

Evolution and Emerging Hotspots in Continuous Labor Support: A CiteSpace-based Bibliometric Study

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Abstract: *Background:* Continuous labor support (CLS)—provided by midwives, doulas, or birth companions—is universally recognized as a core component of high-quality intrapartum care. Despite growing clinical evidence, a macroscopic and quantitative evaluation of the global research landscape, collaborative networks, and thematic evolution in CLS remains lacking. *Objective:* This study aimed to conduct a comprehensive bibliometric and visual analysis of global CLS research from 2005 to 2025 to map its intellectual structure, developmental trajectories, and emerging hotspots. *Methods:* Publications related to CLS between 2005 and 2025 were retrieved from the Web of Science Core Collection (WoSCC). CiteSpace was utilized to perform network visualizations, including annual publication trends, co-authorship (authors and countries/regions), keyword co-occurrence, cluster analysis, and timeline evolution. *Results:* Annual publication volume exhibited a steady upward trend, peaking at 106 articles in 2025. China and the USA were the predominant country contributors, while authors such as Meghan A. Bohren and Declan Devane occupied core positions in the author network. However, low network densities among authors (0.0042) and countries (0.0313) reflected relatively dispersed international collaboration. Keyword cluster analysis identified 10 major thematic clusters (Modularity $Q = 0.8757$, Mean Silhouette $S = 0.8515$), with “#0 doula” being the largest cluster. High-frequency keywords (childbirth, women, labor, care) highlighted a strong focus on woman-centered intrapartum management. The timeline visualization revealed a clear paradigm shift: moving from foundational randomized clinical trials and psychological support (2005–2018) toward data-driven intelligent monitoring, artificial intelligence, and predictive modeling (2019–2025). *Conclusion:* Global research on continuous labor support has expanded rapidly over the past two decades. The research paradigm is evolving from traditional continuous companionship toward integrating smart healthcare and AI-assisted predictive decision-making into woman-centered intrapartum care. Strengthening international interdisciplinary collaboration and advancing intelligent intrapartum monitoring represent crucial directions for future research.

Keywords: Continuous labor support; Bibliometric analysis; Intrapartum care

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1. Introduction

Continuous labor support (CLS)—typically provided by midwives, doulas, partners, or family members—is universally recognized as a fundamental component of high-quality intrapartum care ^[1]. Over the past decade, accumulating clinical evidence has demonstrated that continuous emotional, informational, and physical support during childbirth yields substantial maternal and neonatal benefits ^[2]. Specifically, women receiving CLS are more likely to experience spontaneous vaginal births, shorter labor durations, and positive birth experiences, while presenting a reduced need for intrapartum analgesia and lower rates of cesarean sections ^[1, 3]. Recognizing these profound impacts, global health authorities have actively advocated for the integration of continuous labor companionship into routine maternity care to ensure respectful and patient-centered childbirth environments ^[4].

Despite the robust evidence and clinical guidelines supporting CLS, its practical implementation remains inconsistent across varying socio-cultural and healthcare contexts ^[3, 4]. In recent years, scholars have extensively investigated multiple dimensions of labor support, ranging from the comparative efficacy of different caregiver models (e.g., doula versus family care) to the mitigation of maternal psychological distress during public health crises such as the COVID-19 pandemic ^[2, 9]. Consequently, an overwhelming volume of literature has emerged in this domain. However, existing reviews and meta-analyses primarily focus on specific clinical outcomes or qualitative syntheses of maternal experiences ^[1, 3]. There remains a critical lack of macroscopic and systematic evaluation regarding the global research landscape, evolutionary trajectories, and emerging frontiers within the CLS field.

Bibliometric analysis serves as a robust quantitative methodology for deciphering the structural dynamics and thematic evolution of a specific academic discipline over time ^[5]. Compared to traditional systematic reviews, bibliometrics—coupled with advanced visualization software such as CiteSpace—enables researchers to visually map complex collaboration networks among countries, institutions, and authors ^[6, 7]. Furthermore, it facilitates the identification of critical knowledge hubs, foundational references, and potential future hotspots through keyword co-occurrence and burst detection ^[8]. Recently, CiteSpace-based bibliometrics has been widely and successfully applied in various medical and obstetrical sub-fields, providing researchers with clear developmental trajectories and evidence-based insights for future investigations ^[8, 10].

