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Global Research Progress of Idiopathic Scoliosis Based on Bibliometric and Visualization Analysis

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Abstract: *This paper conducted a scientometric investigation of research evolution and worldwide patterns in idiopathic scoliosis(IS) through bibliographic mapping and temporal trend visualization. Relevant literature on idiopathic scoliosis published between January 1, 2014, and January 1, 2025, was retrieved from the Web of Science. Bibliometric methods were employed to analyze publication years, journal distribution, author information, and keywords. Additionally, VOSviewer version 1.6.20 was used to identify key nodes and clusters, analyze collaboration networks and co-citation relationships, and the research overview of IS in recent years was monitored. The study's final synthesis comprised 1572 eligible publications. It was found that global research and publication output on idiopathic scoliosis initially increased and then declined, with a concentration among specific research institutions and author groups. Hot topics included early screening, diagnosis, and treatment methods for idiopathic scoliosis. The United States dominated global research output in this domain, demonstrating both the highest citation frequency and most prominent h-index. Spine and European Spine Journal had the highest publication volumes. Nanjing University, The Chinese University of Hong Kong, The University of Hong Kong, and Keio University were the four institutions with the most significant contributions. The research in question can be meticulously classified into four primary categories: studies on mechanisms, empirical clinical research, advanced tissue engineering, and analysis of risks associated with the treatment. Current scientometric trajectories suggest a sustained growth pattern in IS-related publications, with the United States maintaining its position as the predominant knowledge producer. Most studies focus on surgical treatment approaches for IS, indicating that research hotspots in this field are gradually shifting toward the optimization of clinical therapies.*

Keywords: *idiopathic scoliosis; worldwide patterns; visualization analysis; bibliometrics*

1. Introduction

Idiopathic Scoliosis(IS) is most commonly observed during adolescence but can manifest at any age from infancy to adulthood[1]. In the absence of therapeutic intervention, 80% of infantile scoliosis shows spontaneous regression, and the remaining 20% may necessitate prolonged and multidisciplinary management. Left untreated, progressive infantile scoliosis can culminate in severe restrictive lung disease—one of the rare life-threatening complications in pediatric orthopedics. Despite this, the pathogenesis of idiopathic scoliosis remains incompletely understood, possibly involving a multifactorial mechanism. However, it is worth noting that epidemiological evidence confirms a significantly higher incidence among first-degree relatives. The primary diagnostic criterion for IS is a Cobb angle exceeding 10 °on an anteroposterior radiograph, but IS is typically diagnosed by exclusion when medical history, clinical evaluation, and imaging studies fail to identify a definitive underlying etiology"[2].

There is still a significant gap in the systematic analysis of the current global research situation of IS. To address this limitation, this study not only examines the academic cooperation network but also precisely locates the core research forces, advantageous disciplinary clusters, and knowledge production patterns through multi-dimensional measurement indicators (such as discipline weight index, scholar contribution degree)[3]. Bibliometric analysis is a quantitative research technique that uses statistical measures to systematically evaluate the patterns and evolution of scholarly publications within a specific field of study[4]. Unlike conventional systematic reviews authored by experts, bibliometric analysis provides a faster, more visual, and objective way to monitor research trends and map knowledge domains[5]. This method can comprehensively assess the research prospects and emerging trends in this

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field, while also uncovering potential frontiers for future exploration[6]. Moreover, this approach has been effectively utilized to analyze research trends in diseases such ashypertension, osteoarthritis, injuries, and diabetes. However, to date, the volume and impact of studies in the field of IS remain unexamined. Thus, this study aims to evaluate the current research landscape and worldwide trends in IS treatment.

2. Materials and Methods

2.1. Data Source

A bibliometric analysis was conducted based on the Web of Science. As a leading digital repository of scholarly literature, Web of Science is widely recognized and extensively utilized in academic research. and it has been empirically validated as the most robust platform for citation network studies[7].

2.2. Search Strategy

The following search terms were utilized in this study:Topic=(idiopathic scoliosis) AND Publication Year=(2014-1-1--2025-1-1) AND Document Type=(Article)AND Language=(English).

2.3. Data Collection

Data were retrieved from Web of Science (Core Collection). To ensure accuracy and comprehensiveness, the indexes selected were SCI-EXPANDED and SSCI. All extracted data-including titles, publication years, authors' names, countries of origin, journal names, document types, institutional affiliations, abstracts, and keywords-were systematically analyzed and subsequently uploaded to WPS.

2.4. Bibliometric Analysis

Bibliometric analysis serves as a quantitative approach to assess published research outputs and forecast emerging scientific trends[8]. This methodology enables the examination of scholarly relationships among countries, authors, institutions, journals, and keywords through citation networks and co-occurrence patterns[9]. Having been extensively employed across diverse academic disciplines, it provides systematic insights into a field's developmental trajectory and intellectual boundaries. Such analyses not only reveal current research hotspots but also offer valuable guidance for future research directions[10]. The h-index has emerged as a robust alternative to traditional research metrics, offering an effective method for quantifying scientific impact. The h-index measures research impact by indicating that a scientist (or country/institution) has published N papers, each cited at least N times[11]. The logistic growth model, expressed as $f(x) = a/(1 + e\hat{}(b - cx))$, exhibits robust stability and demonstrates strong predictive performance for trend forecasting[12]. The publication quantity over time was plotted using WPS, where the X-axis represents the years and the Y-axis shows $f(x)$, which indicates the number of publications. Additionally, WPS was used to examine the annual publication output, top 20 countries globally, authors, institutions, funding agencies, research fields, total citation counts, journals, average citation frequency, and h-index. VOSviewer software (VOS) was employed to explore the underlying relationships among these variables and to conduct visual analysis of the publications.

3. Results

3.1. Global Publishing Trends

3.1.1. Total Global Publications

Our systematic search identified 1572 eligible articles published between January 2014 and January 2025. An examination of annual publication volumes revealed that the number of global publications increased initially, then declined, and showed an upward trend again in 2024 (Figure 1a).

