along with the consideration of different cited-by counts, ensures that the resulting dataset provides a more accurate representation of the landscape of knee osteoarthritis research, ultimately enhancing the reliability and validity of the subsequent analyses and findings.

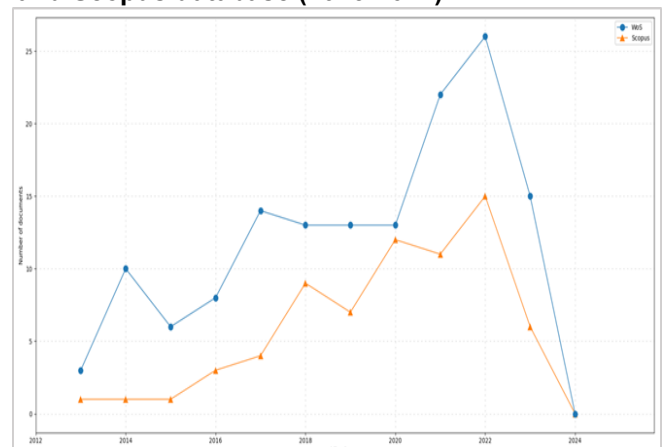
Figure I: Research Flow



RESULTS

The volume of research publications on knee osteoarthritis has demonstrated an upward trend over the past decade in both Indonesia and Malaysia. In the Web of Science (WoS) database, the number of publications has increased gradually, starting with three publications in 2013 and reaching its peak in 2022 with 26 publications. The Scopus database reflects a similar trend, with a steady rise from one publication in 2013 to a peak of 15 publications in 2022; this indicates a growing interest in and research activities on knee osteoarthritis. For more details, see **Figure II**.

Figure II: The Publication volume from the WoS and Scopus database (2013-2024)



The dataset indicates that Malaysia and Indonesia are the primary contributors to knee osteoarthritis research, with 121 and 93 publications, respectively. Other countries, such as China, India, and Pakistan,

have also participated in collaborative efforts, with the Netherlands and Thailand each contributing five publications. The dataset provides further details. In terms of the most active institutions, it becomes evident that Malaysia and Indonesia stand as key contributors, with the University of Malaya in Malaysia leading the way, contributing to a substantial 44 publications. Other Malaysian institutions also actively participated, including the University of Sains Malaysia (19 publications), University Teknologi Malaysia (12 publications), University Kebangsaan Malaysia (10 publications), Sunway University (6 publications),

International Islamic University Malaysia (5 publications), and University Kuala Lumpur (5 publications). These institutions collectively reflect Malaysia's dedication to knee osteoarthritis research, fostering a dynamic environment for research collaboration.

The University of Indonesia has emerged as a prominent institution in Indonesia, with 17 publications to its name. This signifies the active involvement of Indonesian institutions in partnership with researchers from Malaysia and beyond, demonstrating a shared commitment to addressing knee osteoarthritis. The

