



Holistic Prenatal Class-Based Learning Model and Its Effect on Pregnant Women's Anxiety



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ABSTRACT

Aims Anxiety experienced by pregnant women in the third trimester can adversely affect labor outcomes. The holistic prenatal class-based learning model has emerged as an effective intervention to reduce anxiety and enhance childbirth outcomes. However, research evaluating its efficacy, particularly from a bibliometric perspective, remains limited. This study aimed to analyze research trends related to the holistic prenatal class-based learning model and its impact on third-trimester maternal anxiety and childbirth outcomes using a bibliometric approach.

Instrument & Methods A bibliometric analysis was conducted using the Scopus database. The keywords included "Holistic Prenatal Learning Model," "Third Trimester Pregnant Women's Anxiety," "Childbirth Outcomes," and "Prenatal Classroom Approach." VOSviewer and Biblioshiny were utilized to map publication trends, keyword co-occurrence, and author collaborations.

Findings There was a notable increase in publications on holistic prenatal learning over the past decade. There was a significant association between the holistic learning model and reduced anxiety levels among pregnant women, along with improved childbirth outcomes, such as shorter labor duration and fewer complications.

Conclusion The holistic prenatal class-based learning model demonstrates strong potential as a widely applicable intervention for managing third-trimester pregnancy-related anxiety.

Keywords Learning; Women; Anxiety; Childbirth; Bibliometric

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Introduction

Pregnancy is a complex physiological process that involves physical, hormonal, psychological, and social changes in a woman [1]. These changes can trigger stress and anxiety, particularly as childbirth approaches [2]. Maternal anxiety has been associated with elevated cortisol levels, immune dysfunction, and disruption of the mother's physiological balance [3]. This condition may affect fetal health through intrauterine stress mechanisms that influence nervous system development [4]. Therefore, prenatal interventions should comprehensively address the physical, emotional, and spiritual dimensions of the mother [5].

The prevalence of anxiety among pregnant women has been reported to be high in various countries, including Indonesia [6]. A study in Indonesia revealed that approximately 28.7% of pregnant women experience anxiety, with prevalence increasing significantly during the third trimester. The main causes of anxiety include a lack of knowledge about childbirth, negative past experiences, and limited social support [7]. This condition has the potential to increase pregnancy complications, including preterm birth, excessive pain, and unplanned medical interventions [8]. Additionally, maternal anxiety impacts the overall quality of life of mothers, both during pregnancy and after delivery [9].

Most prenatal services remain focused on medical aspects such as pregnancy monitoring and the detection of complications [10]. This approach often neglects the psychological and spiritual dimensions, even though these aspects are critical in preparing mothers for childbirth [11]. As a result, many pregnant women continue to experience high levels of anxiety despite receiving conventional prenatal care [12]. This phenomenon highlights a gap in maternal healthcare systems that have yet to integrate holistic approaches [13].

From a research perspective, most studies on maternal anxiety remain focused on partial interventions such as yoga or relaxation, without integrating the multiple dimensions of maternal health [14]. Moreover, research on the effectiveness of such interventions is more frequently conducted in high-income countries, making it less representative of the social and cultural contexts in developing nations [15]. Prenatal class-based studies that adopt holistic approaches, which simultaneously encompass physical, emotional, and spiritual aspects, remain limited [16]. This indicates a need for research capable of evaluating the effectiveness of holistic models in broader and more diverse contexts [5].

Untreated maternal anxiety can directly affect birth outcomes, including prolonged labor duration [1]. Other studies have shown that anxiety is associated with an increased risk of obstetric complications and medical interventions such as cesarean sections [16]. High anxiety also increases the risk of postpartum

depression, which can affect mother-infant bonding. Thus, effective strategies to reduce maternal anxiety are urgently needed in maternal healthcare services. The novelty of this study lies in the application of bibliometric analysis to map research trends and themes related to holistic prenatal education. Bibliometric analysis enables the mapping of dominant keywords, author collaborations, and the evolution of global research themes. With this approach, studies can identify both emerging and underexplored areas of research. Furthermore, its focus on interventions that integrate physical, emotional, and spiritual aspects into a single learning model makes this study distinct from previous works. The expected benefits of this study include scientifically enriching the literature on holistic approaches in prenatal education and maternal anxiety, practically providing recommendations for healthcare providers (midwives, doctors, maternity clinics) to design more comprehensive prenatal education modules, in terms of policy, supporting the establishment of prenatal care standards that consider psychosocial and spiritual aspects alongside medical ones, and socially enhancing the emotional well-being of pregnant women, reducing anxiety, and fostering more positive childbirth experiences.