3.1.2. Contributions by Countries

A total of 63 countries/regions have contributed publications in this research field worldwide. China ranked first with 420 publications (26.718%), followed by the United States (357 publications, 22.710%), Japan (162 publications, 10.305%), Canada (126 publications, 8.015%), and France (93 publications, 5.916%) in the second to fifth positions, respectively. (Figure 1b).

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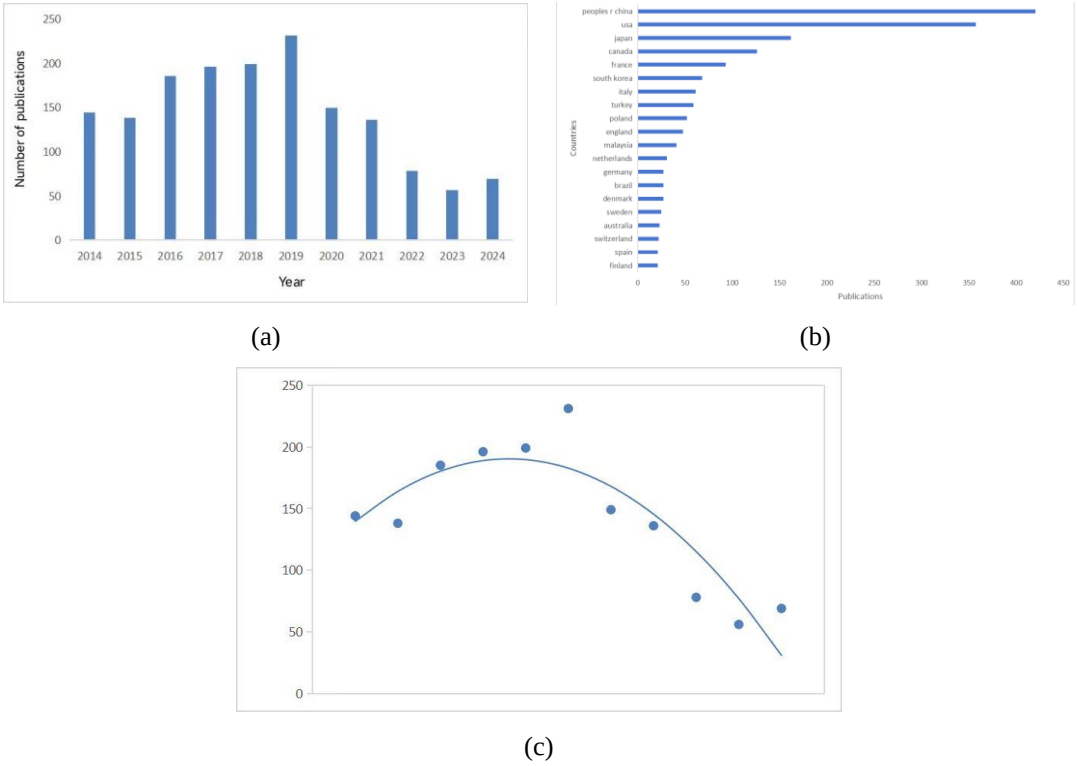
3.1.3. Global Publishing Trends

We employed logistic regression to model the temporal dynamics of publication counts, generating a characteristic S-shaped growth curve. The fitted model parameters were then used to forecast future trends in research output. Figure(1c) presents the resulting growth curve projection, illustrating the predicted trajectory of global publication volumes in forthcoming years.



(a) (b)

(c)

Figure 1: Global research trends in IS and correlated investigations: (a) Cumulative publications addressing IS and correlated research interests; (b) Cumulative publications addressing IS and correlated research interests; (c) Fitted growth curve predicting worldwide IS literature production trends

3.2. Publication Quality by Country

3.2.1. Total Citation Frequency

The United States as the dominant contributor with 7,826 total citations, China ranked second in total citation frequency (6,094), followed by Canada (2,878), Japan (2,289), and France (1,294) (Figure 2a).

3.2.2. Average Citation Frequency

Greece significantly outperformed other nations in research impact(50.71). Sweden ranked second (25.72), followed by Sri Lanka (25.00), the Netherlands (23.65), and Scotland (23.00) (Figure 2b).

3.2.3. h-Index

The United States had the highest h-index (45), followed by China (32), Canada (29), Japan (26), and France (21) (Figure 2c).

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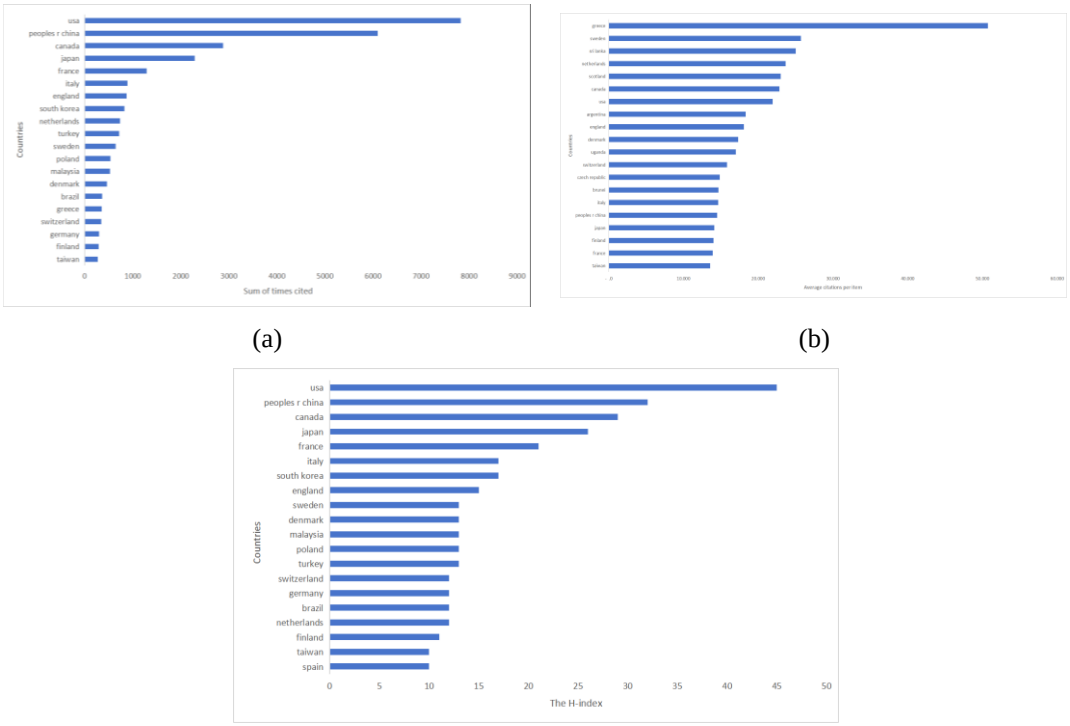