Figure III: (a) Top 10 Countries and (b) Top 10 Active Institutions

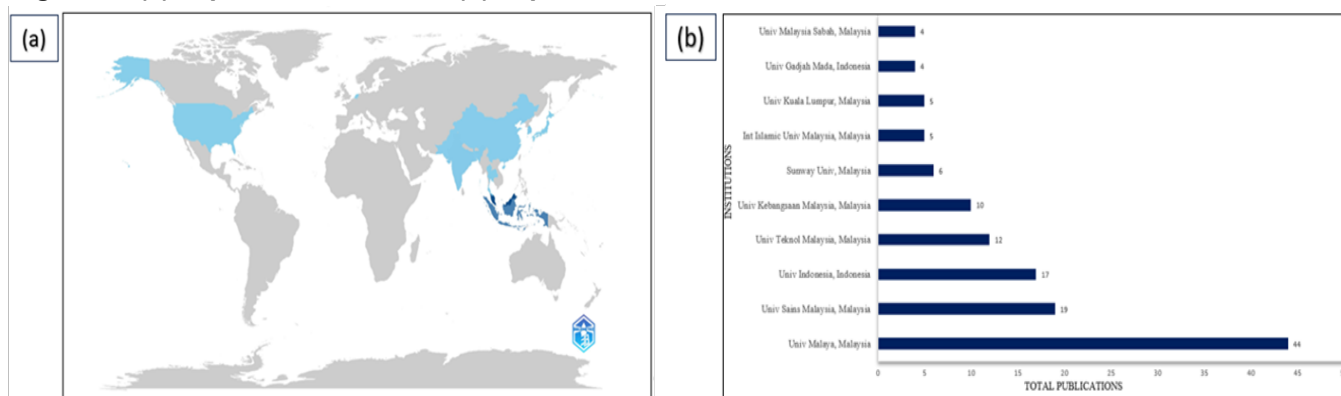


Table I: The Top 10 Journals and their cited related papers

Journal	Total Publication	Annual Growth Rate	Average Document Year	Publication in The Last Year	h-Index	Most cited papers
Malaysian Journal of Medicine and Health Sciences	8	-1.5	0	0	1	¹³ Knee pain and functional disability of knee osteoarthritis patients seen at Malaysian government hospitals
Bali Medical Journal	6	-1.5	0.5	16.7	1	¹⁴ High levels of serum cartilage oligomeric matrix protein and plasma interleukin-6 increase the risk of ultrasound-detected synovial inflammation in knee osteoarthritis.
International Journal of Surgery Case Reports	6	-1.5	0.5	16.7	1	¹⁵ A rare case of septic arthritis of the knee caused by Salmonella typhi with preexisting typhoid fever in a healthy, immunocompetent child - A case report
Malaysian Orthopaedic Journal	5	0	0	0	3	¹⁶ Intra-articular hyaluronic acid (HA) and platelet-rich plasma (PRP) injection versus hyaluronic acid (HA) injection alone in patients with grades III and IV knee osteoarthritis (OA): A retrospective study on functional outcome
PLOS One	5	0	0.5	20	4	¹⁷ Balance and Risk of Falls in Individuals with Bilateral Mild and Moderate Knee Osteoarthritis
Research Journal of Pharmacy And Technology	4	0	0.5	25	2	¹⁸ Does Proprioception of the knee improve after various forms of training in osteoarthritis of the knee?
ACM International Conference Proceedings Series	3	-0.5	0	0	1	¹⁹ Deep Neural Networks for Automatic Classification of Knee Osteoarthritis Severity Based on X-ray Images
Biomedicine (India)	3	-0.5	0	0	0	²⁰ A comparative study on the effects of the combined application of Russian current and various strengthening exercise protocols in primary osteoarthritis of the knee joint
Diagnostics (Basel)	3	-1	0	0	1	²¹ Knee Osteoarthritis Detection and Severity Classification Using Residual Neural Networks on Preprocessed X-ray Images
Diagnostics	3	0	0	0	1	²² Quadriceps Strength, Postural Stability, and Pain Mediation in Bilateral Knee Osteoarthritis: A Comparative Analysis with Healthy Controls

By considering **Figure IV**, which indicates the high occurrence of keywords and their corresponding weights, valuable insights can be gleaned into the prevalent research themes and topics surrounding knee osteoarthritis research in Indonesia and Malaysia.

The Bali Medical Journal published six articles on knee osteoarthritis research, highlighting a correlation between serum cartilage oligomeric matrix protein and plasma interleukin-6 levels, as well as ultrasound-detected synovial inflammation, which enhances understanding of disease progression. 14 Biochemical markers of OA, including metabolites and inflammatory mediators, are found in synovial fluid, blood, and urine, with blood-based biomarkers being most studied²³. Various methods for measuring OA biomarkers exist, ranging from simple to complex procedures. Prioritising the multiplexing of marker miniaturisation and chip-based measurement can increase the cost-effectiveness of diagnostics and

The research on knee osteoarthritis, involving 101 cases, focuses on clinical aspects, pain management, prevalence studies, and age groups, highlighting the importance of understanding and addressing its complexities. Several studies on this topic have raised the issue that sex, age, education level, BMI, sleep quality, and frequency of walking are independent influencing factors for KOA, with notable differences between sexes⁴⁵. Osteoarthritis is most prevalent in the lumbar joint, followed by the knee, cervical, hand, and hip joints. Women, the southern population, and the older population are more susceptible to this

condition, as noted in a study⁴⁶. The intervention for symptomatic knee OA should focus on females, those in rural areas, and those over 40 years old⁴⁷.

As a result, the idea of a "one drug fits all" treatment should give way to the creation of customised remedies⁴⁸. Therapeutic options for OA include synergetic therapy, drug intervention, bone resorption/formation balance, and exercise therapy to manage pain, inflammation, and degeneration of synovial joint tissues⁴⁹. Enhancing adherence and reducing attrition for a particular condition can be achieved through holistic digital interventions^{50,51}.

CONCLUSION

Malaysia and Indonesia were identified as the primary contributors to knee osteoarthritis research. Other nations that took part in cooperative initiatives included China, India, the Netherlands, Thailand, and Pakistan. These nations demonstrate a strong interest in their scientific and intellectual communities. The University of Malaya in Malaysia is in first place. Sunway University, International Islamic University Malaysia, University Teknologi Malaysia, University Kebangsaan Malaysia, University of Sains Malaysia, and University Kuala Lumpur are all Malaysian academic institutions. University Malaysia Sabah and University Gadjah Mada in Indonesia both support international cooperation by showcasing a shared dedication to knee osteoarthritis research. Suggestions for future research could include exploring the impact of different treatment modalities on patients with knee osteoarthritis in diverse populations, as well as investigating the potential role of genetic factors in the development and progression of the disease.

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Data Sharing Statement: The corresponding author can provide the data proving the findings of this study on request. Privacy or ethical restrictions bound us from sharing the data publicly.

AUTHOR CONTRIBUTION

Sulfandi S: Data gathering, evaluating, and interpreting for the project, creating and editing the draft, and obtaining final approval

Azizan A: Analysing the data for the project, creating the work, and editing the manuscript

Zahari Z: Analysing the data for the project, creating the work, and editing the manuscript

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