The main objective of this study was to analyze how holistic prenatal education affects anxiety among third-trimester pregnant women and how it relates to birth outcomes. In addition, this study aimed to map global research trends on holistic prenatal education, identify gaps in the literature, and examine the influence of cultural context on its effectiveness.

Instrument and Methods

Research design

A bibliometric analysis was conducted using the Scopus database. Bibliometric analysis is a method used to evaluate and map scientific literature within a specific field of research. This method utilizes statistical and mathematical techniques to measure and analyze academic publications, including articles, books, and other scholarly documents. The primary aim of bibliometric analysis is to identify research trends, collaboration networks among researchers, and the development of prominent topics within a given academic discipline [17,18].

Furthermore, bibliometric analysis provides valuable insights into international research collaborations. It can be employed to identify underdeveloped research areas and potential opportunities for collaboration among researchers across different countries [19]. This is crucial for strengthening research networks and improving the overall quality of scientific output. More broadly, bibliometric analysis can also be used to evaluate the impact of research on policy development and practical implementation in the field.

The inclusion criteria comprised studies relevant to holistic prenatal education and pregnancy-related anxiety, published in English. Studies focusing exclusively on pharmacological interventions or those outside the context of the third trimester were excluded.

One of the primary applications of bibliometric analysis is to understand the development of a particular research area. Data were collected using the following keywords: “Holistic Prenatal Learning Model,” “Third Trimester Pregnant Women’s Anxiety,” “Childbirth Results,” and “Prenatal Classroom Approach.” The search strategy employed was (TITLE-ABS-KEY (“holistic prenatal learning”) OR TITLE-ABS-KEY (“third trimester pregnant”) OR TITLE-ABS-KEY (anxiety) OR TITLE-ABS-KEY (“childbirth results”) OR TITLE-ABS-KEY (“prenatal classroom approach”)) AND TITLE-ABS-KEY

(“holistic approach”) AND PUBYEAR. This search returned a total of 521 documents.

VOSviewer was employed to identify research trends, network mapping, and citation analysis. In addition, Biblioshiny was used to compile citation statistics.

Findings

Publication patterns

Bibliometric statistics on research on the holistic prenatal learning model and its impact on maternal anxiety and childbirth outcomes were assessed (Figure 1).

The number of publications has increased annually, with a noticeable peak in the last three years. Key journals that have frequently published articles on holistic prenatal learning include the Journal of Midwifery & Women’s Health and BMC Pregnancy and Childbirth (Figure 2).



Figure 1. Bibliometric statistics on research related to the holistic prenatal learning model and its impact on maternal anxiety and childbirth outcomes (2014-2024)