Figure 2: Comparative research quality metrics of IS publications across countries: (a) Cumulative citation impact of IS research outputs by country; (b) Mean citation rate per publication in IS research by nation; (c) Mean citation rate per publication in IS research by nation

3.3. Evaluation of Global scholarly output

3.3.1. Journal Influence Assessment

In the field of IS research, Spine (Impact Factor, IF=19.555) ranked first with 218 publications, followed by European Spine Journal (IF=17.100, 180 publications). World Neurosurgery (IF=6.597) and Spine Journal (IF=19.453) published 67 and 64 related studies, respectively. The distribution of publications across the top 20 most productive journals is presented in (Figure 3a).

3.3.2. Funding Sources

(Figure 3b) presents the 20 most active funding sources in this research domain. The National Natural Science Foundation of China emerged as the predominant supporter, funding 138 studies , followed by the U. S. Department of Health and Human Services with 40 supported studies .

3.3.3. Authors

The top 20 contributors accounted for 685 (43.58%) of all idiopathic scoliosis publications (Figure 3c). Yong Qiu, was the most published author (104), ahead of Zezhang Zhu, (73) and Zhen Liu, (47).

3.3.4. Publishing Institutions

The top 20 most productive research institutions accounted for 720 publications, comprising 45.8% of the total literature in this domain (Figure 3d). Nanjing University led with 122 publications, followed by The Chinese University of Hong Kong with 66 publications.

3.3.5. Research Directions

(Figure 3e) illustrates the predominant research directions within the IS field.

Analysis revealed Orthopedics, Neuroscience, Surgery, and Pediatrics as the predominant research foci.

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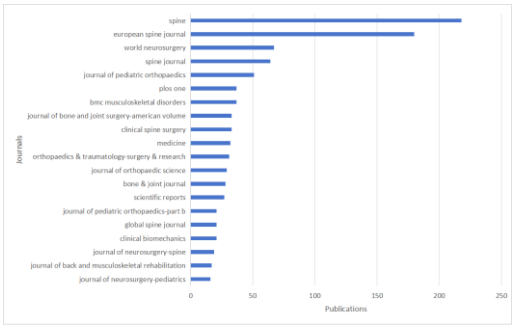
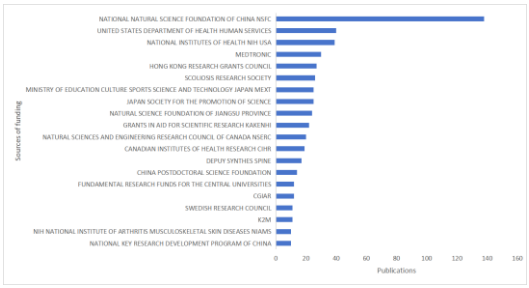


(a)



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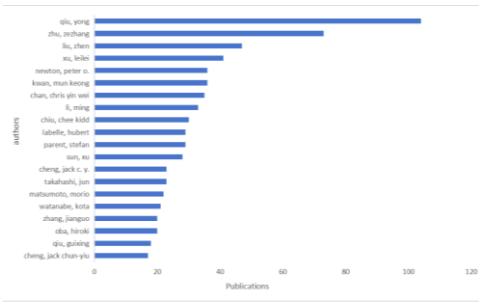

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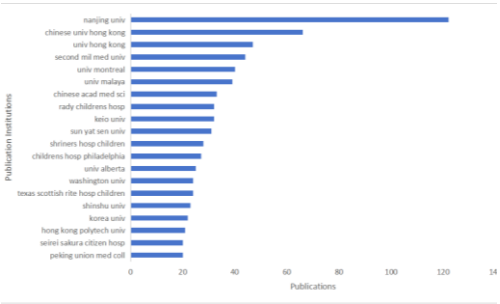

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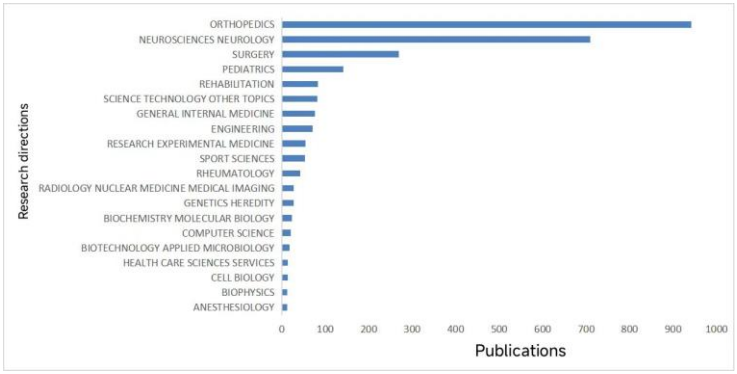

(e)

Figure 3: Global scholarly output assessment in IS research: (a) Leading 20 periodicals by publication volume in IS research; (b) Funded research output from top 20 sponsoring organizations in IS investigations (c) Scholarly productivity of the 20 most prolific authors in IS-related studies; (d) Research contribution of premier 20 institutions publishing on IS; (e) Prevalent 20 research domains in IS scholarship

3.4. Bibliographic coupling analysis

3.4.1. Journals

The VOSviewer tool was employed to examine the names of the journals within the corpus of analyzed articles. The inclusion criterion for journals was defined as having a minimum count of articles published, with a threshold set at more than five occurrences. As depicted in Figure 4a, a total of fifty-one identified journal titles were incorporated into the measurement of the total link strength, as detailed in reference[13](previously cited as reference 18). The five journals that exhibited the highest values in the measurement of the total link strength are as follows:Spine (Total Link Strength=62,213), European spine journal (Total Link Strength=54,401), Spine jounnal (Total Link Strength=22,332), World neurosurgery (Total Link Strength=21,608), and BMC Musculoskeletal Disorders (Total Link Strength=14,633).