Therefore, to address the current knowledge gap, this study aims to conduct a comprehensive bibliometric and visual analysis of the literature related to continuous labor support published between 2005 and 2025, based on the Web of Science Core Collection (WoSCC). By systematically mapping annual publication trends, collaboration networks, and key thematic clusters using CiteSpace, this research intends to elucidate the intellectual structure and trace the developmental milestones of CLS. Ultimately, the findings of this study will provide researchers, clinicians, and healthcare policymakers with a panoramic visualization of the current research status and emerging hotspots, thereby guiding future investigations and optimizing evidence-based intrapartum care practices.

2. Method

2.1. Data source

The literature data for this bibliometric study were obtained from the Web of Science Core Collection database. A comprehensive search was conducted using the following topic search strategy: TS = (“continuous

labor support” OR “continuous labor support” OR “continuous support during labor” OR “continuous support during labor”). The search period was set from January 1, 2005, to December 31, 2025, and only articles published in English were included. The literature search was conducted on March 1, 2026. Two researchers independently screened all retrieved records based on predefined inclusion and exclusion criteria. Studies directly related to continuous labor support during childbirth were included, whereas irrelevant articles, duplicate records, conference abstracts, and non-research publications were excluded. Any discrepancies between the reviewers were resolved through discussion or consultation with a third researcher. Finally, the eligible publications were exported for subsequent bibliometric analysis.

2.2. Research methods

The retrieved records were exported from the Web of Science Core Collection in plain text format with full records and cited references and subsequently imported into CiteSpace (version 6.4.R1) for bibliometric visualization and knowledge mapping. This bibliometric investigation systematically analyzed annual publication trends, collaboration networks among authors and countries/regions, as well as keyword co-occurrence, clustering, and evolutionary trends. For the collaboration analysis, the time span was set from 2005 to 2025 with a one-year time slice, selecting “Author” and “Country” as node types. The selection criterion was set to Top N = 50 per slice, while other parameters remained at default settings. For the keyword analysis, “Keyword” was selected as the node type with a one-year time slice, extracting the top 50 high-frequency keywords per slice. Keyword co-occurrence analysis was performed to identify major research themes, followed by keyword clustering analysis to reveal the knowledge structure of the field. The reliability and consistency of the clustering results were evaluated using the Modularity Q value and Mean Silhouette value. Furthermore, keyword timeline views were generated to illustrate the temporal evolution and dynamic trends of research topics. To enhance network readability and eliminate redundant connections, the “Pathfinder” and “Pruning sliced networks” algorithms were applied. All remaining parameters were kept at the default.

3. Result

3.1. Annual publication numbers and trends over the past decade

As shown in **Figure 1**, the annual number of publications generally exhibited an upward trend, despite minor fluctuations, from 2005 to 2025. In the early period (2005–2011), publication output remained relatively low and stable, fluctuating between 10 and 15 articles per year. The output experienced a slight increase starting in 2012, maintaining a plateau of around 20 publications per year through 2016. From 2017 onward, a more pronounced growth pattern emerged. After rising to 29 in 2017 and remaining stable around 31 through 2019, the volume surged significantly in subsequent years. Although slight dips occurred in 2021 (38) and 2023 (49), the overall momentum remained strongly positive, ultimately peaking at 106 publications in 2025. These results indicate that research in this field has expanded steadily, with scholarly interest accelerating rapidly over the past decade.