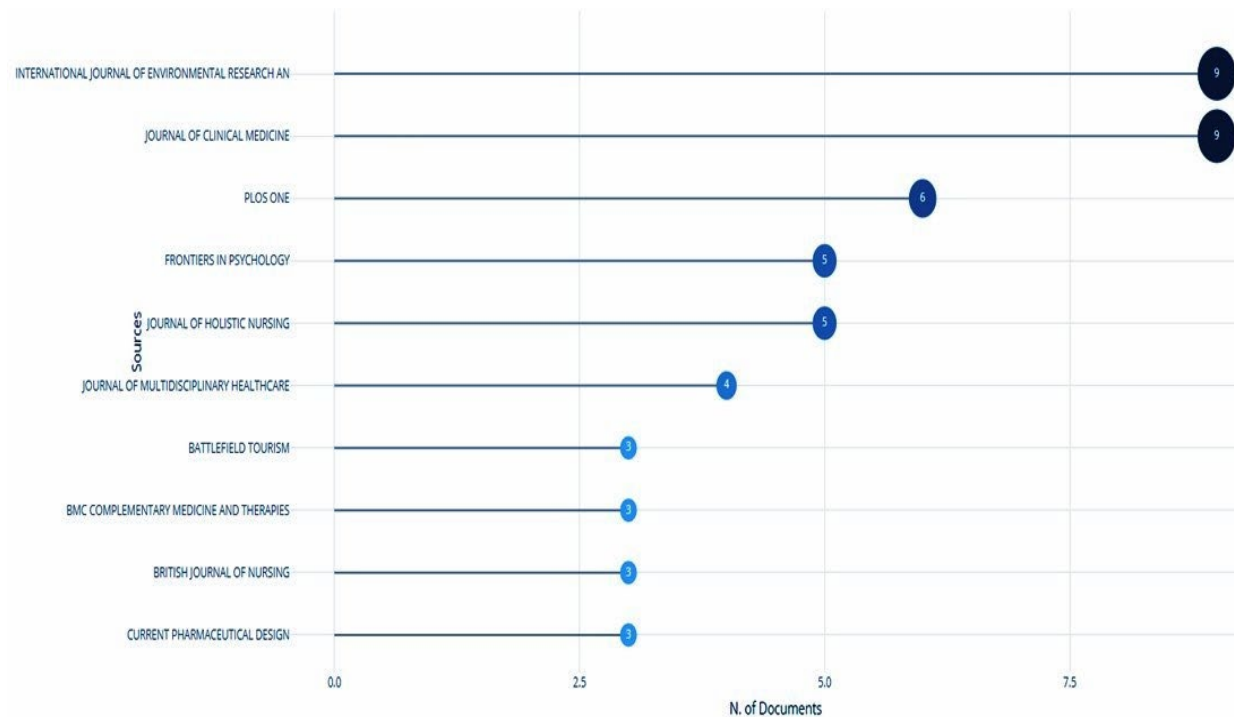


Figure 2. Visualization of leading journals publishing on the holistic prenatal learning model (2014-2024)

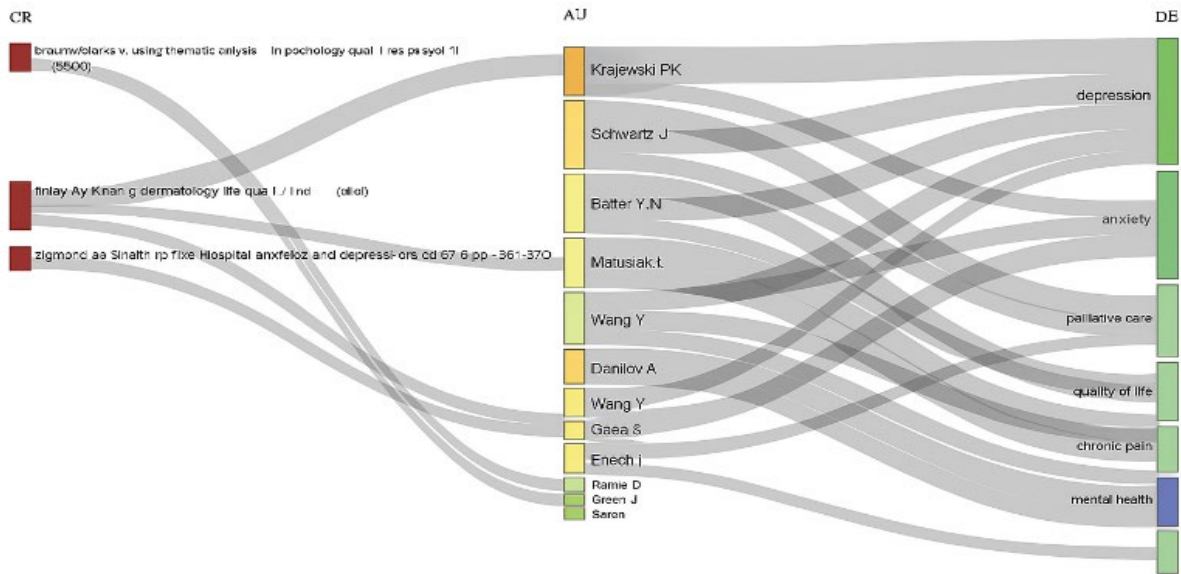


Figure 3. Visualization of a three-field plot displaying Citation References (CR), Authors (AU), and Descriptive Keywords/Terms (DE)