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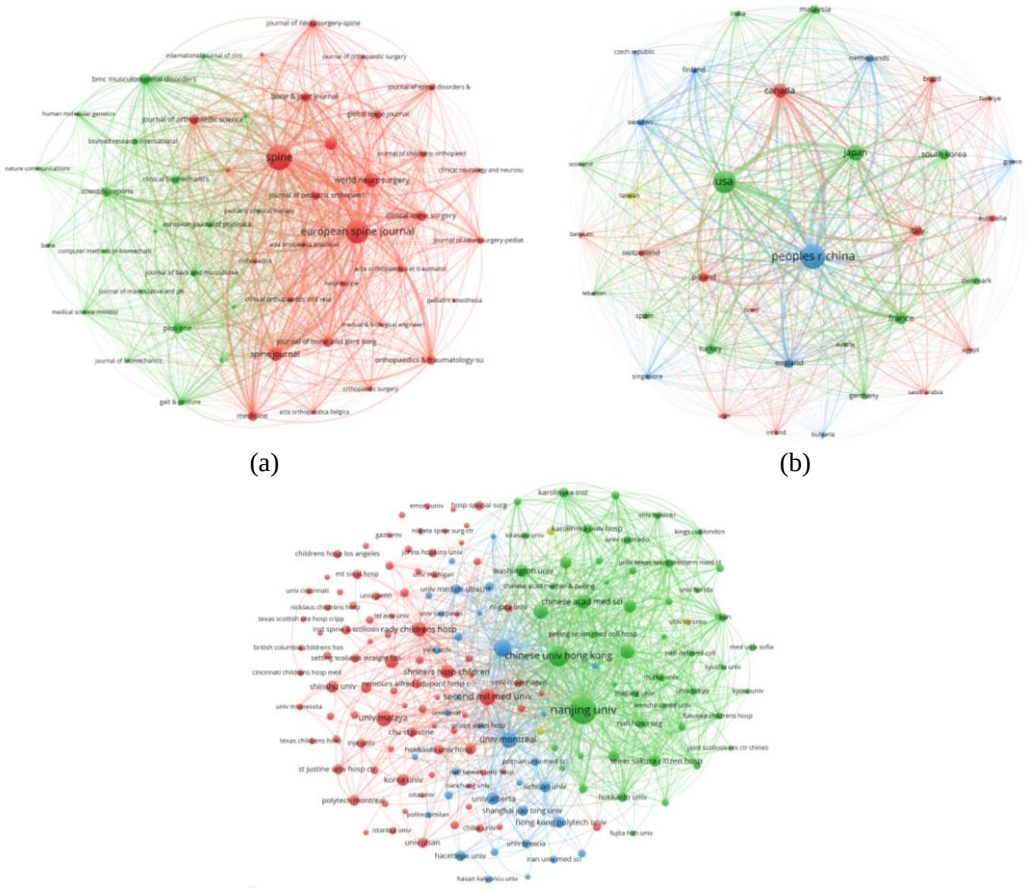
3.4.2. Countries

A total of thirty-six articles from various countries, which were defined as those having a minimum of more than five occurrences within the analysis corpus per country, were analyzed by using the VOSviewer tool (please refer to Figure 4b). The five countries that exhibit the highest values in terms of the total link strength are as follows:China (Total Link Strength=181,444), the United States (Total Link Strength=148,493), Japan (Total Link Strength=89,506), Canada (Total Link Strength=71,618), and France (Total Link Strength=44,443).

3.4.3. Institutions

VOSviewer was utilized to analyze the articles affiliated with institutions (where the criterion for inclusion was set as an institution having used a minimum number of articles more than 5 times). A total of 174 institutions were identified, and the relevant analysis results are presented in Figure 4c. The top 5 institutions in terms of total link strength are as follows: Nanjing University (Total Link Strength=91,783), Chinese University of Hong Kong (Total Link Strength=68,785), The University of Hong Kong (Total Link Strength=59,114 times), Keio University (Total Link Strength=44,332), and University of Montreal (Total Link Strength=39,062).



(a) (b)

(c)

Figure 4: Bibliographic coupling analysis of IS research: (a) Network diagram of 51 journals on IS-related research; (b) Network diagram of 36 countries on IS-related research; (c) Network diagram of 174 institutions for IS-related research

3.5. Co-author analysis

3.5.1. Authors

The co-author analysis revealed that the relevance of a project was contingent upon the number of publications in which one had served as a co-author, as stated in reference[14]. A total of thirty-eight authors, defined as those who had contributed to a minimum of more than five individual articles, were subjected to an analysis using the VOSviewer tool (please refer to Figure 5a). Below are the five authors with the highest values in terms of the total link strength:Qiu, Yong (Total Link Strength=523), Zhu,