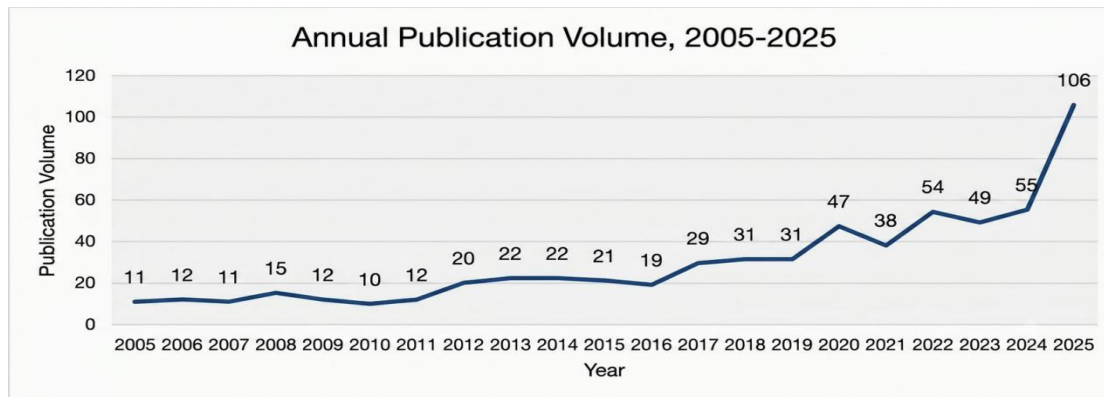


Figure 1. Annual number of publications on continuous labor support from 2005 to 2025.

3.2. Analysis of author collaboration network

Figure 2 presents the author co-occurrence network generated by CiteSpace. The resulting network comprised 647 nodes and 875 links, with a density of 0.0042, reflecting a relatively low density and a dispersed overall structure. Among the visible authors, Bohren, Meghan A, Devane, Declan, Brocklehurst, Peter, and Cuthbert, Anna emerged as the most prominent nodes, indicating their substantial contribution and central role in this research area. Other key active contributors included Crowther, Caroline A, Hofmeyr, G Justus, Tuncalp, Ozge, and Caughey, Aaron B. Although several localized, small-scale collaborative clusters have formed, the low network density (0.0042) suggests that inter-team collaborations and cross-regional academic exchanges remain modest. Broadening collaborative networks across different institutions and research group partnerships will be essential for further pushing this field forward.

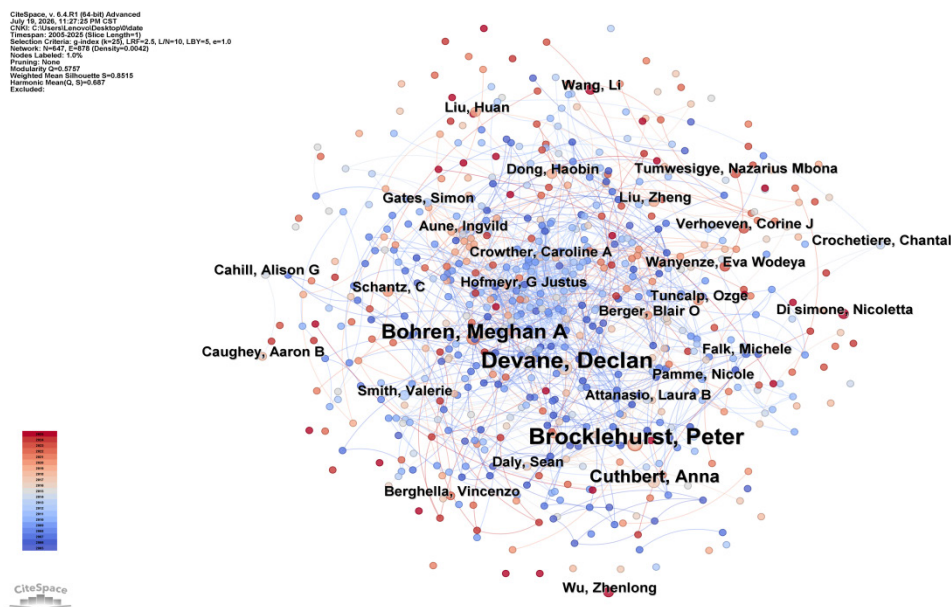


Figure 2. Author collaboration network in continuous labor support research.

3.3. Country/Region co-occurrence analysis

Figure 3 displays the country/region co-occurrence network generated by CiteSpace. The network consists

of 65 nodes and 65 links, with a density of 0.0313, representing a global contribution network with structural dispersion. Among the participating countries/regions, PEOPLES R CHINA and the USA emerge as the two most prominent nodes with the largest label sizes, reflecting their dominant publication volume and pivotal role in this domain. Other major active contributors include ENGLAND, AUSTRALIA, CANADA, and GERMANY. Additionally, countries such as ITALY, SPAIN, JAPAN, INDIA, SOUTH KOREA, BRAZIL, FRANCE, and SWEDEN are visible within the network. Overall, while research in this field draws contributions from a diverse range of countries across Asia, North America, Europe, and Oceania, the network density (0.0313) remains relatively low. This suggests that cross-border partnerships between nations are still in a developing stage, calling for stronger international cooperation to foster global advancements.