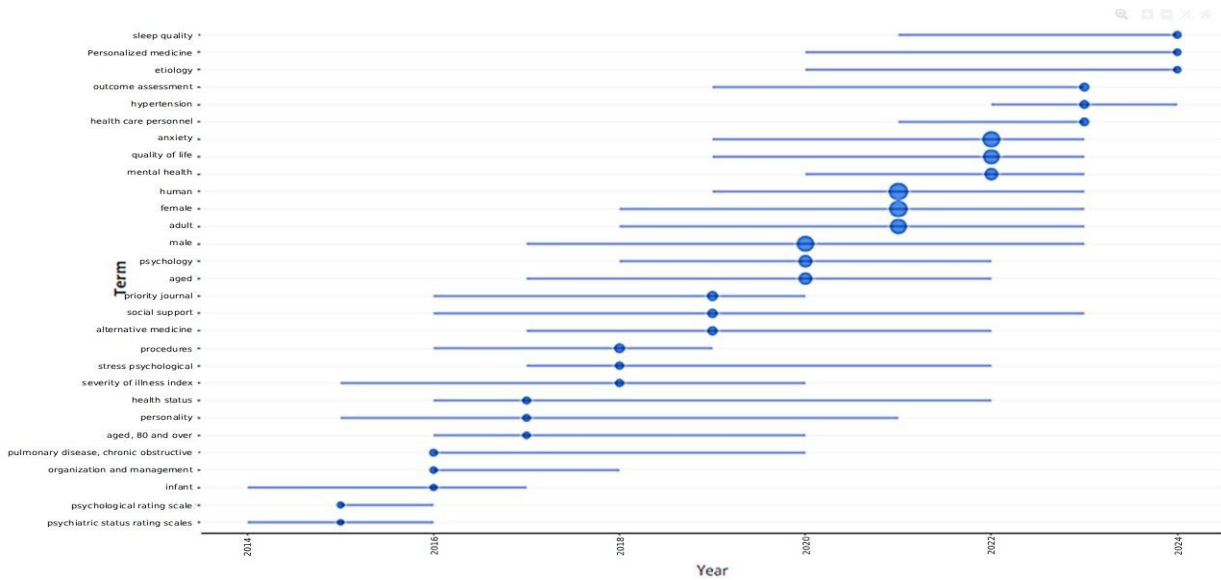


Figure 4. Visualization of keyword trend topics from 2014 to 2024

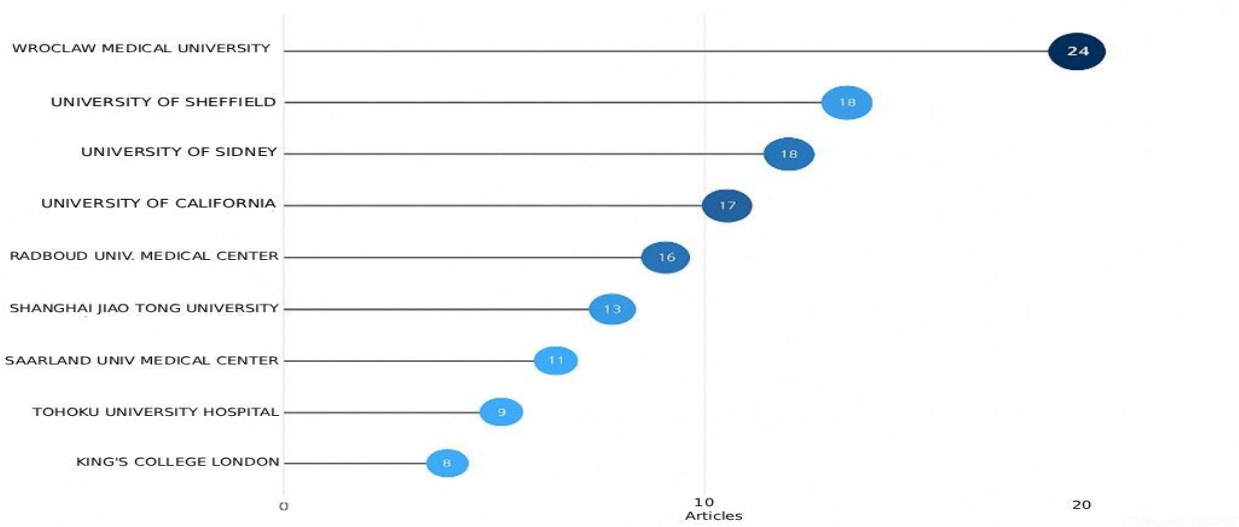


Figure 5. Institutions with the highest research output

Based on the visualization of the research data, several key journals emerged as major sources for publications related to holistic prenatal education. Among them, the International Journal of Environmental Research and Public Health and the Journal of Clinical Medicine were identified as the most prolific, each contributing 9 articles. This indicates a strong alignment of holistic maternal health research within the domains of environmental and clinical health sciences. PLOS ONE and Frontiers in Psychology also contributed significantly, with 6 and 5 documents, respectively, emphasizing the psychological and public health dimensions of this research topic. In addition, the Journal of Holistic Nursing and the Journal of Multidisciplinary Healthcare each published 5 and 4 articles, respectively, reflecting considerable academic attention to multidisciplinary and integrative approaches in maternal healthcare. Collectively, these journals demonstrate a wide-ranging interest in holistic and psychological approaches to maternal health management, underscoring both the multidisciplinary perspectives and clinical relevance in the realm of public health practice.