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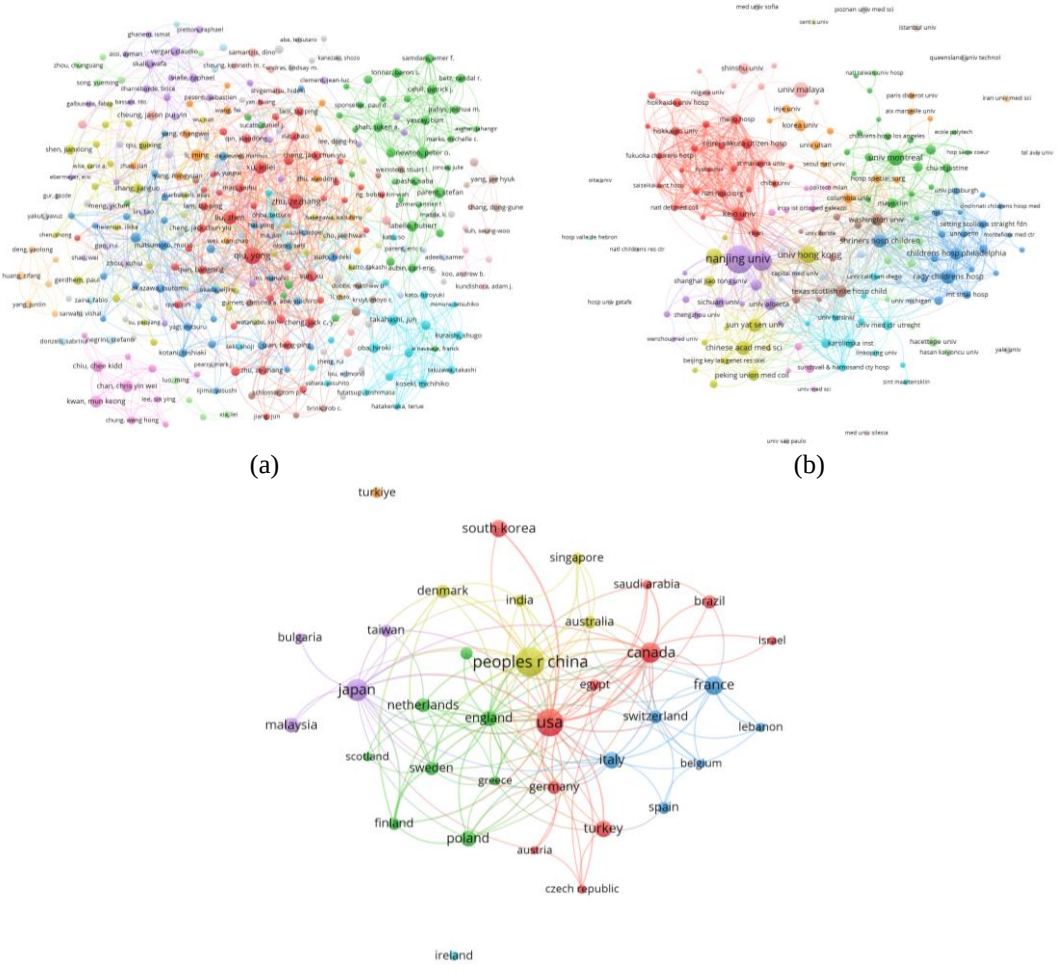
Zezhang (Total Link Strength=391), Xu, Leilei (Tota Link Strength=257), Liu, Zhen (Total Link Strength=246), and Sun, Xu (Total Link Strength=173).

3.5.2. Institutions

The studies, which were defined as those that included a minimum of more than five occurrences of articles produced by an institution, were subjected to a rigorous analysis through the application of the VOSviewer tool (please refer to Figure 5b). Below are the five institutions that exhibit the highest values in terms of the total link strength:Keoh University (Total Link Strength=175), Sakura Civic Hospital (Total Link Strength=118), Nanjing University (Total Link Strength=111), Chinese University of Hong Kong (Total Link Strength=105), and Laeken Children's Hospital (Total Link Strength=103).

3.5.3. Countries

The publications, defined in this context as the collection of articles in which a country has recorded a minimum of more than five occurrences in the analysis, were subjected to a meticulous analysis using the VOSviewer tool (please refer to Figure 5c). The top five countries in terms of total link strength are the United States (Total Link Strength=167), China (Total Link Strength=107), Japan (Total Link Strength=75), the United Kingdom (Total Link Strength=65), and Sweden (Total Link Strength=40).



(a) (b)

(c)

Figure 5: Co-authored analysis of the IS study: (a) Analysis of the 328 co-authors of the IS study; (b) Mapping of the IS collaboration analysis of 174 institutions; (c) Mapping of IS studies on cooperation in 36 countries

3.6. Co-citation analysis

3.6.1. Articles

In accordance with the co-citation analysis, the correlation existing among the elements under study is determined based on the count of the co-citations in which these elements appear, as set forth in

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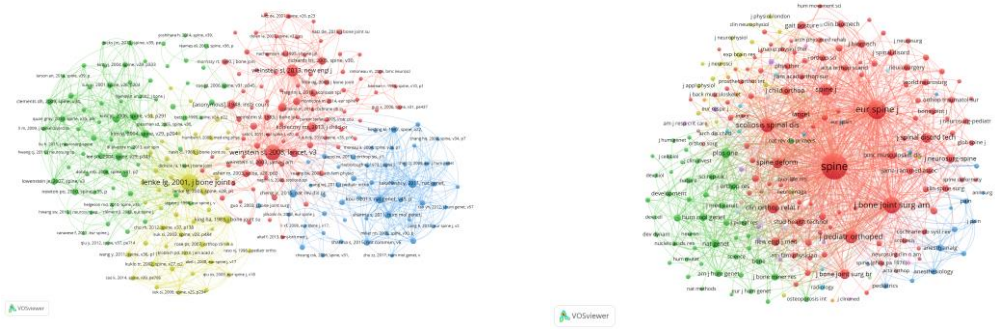
reference[15]. To conduct the analysis, the VOSviewer tool was employed on a corpus of 250 articles. These articles were selected according to the criterion of representing the minimum required number, each having a total of more than 20 references used, as illustrated in Figure 6a. Subsequently, the five studies that stand out for having a high total link strength, which are of particular interest within the context of the analysis, are presented: lenke lg, 2001, j bone joint surg am, v83a, p1169, doi 10.2106/00004623-200108000-00006; kim yj, 2006, spine, v31, p291, doi 10.1097/01.brs.0000197865.20803.d4; takahashi y, 2011, nat genet, v43, p1237, doi 10.1038/ng.974; weinstein sl, 2008, lancet, v371, p1527, doi 10.1016/s0140-6736(08)60658-3 and weinstein sl, 2013, new engl j med, v369, p1512, doi 10.1056/nejmoa130733.

