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**GLOBAL HOTSPOTS AND FUTURE DIRECTIONS OF
POSTPARTUM DEPRESSION RESEARCH: A BIBLIOMETRIC
PERSPECTIVE (2016–2024)**

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ABSTRACT

Introduction: Postpartum depression (PPD) is the most common mood disorder in the perinatal period that has a serious impact on maternal and infant health, quality of care, and socio-economic burden. In the past decade, publications on PPD have increased sharply, covering aspects of prevalence, biopsychosocial risk factors, screening, and psychological and pharmacological interventions. The COVID-19 pandemic has also broadened the focus of research, especially on maternal vulnerability and technology-based interventions. This study uses a bibliometric approach to 6,893 international publications on PPD for the period 2016–2024. **Method:** Data is obtained from reputable bibliographic bases and normalized to standardize authors, institutions, countries, keywords, and citations. Analysis using Vosviewer, the analysis includes annual publication trends, authors and productive institutions, country distribution, dominant keywords, as well as the most cited articles. **Result:** Visualization is carried out with density, overlay, and network mapping to identify hotspots and research frontiers. The number of publications has increased rapidly since 2020, reflecting the academic response to the pandemic as well as the global maternal mental health agenda. The United States dominates scientific production, with the University of California as the center of collaboration. The figure of Samantha E. Meltzer-Brody emerged as a key author pushing the clinical agenda. Keyword analysis showed hotspots such as anxiety, cesarean section, risk factors, female, and pregnant woman. Overlay visualization highlights the shift from classic themes (psychology, obstetrics) to new frontiers such as digital health, social media, screening, and mental health services. Network visualization revealed four main research clusters: psychological aspects, obstetric complications, maternal services, and biological biomarkers. **Conclusion:** Global PPD research 2016–2024 shows substantial growth with new directions in digital interventions, universal screening, and biomarkers. It is necessary to develop point-of-care-based prediction models, test the effectiveness of digital interventions, cultural adaptation, and cross-border collaboration. For Indonesia, the establishment of a national research consortium, the integration of PPD screening into antenatal-postnatal services, and implementation funding are key strategies for maternal mental health to become a national priority.

Keywords: postpartum depression, bibliometrics, maternal mental health, biomarkers

INTRODUCTION

Postpartum depression (PPD) is one of the most common mood disorders in the perinatal period that has a significant impact on the mother, baby, and family. This condition is characterized by depressive symptoms that appear after childbirth, including prolonged feelings of sadness, loss of interest, sleep disturbances, and difficulty in carrying out the role of mother. The global prevalence of PPD is reported to range from 10–20%, with variation between countries influenced by social, economic, cultural, and health care system factors (Hahn-Holbrook et al., 2018). The impact is not only felt by the mother, but also affects the cognitive, emotional, and social development of the child, as well as increases the risk of conflict in family relationships (Shorey et al., 2019). Increased attention to maternal mental health in the last two decades has encouraged the growth of research on PPD, ranging from the identification of risk factors, screening strategies, to the development of psychological and pharmacological interventions. The risk factors for PPD are multifactorial, involving biological, psychological, obstetrics, and socio-economic aspects. For example, a history of depression, obstetric complications, lack of social support, and economic stress have been shown to increase the risk of PPD (Hahn-Holbrook et al., 2018). In addition, breastfeeding has also been reported to have the potential to protect against symptoms of maternal depression (Pearlstein et al., 2009) (Woody et al., 2017).

The development of science encourages the exploration of PPD from a biomedical perspective. Recent studies highlight the role of biological biomarkers such as cortisol, progesterone, interleukin-6, and DNA methylation as risk predictors (O'Hara & Wisner, 2014). However, the psychosocial aspect remains the dominant factor in the understanding and intervention of PPD, thus demanding a multidisciplinary approach that combines clinical science, public health, and digital technology. The COVID-19 pandemic has been an important momentum that has impacted the PPD research landscape. Social isolation, limited access to services, and economic uncertainty worsened the mental state of pregnant and lactating women, triggering a spike in the prevalence of depression and anxiety symptoms (Almeida et al., 2016). The academic response to this phenomenon can be seen from the increasing publication of technology-based interventions, such as online counseling, application-based therapy, and the use of social media as psychological support (Shorey et al., 2019).