Co-Authorship Analysis

Co-authorship analysis showed that the most productive research collaborations originated from

countries, such as the United States, United Kingdom, and Australia. Krajewski and Schwartz emerged as leading contributors in this field (Figure 3).

Keywords co-occurrence

The most frequently occurring keywords associated with holistic prenatal classes and pregnancy-related anxiety were “holistic learning,” “prenatal anxiety,” “childbirth,” and “pregnancy outcomes.” These findings indicate an increasing research focus on integrative educational approaches during pregnancy (Figure 4).

Other notable contributors included the University of California and Radboud University Medical Center, with 17 and 16 articles, respectively. Research institutions in Shanghai, Tokyo, and London also played important roles, demonstrating the global nature of academic collaboration in this field (Figure 5).

These network analyses reveal that research on holistic maternal care is being conducted within a robust framework of international collaboration, with the United States, the United Kingdom, and India serving as leading contributors. The transnational nature of this collaboration highlights the universal importance of prenatal mental health and the increasing global recognition of holistic care models (Figure 6).

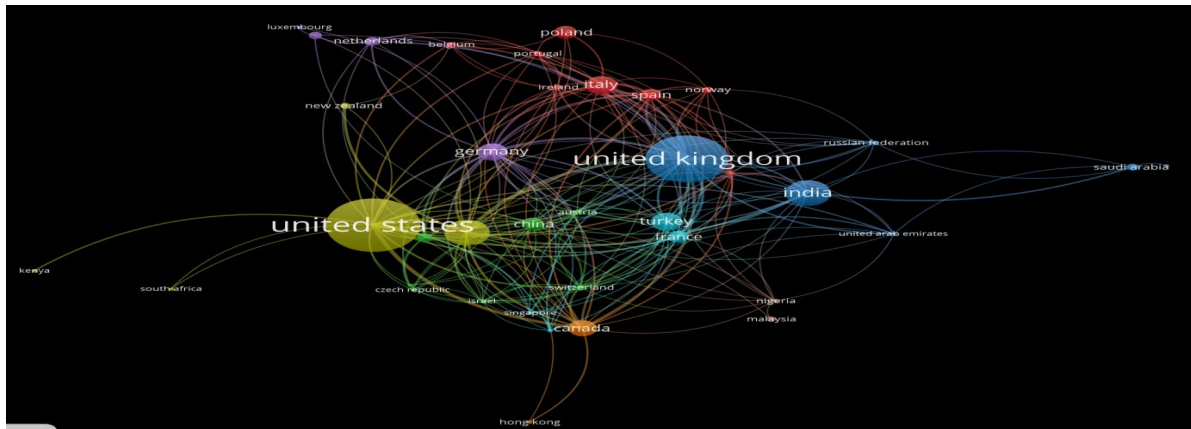


Figure 6. Corresponding author countries in the development of holistic prenatal education models

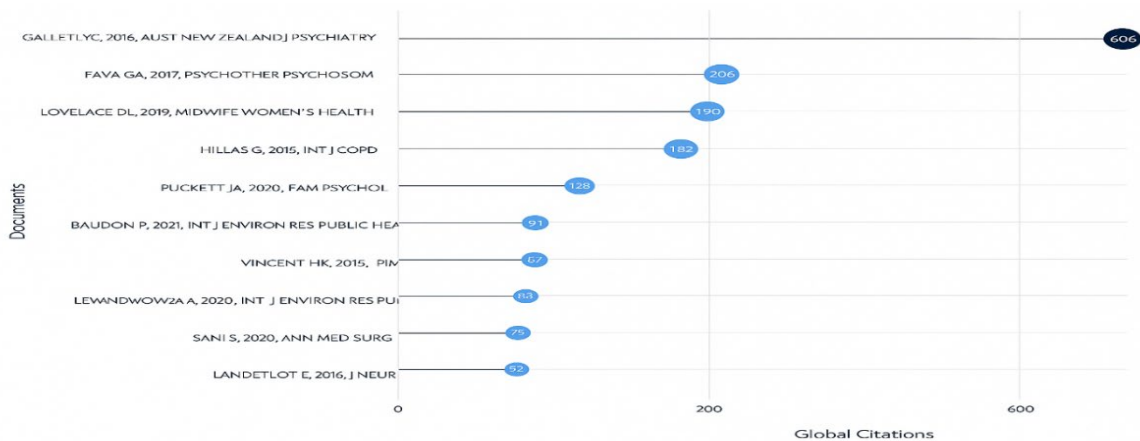


Figure 7. Visualization of citation trends for research articles on holistic prenatal education (2014-2024)