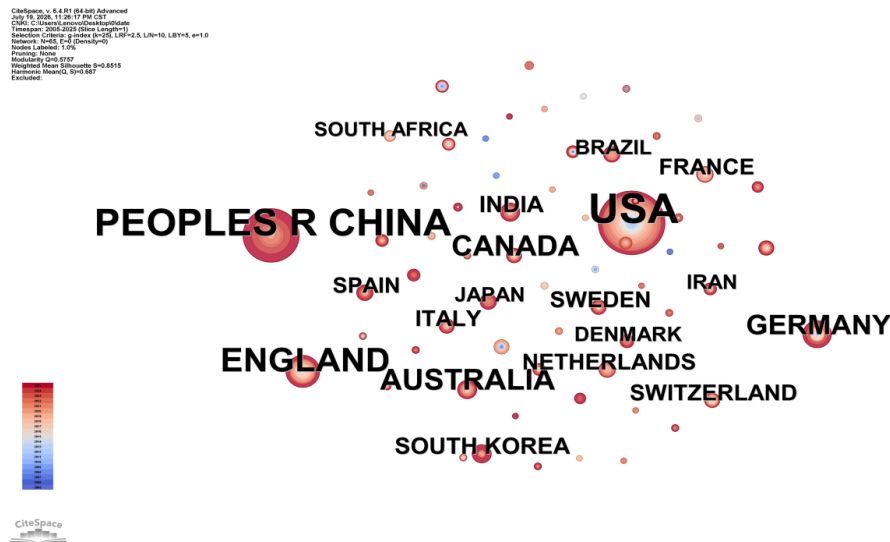


Figure 3. Country/region collaboration network in continuous labor support research.

3.4. Keyword co-occurrence analysis

Figure 4 displays the keyword co-occurrence network generated by CiteSpace. The network consisted of 526 nodes and 1,657 links, with a density of 0.0123, reflecting an interconnected and multifaceted research structure. Among the nodes, childbirth, women, labor, care, outcome, management, and delivery emerged as the most prominent keywords with the largest label sizes and node centrality. Other frequently co-occurring terms included health, birth, and risk. These high-frequency terms collectively reflect the primary focus of research on continuous labor support, which centers around maternal experience, labor management, continuous care pathways, and health outcomes for women. Overall, the high frequency and centrality of keywords such as childbirth, women, labor, and care highlight the core paradigm of this research domain—emphasizing woman-centered care, supportive interventions, and optimized labor management during delivery.

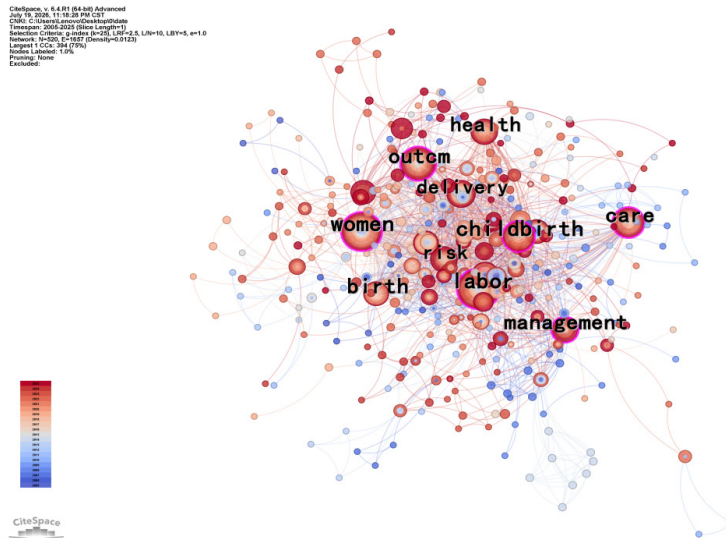


Figure 4. Keyword co-occurrence network in continuous labor support research.