3.6.2. Journals

VOSviewer was employed to perform a co-citation analysis wherein the names of the journals were factored in. The inclusion criterion was established as the minimum number of citations necessary to record over 20 co-citations. As illustrated in Figure (6b), a total of 228 journals were identified and are encompassed within the calculation of the total link strength, as expounded in reference[16]. Below are presented the five journals that stand out for having the highest total link strength:Spine(Total Link Strength=213,304), European spine journal (Total Link Strength=98,818), J bone joint surg am (Total Link Strength=66,564), Scoliosis spinal dis (Total Link Strength=38,112) and J pediatr orthoped (Total link strength=32,324).



(a) (b)

Figure 6: Co-citation network diagram of IS: (a) Network diagram of co-cited references in the field; (b) Network diagram of co-cited journals in this field

3.7. Co-occurrence analysis

The purpose of co-occurrence analysis is to discover the direction of research and hot topics (defined as the minimum number of keyword uses more than 9 times)[17], which is even very important for the development of scientific research directions. As shown in (Figure 7a), the 300 identified keywords are categorized into four clusters, roughly as: "mechanistic research", "tissue engineering", "clinical research", and "health assessment" (Figure 7a). In the "mechanistic studies" cluster[18], common keywords are: deformity, balance, fusion, and cervical spine. For the "tissue engineering" cluster, the main keywords are: curve progression, susceptibility, association. For the "clinical research" cluster, the main keywords are: surgery, instrument operation, results, fixation. For the "treatment risk" cluster, the main keywords were: reliability, quality of life, orthopedic stents[19]. These results indicate that the most salient aspects within the research on idiopathic scoliosis encompass the four directions elaborated above. The VOSviewer software designates color-coding schemes to the keywords in accordance with the mean time of their emergence across all the publications incorporated in the analysis (as illustrated in Figure 7b). A blue color in the visual representation denotes that the keyword in question had an early appearance within the corpus of publications, whereas the yellow color indicates a more recent appearance. Prior to the year 2019, during the initial phases of research in the field under study, the majority of the studies were focused on areas such as "mechanistic studies", "clinical studies", "tissue engineering", and "treatment risks". According to the latest trends identified from the analysis of the keywords, it is suggested that the third cluster of topics, specifically "clinical research", will attract significant interest in the future, as detailed in reference[20].

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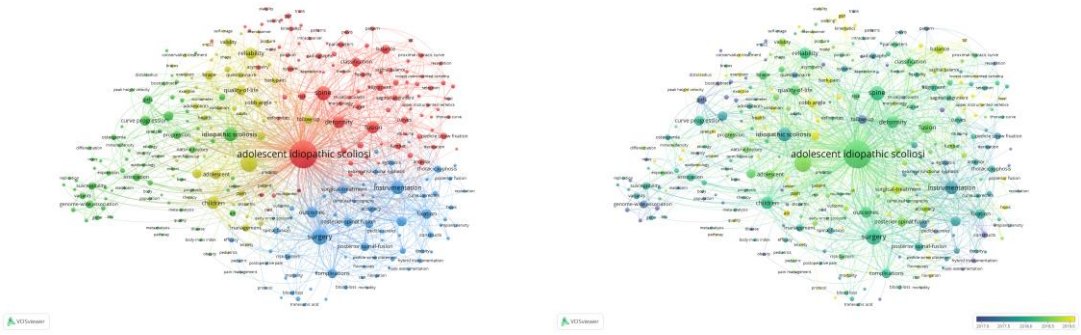

(a) (b)

Figure 7: Co-occurrence analysis of IS studies: (a) Keyword network diagram in IS research; (b) Average occurrence frequency distribution network diagram of keywords

4. Discussion

4.1. Global publication status and quality

The comprehensive analysis of bibliographic references and the detailed visualization of the evolving trends in the field of Information Systems (IS) have the potential to provide an accurate understanding of the current progress achieved within this academic and professional domain. Moreover, this enables the formulation of robust data-driven projections. In light of the above, the present study aims to conduct an in-depth evaluation of the countries actively participating in IS research, the academic and industrial institutions involved, the funding agencies driving these efforts, and, finally, the fundamental research priorities related to Information Systems, as described in reference[21].

Recently, progress in the field of IS treatment has risen again in the most recent year after declining annually after 2019. As evidenced by the findings of this study, the annual number of published works exhibited a steady increase up to 2019. However, subsequent to 2019, it gradually declined, and then experienced a resurgence in 2024. A cumulative total of 63 countries have issued relevant research within this domain[22]. Leveraging the extant data, a prediction of the quantity of future publications is made. It is anticipated that there will be a stable upward trend in the number of studies published as knowledge of deepens over the ensuing years. This is a reflection of the fact that researchers will gradually advance their research on IS.

4.2. Trends in IS research

In light of the results derived from the analysis of national contributions, China assumes a leading position in the quantity of publications. Concerning the number of papers published in relation to research directions and funding sources, the National Natural Science Foundation of China ranks first, followed by the U.S. Department of Health and Human Services, which occupies the second position[23]. Based on the cumulative number of published papers, the United States has made the most substantial contribution to the study of. In terms of the total citation frequency and h-index, the United States can be regarded as a pioneer and leader within this field. Although the United States ranks second in terms of the total number of publications, it holds the top position with respect to the total citation frequency and the h-index. In fact, the gradual growth of research funding in China (the National Natural Science Foundation of China is ranked 138th) will lead to a remarkable improvement in the quality of Chinese publications. This enhancement is intended to match the quality of global publications in this field of study, as elaborated in reference[24].