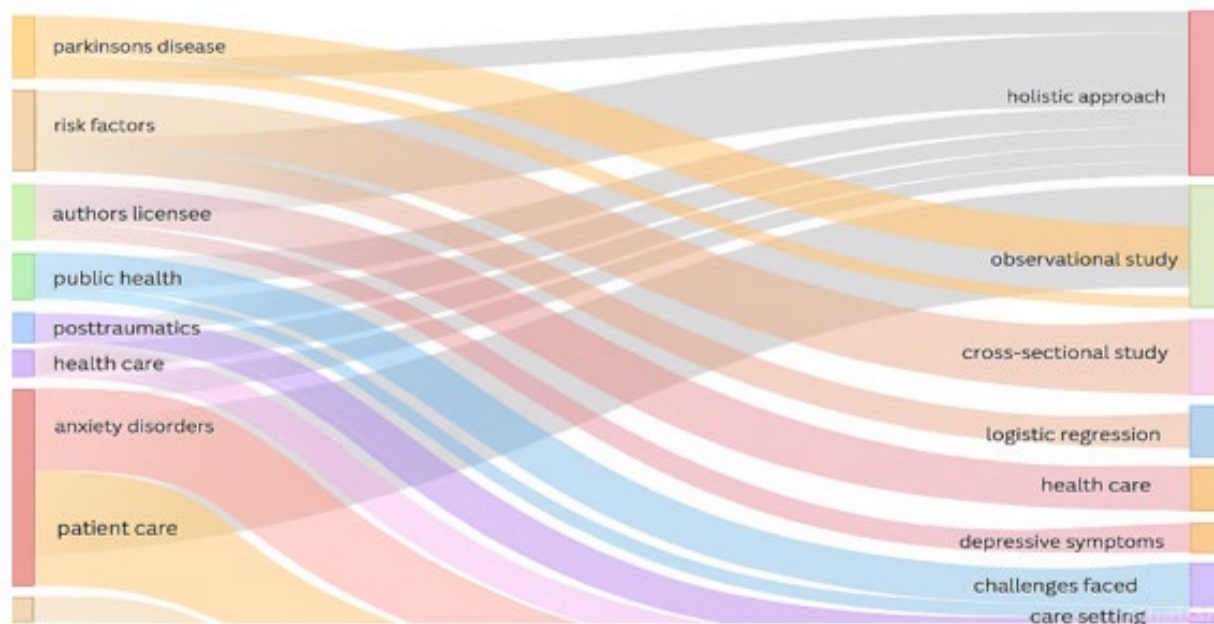


Figure 10. Thematic evolution of research topics in holistic models (2014-2024)

Discussion

This study aimed to analyze how holistic prenatal education affects anxiety among third-trimester pregnant women and how it relates to birth outcomes. The research in this area spans a ten-year period from 2014 to 2024, indicating increasing scholarly attention over the past decade. A total of 521 documents were published during the specified timeframe, demonstrating substantial academic interest in holistic prenatal learning and its association with maternal anxiety and birth outcomes. With an annual growth rate of 18.26%, this reflects a rapid increase in research, highlighting growing awareness of the importance of holistic approaches in maternal health, particularly in mitigating anxiety and improving delivery outcomes. Additionally, a total of 2,577 authors contributed to this body of research, indicating broad collaboration and considerable scholarly engagement across different regions of the world.

Approximately 20.35% of published articles involved international collaboration, underscoring the global nature of scholarly engagement in this field [20, 21]. The average number of authors per document was 5.08, suggesting a tendency towards large-scale or multidisciplinary research teams [22, 23]. A total of 1,649 keywords were used across the dataset, reflecting the thematic diversity of studies related to holistic prenatal education, anxiety, and childbirth outcomes [24]. The high number of references, totaling 25,824, indicates that this field is supported by an extensive and in-depth literature base, which reinforces the reliability and credibility of the findings [24, 25]. The cited documents had an average age of 3.27 years, showing that the literature is relatively recent and aligned with current research