3.5. Keyword clustering analysis

Figure 5 demonstrates the keyword cluster analysis generated by CiteSpace. A total of 10 major clusters were identified, including #0 doula, #1 labor, #2 artificial intelligence, #3 second-stage pushing, #4 asphyxia, #5 randomized controlled trial, #6 postpartum hemorrhage, #7 predictive modeling, #8 bg-sentinel, and #9 epidural analgesia. The network yielded a modularity Q value of 0.8757 (well above 0.3) and a weighted mean silhouette S value of 0.8515 (exceeding 0.7), confirming a robust modular structure and high clustering credibility. Among these, #0 doula emerged as the largest cluster, directly reinforcing the central theme of continuous labor support provided by professional birth companions or nurses. Overall, these clusters map out the multi-dimensional focus of current research, spanning non-pharmacological labor support (doula, second-stage pushing), maternal-neonatal safety and clinical outcomes (asphyxia, postpartum hemorrhage), methodological rigor (randomized controlled trial), and emerging intelligent technologies (artificial intelligence, predictive modeling).

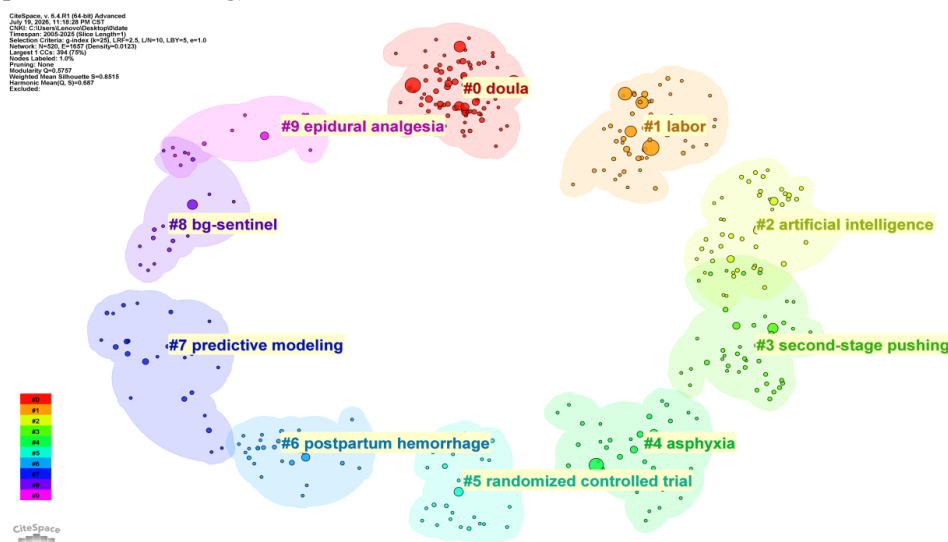


Figure 5. Keyword clustering network in continuous labor support research.

Figure 6 illustrates the timeline view of keyword co-occurrence clusters from 2005 to 2025, mapping the temporal evolution and research trajectories in continuous labor support. The 10 major clusters are arranged vertically according to their size, with horizontal axes depicting the developmental course of each research topic over time. In the early phase (2005–2010), foundational topics such as #0 doula, #1 labor, and #5 randomized controlled trial emerged with high-frequency nodes including childbirth, labor support, emotional support, continuous support, and women. This indicates that early research primarily established the clinical efficacy and psychological benefits of continuous labor support through clinical trials. Over the middle period (2011–2018), research expanded toward broad health management and maternal experiences, highlighted by emerging nodes like social support, anxiety, depression, experience, and maternity care across clusters #0 and #1. In recent years (2019–2025), a distinct dynamic shift toward digital healthcare and intelligent decision-making has taken shape. Clusters #2 artificial intelligence and #7 predictive modeling show high active density in recent time slices, with prominent nodes such as machine learning, classification, diagnosis, and strategy. Concurrently, persistent clinical focus remains evident in maternal and neonatal safety topics (#3 second-stage pushing and #6 postpartum hemorrhage). Overall, the timeline view reveals a paradigm evolution from foundational continuous care and psychological support toward data-driven intelligent monitoring and refined labor management.