When a third bibliographic source is cited in the references of two different books, a phenomenon known as bibliographic coupling occurs. In the present work, a bibliometric approach was employed with the aim of establishing similarity relationships among various articles, conducting this analysis from three dimensions: scientific journals, academic and industrial institutions, and countries. In the context of the field of study referred to as IS, the research on leading-tier journals included Spine, European Spine Journal, Spine Journal, World Neurosurgery, and BMC Musculoskeletal Disorders[25]. These journals have been particularly prone to disclosing the latest research advances in the area. Notably, Spine and European Spine Journal have the largest number of publications, suggesting that they hold a

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leading position in international research in the field of IS. Nanjing University stands out for having the highest total link strength, positioning it as a leading institution in IS research. Likewise, the three institutions with the largest number of publications worldwide are from China, which is consistent with China's status as a first-tier country in this field. Almost all of the 20 most influential institutions belong to the five countries with the greatest presence in the relevant research. Therefore, it is evident that the establishment of excellent research institutions is fundamental for elevating a country's academic level. As shown in Figure 3d, the researchers Yong, Qiu, Zezhang, Zhu, and Liu, Zhen are among the most prominent in terms of contributions to the field. Thus, it is crucial to closely monitor their future research works and the latest progress in recent publications in the area of IS. The co-authorship and publication of scientific articles are essential factors for driving scientific development. They enable research innovation, knowledge exchange, and the improvement of the quality of scientific research. The co-authorship analysis method allows for the evaluation of the collaboration existing between different countries, institutions, and authors. On the other hand, the co-citation analysis aims to determine the impact of a study based on the number of times it is cited, as detailed in reference[26]. The results of the current study suggest that the overall citation frequency of landmark research on IS is high and provides many meaningful references. As we all know, Spine and European spine journals are the most widely mentioned on this topic.

4.3. IS Research Focus

Co-occurrence analysis was employed to discern the research directions and focal issues within this field. A co-occurrence network diagram was constructed using all the terms present in the study titles and abstracts. As depicted in Figure 7a, four research directions were identified[27], namely "mechanistic research", "tissue engineering", "clinical research", and "treatment risk". These investigations are conducive to elucidating the future research trajectories. Keywords such as "fusion", "balance", "orthopedic stent", "susceptibility", and "deformity" are relatively prevalent and assume a pivotal position in the co-occurrence network diagram. Therefore, additional high-quality studies have been conducted on IS, and these four aspects of the indication are still required. The overlay visualization map shares similarities with the co-occurrence map. In the overlay visualization map (see Figure 7b), the colors of the elements represent the publication year of the study to which they pertain. However, it is crucial to note that the color-coding in this case is not identical to that in other visual representations. This is because it is specifically designed to reflect the moment when the concepts or themes associated with the elements in question emerge within the research corpus. This form of visualization provides an accurate direction for the longitudinal tracking and analysis of research topics, which is of utmost importance in the context of the evolutionary understanding of an academic field. Based on the findings obtained through a rigorous and comprehensive analysis of the collected data, risk factors in clinical research emerge as a highly likely candidate to be the next central focus of attention in the field, as detailed in reference[28]. Furthermore, in light of the analysis results, risk factors, surgical methods, and surgical outcomes stand out as highly attractive and promising research directions for the study of IS. This is especially true for those studies that have been carried out in recent years and address IS. In this regard, it is worth highlighting that the term "surgical method" has been extensively used in current literature, demonstrating its relevance and timeliness in the context of the research in question. Therefore, clinical research in IS is likely to be the main focus of the field.

4.4. Advantages and Limitations

Despite the fact that this study has systematically and comprehensively mapped out the research terrain of IS by means of sophisticated bibliometric and visualization methodologies, several inherent limitations must be duly recognized[29]. Firstly, the search strategy grounded in the Web of Science database has the potential to overlook non-English-language publications. This exclusionary characteristic may inadvertently introduce a language-related bias into the research findings, as valuable insights and research contributions from non-English-speaking regions and scholars could be omitted from the analysis. Such a bias might lead to an incomplete and potentially skewed understanding of the overall research landscape of IS. Secondly, in the context of citation analyses, newly emerging high-quality research studies are likely to be inadequately represented. This underrepresentation is primarily attributed to the insufficient time period for citation accumulation. Since the impact of these recent studies has not had enough time to be fully reflected in the citation counts, their true significance and potential influence on the field may be underestimated. Consequently, within the scope of our daily research endeavors, it remains imperative that we maintain a vigilant eye on the most up-to-date research developments, including those from non-English-speaking academic communities[30]. By doing so, we

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can strive to mitigate the identified limitations and ensure a more inclusive, comprehensive, and accurate understanding of the research domain of IS.

5. Conclusion

This research endeavor meticulously unveils the global developmental trajectories of research in the domain of IS (Information Systems, assuming based on context) through a rigorous bibliometric analysis. The empirical data amassed from this analysis incontrovertibly demonstrate that the United States occupies a preeminent position in terms of exerting research influence on a global scale. The analysis conducted on academic journals within this field reveals that the journal "Spine, " which has published a total of 218 articles relevant to IS research, functions as a pivotal platform for the dissemination of core knowledge pertaining to this area of study. This journal's substantial contribution to the body of literature underscores its significance in fostering academic discourse and knowledge exchange. Looking ahead, based on the current trends and insights gleaned from the study, it is reasonable to project that the optimization of surgical treatments, particularly those associated with the IS field, is poised to become a prominent and dynamic research frontier in the foreseeable future. This anticipated development is likely to attract significant scholarly attention and drive further advancements in the understanding and practice within the IS domain.