trends, contributing to its relevance and academic influence [26, 27]. Each document received an average of 10.58 citations, demonstrating the scholarly impact and influence of the research in this domain. Based on the three-field plot visualization, the top three most frequently cited references were Braun & Clarke, regarding thematic analysis in psychology; Finlay & Khan [28], concerning the Dermatology Life Quality Index (DLQI); and Zigmond & Snaith [29], related to the Hospital Anxiety and Depression Scale (HADS). These references provided a strong theoretical foundation for studies focusing on quality of life and mental health outcomes [30]. Research by Padula *et al.* reports that exposure to air pollution and heavy metals during pregnancy, when combined with maternal psychosocial stress, can worsen fetal and child health. This combined exposure increases the risk of developmental delays, low birth weight, and neurocognitive problems [31]. The most frequently appearing keywords included depression, anxiety, quality of life, and mental health. These topics indicate the central research themes in exploring the interrelationship between psychological health and physical health conditions. The plot illustrates a strong link between theoretical frameworks on mental health, the pivotal role of prolific authors, and the growing depth of research on depression, anxiety, and quality of life within palliative and chronic pain care settings [32]. A marked increase was observed in research on key topics such as “anxiety,” “hypertension,” and “quality of life” between 2020 and 2023. This trend reflects a growing emphasis on mental health, hypertension management, and quality of life within the context of holistic prenatal care [33]. Emerging keywords, such as “sleep quality” and “personalized medicine”

appeared consistently after 2020, indicating a shift toward more individualized maternal healthcare approaches. These topics also highlight the influence of sleep on anxiety and birth outcomes, further emphasizing the holistic nature of maternal care [34]. Based on institutional affiliation data, Wrocław Medical University ranked highest with 24 articles, highlighting its significant contribution to research in maternal health, quality of life, and holistic care approaches. The University of Sheffield and the University of Sydney followed closely with 18 publications each, reflecting their leadership in multidisciplinary research related to maternal mental health and prenatal anxiety [35].

Other notable contributors included the University of California and Radboud University Medical Center, with 17 and 16 articles, respectively. Research institutions in Shanghai, Tokyo, and London also played important roles, demonstrating the global nature of academic collaboration in this field. These findings confirm that research on prenatal and holistic care includes contributions from institutions worldwide [36], underscoring the global relevance and scientific significance of the topic.

The network map visualizing country collaborations shows strong international connections. The United States is identified as the central hub of collaboration, with the largest node size indicating its dominant contribution to holistic prenatal education research [33]. U.S.-based researchers frequently engage in collaborative studies with scholars from other countries. The United Kingdom and India also emerged as significant research hubs, contributing notably to the existing literature on holistic prenatal education [37].

Additional countries showing strong international collaboration included Germany, Italy, Spain, and China, all of which were well-integrated within the global research network. Countries, such as the Netherlands, France, and Turkey also exhibited extensive international connections [38].

Pandura *et al.* [31] reported that exposure to air pollution and heavy metals during pregnancy, when accompanied by psychosocial stress in the mother, can worsen fetal and child health. This combined exposure increases the risk of developmental disorders, low birth weight, and neurocognitive problems. Fava, in *Psychotherapy and Psychosomatics*, has been cited 206 times, highlighting the role of psychotherapy in managing prenatal anxiety and promoting maternal well-being [39]. O'Connor *et al.* [40] also reported that prenatal alcohol exposure (PAE) is strongly associated with various mental health disorders in individuals exposed in utero. Genetic factors, such as a family predisposition to psychiatric disorders, along with epigenetic influences and postnatal environmental factors—including socioeconomic conditions and early childhood stress—act as moderators or mediators in this relationship. Kanner *et al.* [41] noted

that chronic exposure to air pollution during pregnancy, particularly fine particles such as PM₁₀ and PM_{2.5}, as well as nitrogen dioxide (NO₂) and nitrogen oxides (NO_x), is associated with an increased risk of developing or worsening mental disorders in pregnant women, including unspecified mental disorders complicating pregnancy and depression during pregnancy. The keywords human (365 mentions, 8%) and female (316 mentions, 7%) were identified as the most frequently occurring, indicating a strong research focus on reproductive and maternal health within the human population, with particular attention to women. Additionally, Anxiety (283 mentions, 6%) and Depression (242 mentions, 5%) were also highly prevalent, reflecting significant concern with mental health issues among pregnant women—particularly anxiety and depression during pregnancy, which are known to impact childbirth outcomes [34].