This bibliometric analysis provides a comprehensive and macroscopic overview of the research landscape concerning continuous labor support (CLS) over the past two decades. Our findings reveal a steady and significant upward trajectory in publication volume, peaking notably in recent years, which underscores a growing global consensus on the indispensability of non-pharmacological intrapartum support ^[11]. The country collaboration network indicates that while the USA and China dominate the publication output and

act as core knowledge hubs, the overall network density remains relatively low (0.0313). This structural dispersion highlights a critical gap in cross-regional academic exchanges ^[12]. Given the varying socio-cultural contexts, healthcare resources, and midwifery policies worldwide, isolated regional research may limit the global standardization of CLS practices. Therefore, establishing robust, multi-center international partnerships is imperative to develop culturally adaptable and universally applicable labor companionship guidelines ^[13].

The keyword co-occurrence and clustering analyses further confirm that the core paradigm of this domain firmly revolves around woman-centered care, with “doula”, “labor”, and “randomized controlled trial” forming the foundational clusters. The prominence of terms such as childbirth, women, and care reflects a widespread academic transition from purely medicalized birthing models to holistic, humanized maternity care ^[14]. Specifically, the emergence of the largest cluster (#0 doula) reinforces the clinical significance of continuous physical and emotional support provided by dedicated companions, which has been shown to significantly enhance positive birth experiences and mitigate intrapartum anxiety ^[15]. Furthermore, the sustained focus on specific clinical topics, such as “second-stage pushing” and “postpartum hemorrhage”, indicates that current researchers are not only evaluating subjective maternal satisfaction but are also rigorously investigating how continuous companionship directly optimizes critical obstetric outcomes and maternal-neonatal safety ^[16].

Notably, the timeline visualization uncovers a transformative evolutionary trajectory in CLS research, transitioning from foundational psychological support toward data-driven, intelligent labor management. Over the past five years, emerging clusters such as #2 artificial intelligence and #7 predictive modeling have shown remarkable activity and high density. This paradigm shift strictly aligns with the rapid integration of digital healthcare and machine learning algorithms in modern obstetrics ^[17]. Advanced predictive models are increasingly being utilized alongside continuous labor support to dynamically assess intrapartum risks, such as fetal asphyxia or severe bleeding, thereby facilitating precise and timely clinical interventions ^[18]. By combining the empathetic, human-centric nature of traditional doula care with cutting-edge intelligent monitoring strategies, future intrapartum care can achieve an unprecedented balance between maternal comfort, personalized support, and clinical safety ^[19].

Despite providing robust visual insights into the CLS field, this study has several inherent limitations. First, literature retrieval was strictly restricted to the Web of Science Core Collection (WoSCC) database; thus, relevant publications in other databases (e.g., PubMed, Scopus) or in non-English languages may have been omitted, potentially introducing language and selection biases. Second, the reliance on quantitative bibliometric algorithms means that the nuanced qualitative findings of individual clinical trials might be underrepresented. Future research should integrate systematic qualitative reviews with quantitative bibliometrics to provide a deeper understanding of specific CLS implementation models. Ultimately, our study maps the multidimensional evolution of continuous labor support, highlighting its transition toward intelligent, technology-assisted intrapartum management. Strengthening international multidisciplinary collaboration and embracing AI-driven predictive technologies will be the crucial next steps in optimizing woman-centered childbirth care ^[20].

5. Conclusion

Over the past two decades, global research on continuous labor support has witnessed sustained

rapid growth, with China and the United States standing as the core contributors to relevant publications. Nevertheless, the low density of author and national collaboration networks reveals fragmented academic communication across regions and research teams. This bibliometric mapping confirms that woman-centered care constitutes the persistent core logic of this field, with doula companionship, clinical obstetric safety indicators, and randomized controlled trials forming the foundational research framework. The temporal evolution of research themes manifests an obvious paradigm shift: early studies focused on verifying the clinical value and psychological benefits of traditional continuous labor support, while recent research has gradually integrated artificial intelligence, predictive modeling, and intelligent monitoring technologies into intrapartum service systems. To further advance the development of continuous labor support worldwide, future scholars ought to break cross-national and interdisciplinary communication barriers to build stable international cooperative research platforms. Meanwhile, more empirical studies are required to explore the synergistic application of humanized continuous companionship and intelligent obstetric technology, so as to deliver safer, more personalized and high-quality childbirth care for women globally.

Disclosure statement

The authors declare no conflict of interest.

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