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References

[1] Angevine PD, Deutsch H. Idiopathic scoliosis. Neurosurgery. 2008, 63(3 Suppl):86-93.
[2] Trobisch P, Suess O, Schwab F. Idiopathic scoliosis. Dtsch Arztebl Int. 2010,107(49):875-883.
[3] Hassan W, Duarte AE. Bibliometric analysis: A few suggestions. Curr Probl Cardiol. 2024;49(8):102640. doi:10.1016/j.cpcardiol.2024.102640
[4] Ru L, Zheng H, Lian W, et al. Knowledge mapping of idiopathic scoliosis genes and research hotspots (2002–2022): A bibliometric analysis[J]. Frontiers in Pediatrics, 2023, 11: 1177983.
[5] Broadus R. Toward a definition of "bibliometrics"[J]. Scientometrics, 1987, 12(5-6): 373-379.
[6] Ninkov A, Frank JR, Maggio LA. Bibliometrics: Methods for studying academic publishing. Perspect Med Educ. 2022;11(3):173-176.
[7] Kulkarni AV, Aziz B, Shams I, Busse JW. Comparisons of citations in Web of Science, Scopus, and Google Scholar for articles published in general medical journals. JAMA. 2009;302(10):1092-1096.
[8] Lin GX, Kotheeranurak V, Mahatthanatrakul A, Ruetten S, Yeung A, Lee SH, et al. Worldwide research productivity in the field of full-endoscopic spine surgery: a bibliometric study. Eur Spine J. 2020, 29:153–160.
[9] Lin GX, Nan JN, Chen KT, Sun LW, Tai CT, Jhang SW, et al. Bibliometric analysis and visualization of research trends on oblique lumbar interbody fusion surgery. Int Orthop. 2022, 46:1597–1608.
[10] Jiang X, Liu F, Zhang M, Hu W, Zhao Y, Xia B, Xu K. Advances in genetic factors of adolescent idiopathic scoliosis: a bibliometric analysis. Front Pediatr. 2024, 3;11:1301137.
[11] Poirrier M, Moreno S, Huerta-Canepa G. Robust H-Index. SCIENTOMETRICS 2021, 126 (3), 1969-1981.
[12] Muñoz J A M, Viedma E H, Espejo A L S, et al. Software tools for conducting bibliometric analysis in science: An up-to-date review[J]. El profesional de la información, 2020, 29(1): 4.
[13] Peng Zhao, Meng Li, Yuwei He, Zhoupeng Lu, Hui Zou. Impact of postural variations on trunk rotation angle during the forward bending test in adolescents idiopathic scoliosis[J]. Spine deformity, 2024: 1-7.
[14] Tang Y, Zhou L, Jiang J, et al. Unilateral multifidus hypoplasia as a potential cause of adolescent idiopathic scoliosis: A hypothesis[J]. Medical Hypotheses, 2025, 194: 111549.
[15] Pereira A, Lima D, Martins M, et al. Idiopathic scoliosis trends one year after COVID-19: a retrospective study[J]. Cureus, 2022, 14(12).

ISSN 2618-1584 Vol. 7, Issue 3: 17-28, DOI: 10.25236/FMSR.2025.070303

[16] Gámiz-Bermúdez F, Obrero-Gaitán E, Zagalaz-Anula N, et al. Corrective exercise-based therapy for adolescent idiopathic scoliosis: Systematic review and meta-analysis[J]. Clinical Rehabilitation, 2022, 36(5): 597-608.
[17] Trzcińska Sandra, Koszela Kamil, Kuszewski Michał. Effectiveness of the FED Method in the Treatment of Idiopathic Scoliosis of Girls Aged 11-15 Years[J]. International Journal of Environmental Research and Public Health, 2021, 19(1): 65.
[18] Liu Ziyang, Jiang Wenbo, Hai Yong, Liu Yufu, Liu Tie. Will the COVID-19 pandemic increase the prevalence of idiopathic scoliosis?[J]. Medical Hypotheses, 2020, 147: 110477.
[19] Gao W, Chen C, Zhou T, et al. Rare coding variants in MAPK7 predispose to adolescent idiopathic scoliosis[J]. Human mutation, 2017, 38(11): 1500-1510.
[20] Fruergaard S, Ohrt-Nissen S, Pitter F T, et al. Revision risk after pediatric spinal deformity surgery: a nationwide study with 2-year follow-up[J]. The Spine Journal, 2021, 21(4): 642-652.
[21] Mello A I, Kanitz A C, Martinez F G. Non-invasive interventions in idiopathic scoliosis: a systematic review[J]. Fisioterapia em Movimento, 2017, 30(suppl 1): 325-333.
[22] Saraiva B M A, Stella T C, Araujo G S, et al. Thoracic changes and exercise capacity in patients with adolescent idiopathic scoliosis[J]. Fisioterapia em movimento, 2017, 30(suppl 1): 209-217.
[23] Schlösser T, Brink R, Castelein R. The etiologic relevance of 3-D pathoanatomy of adolescent idiopathic scoliosis[J]. Coluna/Columna, 2017, 16(04): 302-307.
[24] Ortiz M J R, Bringas G S, Sánchez A A R. Early detection of adolescent idiopathic scoliosis: Strategy in controversy[J]. Revista de la Facultad de Medicina UNAM, 2016, 59(4): 33-41.
[25] Courvoisier Aurélien, Garin Christophe, Vialle Raphaël, Kohler Rémi. The change on vertebral axial rotation after posterior instrumentation of idiopathic scoliosis. [J]. Child's nervous system: ChNS: official journal of the International Society for Pediatric Neurosurgery, 2015, 31(12):2325-2531.
[26] Queruz J C F, Kato A, Aguiar C A, et al. Evaluation of idiopathic scoliosis by anterior and posterior arthrodesis[J]. Coluna/Columna, 2015, 14: 88-92.
[27] Ersen Omer, Bilgic Serkan, Ozyurek Selahattin, Ekinci Safak, Koca Kenan, Oguz Erbil. Comparison of two treatment strategy for Lenke I adolescent idiopathic scoliosis. [J]. Acta orthopaedica Belgica, 2014, 80 (4): 487-492.
[28] Gotfryd A O, Franzin F J, Poletto P R, et al. Pain assessment in patients with adolescent idiopathic scoliosis at different stages of disease evolution[J]. Medical Express, 2014, 1: 170-173.
[29] Charles Y P, Diméglio A, Canavese F, et al. Skeletal age assessment from the olecranon for idiopathic scoliosis at Risser grade 0[J]. JBJS, 2007, 89(12): 2737-2744.
[30] Sergeenko O M, Savin D M, Molotkov Y V, et al. The use of MRI in the study of patients with idiopathic scoliosis: a systematic review of the literature[J]. Хирургия позвоночника, 2022, 19(4 (eng)): 30-39.