Quality of Life (234 mentions, 5%) has emerged as a critical area, especially within the context of pregnant women. Enhancing maternal quality of life is a principal objective of holistic intervention models that integrate physical, mental, and emotional well-being. Although Holistic Care appeared with a lower frequency (39 mentions, 1%), it still signals growing academic attention to care strategies that comprehensively address both the physical and psychological needs of pregnant individuals [42]. This tree map analysis demonstrates that research in maternal health is increasingly emphasizing mental health issues, such as anxiety and depression while also placing considerable focus on improving maternal quality of life [43].

The themes Human, Quality of Life, and Female remain central within the research network, demonstrating a strong scholarly focus on overall human health, particularly women's health during pregnancy and childbirth [44].

The classroom-based prenatal learning model with a holistic approach played an important role in reducing anxiety among third-trimester pregnant women and improving childbirth outcomes. Bibliometric analysis revealed a significant increase in publications over the past decade, with an annual growth rate of 18.26%. This indicates that maternal mental health, particularly anxiety before delivery, has been receiving increasing academic and clinical attention. These findings are consistent with systematic reviews highlighting that prenatal anxiety negatively affects maternal and fetal health and increases the risk of birth complications if left unmanaged [12].

The distribution of publications across multidisciplinary journals, such as the *Journal of Midwifery & Women's Health*, *BMC Pregnancy and Childbirth*, and *Frontiers in Psychology*, demonstrates that holistic approaches are considered relevant not only in midwifery but also in public health and clinical psychology. The inclusion of

holistic nursing journals further strengthens the perspective that the integration of physical, emotional, and spiritual dimensions is now viewed as a core strategy in maternal care. This aligns with the HAPPY cohort study, examining pregnancy and the first postpartum year holistically, showing that psychological support alongside physical monitoring is critical to maternal quality of life [11].

The co-authorship network analysis revealed that the United States, the United Kingdom, and Australia are the leading contributors, while Asian countries such as India, Japan, and China also made significant contributions. This reflects the global nature of maternal anxiety as a research concern. However, the dominance of literature from high-income countries may limit generalizability, as social, cultural, and healthcare contexts differ significantly in resource-limited settings. Therefore, further studies in developing countries are needed to adapt holistic prenatal models to local needs. This argument is supported by Artieta-Pinedo *et al.* [45], who found that pregnancy-related parameters influenced by sociocultural contexts contribute substantially to postpartum quality of life.

The frequent keywords were anxiety, quality of life, childbirth, and holistic care, illustrating a research shift toward improving maternal quality of life and mental health. The emergence of new keywords after 2020, such as sleep quality and personalized medicine, indicates a paradigm shift toward more individualized interventions. This is in line with global health trends emphasizing precision medicine, which tailors health interventions to the unique needs of each individual [46].

Leading academic institutions, such as Wroclaw Medical University, the University of Sheffield, and the University of Sydney, have been identified as research hubs in this field. Their high productivity highlights that maternal anxiety and holistic interventions are considered strategic areas of research. At the same time, these findings open opportunities for broader cross-national collaborations, especially between high-income and low-/middle-income countries, to facilitate the transfer and adaptation of best practices. Recent systematic reviews have shown that integrating telehealth into maternal education can extend access and enhance psychological support for pregnant women [8]. Nevertheless, digital access in developing countries remains a major barrier to implementation. The practical implications of this study are extensive. For healthcare professionals, holistic classroom-based prenatal modules can be integrated into childbirth preparation programs in health facilities. For policymakers, these interventions can be considered part of national strategies to reduce birth complications caused by maternal anxiety. Furthermore, hybrid models that combine face-to-face and online modalities hold promise for reaching pregnant women in remote areas with limited

healthcare access. However, it should be noted that most studies included in this analysis originated from developed countries, which highlights the need for longitudinal studies in developing regions to assess long-term effectiveness [47].

In summary, this study enriches the literature by emphasizing that holistic approaches are effective in reducing maternal anxiety, enhancing quality of life, and improving childbirth outcomes. With the growing body of empirical evidence, the integration of holistic approaches into maternal health policies is both relevant and timely, especially within the global agenda of reducing maternal morbidity and mortality [48].

This study confirms that the holistic prenatal approach is effective in reducing anxiety among third-trimester pregnant women and improving childbirth outcomes. The bibliometric analysis also shows an increasing academic interest in this model, including the use of telehealth, although access to technology in developing countries remains a challenge. The holistic approach can enhance emotional well-being and quality of life for pregnant women and is relevant for global application. However, further research is needed to assess its effectiveness in different cultural and socio-economic contexts, particularly in resource-limited settings.

Conclusion

The holistic prenatal approach is effective in reducing anxiety among third-trimester pregnant women and improving childbirth outcomes.

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