Bibliometric analysis is an important method for mapping the development of PPD research. With a quantitative approach, this analysis can identify publication trends, key actors (authors, institutions, countries), and research hotspots that emerge over time (Dennis et al., 2017). This approach not only provides an objective picture of the knowledge landscape, but also highlights new frontier directions that are future priorities, such as universal screening, digital interventions, and the integration of mental health into maternal services (Fitelson et al., 2011). In the Indonesian context, PPD still receives relatively little attention, both in research and policy. In fact, postpartum psychosocial burdens can reduce the quality of caregiving, increase the risk of domestic violence, and have an impact on children's growth and development. Therefore, a global mapping of PPD research can be a strategic foothold for Indonesia to strengthen national research, build research consortiums, and integrate mental health screening into antenatal and postnatal services.

Thus, this study aims to map trends, hotspots, and frontiers of PPD research for the 2016–2024 period through a bibliometric approach. The findings are expected to

strengthen the direction of maternal health policy, as well as open up space for international collaboration to improve the quality of maternal mental health services.

METHOD

This research is designed using a bibliometric approach, which is a quantitative method that aims to map publication patterns, connections between researchers, and the development of research themes in certain fields. This approach was chosen because it is able to provide a comprehensive picture of the research landscape of postpartum depression (PPD) at the global level, so that it can reveal the main trends, key authors and institutions, countries with high productivity, and research themes that are in the center of attention. Thus, the results of this study are expected not only to present descriptive statistics, but also to provide direction for the development of PPD studies in the future. The source of research data was obtained from a CSV-formatted bibliographic dataset downloaded from internationally reputable databases. This dataset includes a total of 6,893 published documents in the period 2016 to 2024. The document consists of research articles, review articles, and several other types of scientific publications relevant to the topic of PPD. The selection of a nine-year period is considered representative enough to capture the dynamics of contemporary research, especially considering the surge in publications during the COVID-19 pandemic. After the dataset is obtained, the process of cleaning and normalizing the data is carried out so that it can be analyzed consistently. The first step is to standardize the main columns, namely the title of the publication, year, name of the author, institutional affiliation, country, keywords, publication source, and number of citations. The varied column writing in the original file was changed to a uniform shape by removing additional spaces and standardizing capital letters. Furthermore, the year of publication is extracted from each document using a four-digit pattern, so that only valid year information is included in the analysis.

Author names are separated using punctuation, especially semicolons or commas, according to the format of the list of authors in the dataset. Additional information, such as affiliation that is sometimes in parentheses, is removed so that the author's name is clearly legible. This effort is made to avoid duplication of names and ensure each author is counted as a single entity. Similarly, the author's affiliations were analyzed to identify the institution. Parsing is done by marking key terms such as University, College, Hospital, Institute, Centre, Center, or School as institutional markers. To obtain country data, information is obtained both from the available country columns and by extracting the last element of the affiliate. Author keywords and index keywords are then normalized by separating the terms using commas or semicolons. All terms are lowercase for consistency. Some generic keywords that are too dominant, such as *postpartum depression*, *pregnancy*, *depression*, or *women*, are deliberately removed from the final list, because they are too generic and do not reflect more specific research hotspots. With this approach, keyword analysis is expected to be able to display more detailed research themes, such as *anxiety disorders*, *risk factors*, *breastfeeding*, or *digital interventions*. The number of citations is also one of the important indicators in this study. Citation information is extracted from the cited by or times cited columns, then reformatted into round numbers for easy ranking. The article with the highest number of citations is then identified as the most influential work, because bibliometrically the publication is widely used as a reference by other studies.

The indicators analyzed in this study include annual publication trends from 2016 to 2024, ten to fifteen most prolific authors, institutions with the highest number of

publications, distribution of countries with the highest scientific production, twenty dominant keywords, as well as fifteen most frequently cited articles. Analysis using Vosviewer. The results of the analysis are also presented in the form of a summary table so that they can be directly used in writing scientific articles. In terms of validity, it should be recognized that the results of this study depend entirely on the completeness of the dataset analyzed. Because the dataset is sourced from a single bibliographic export, not all global publications may be covered, particularly non-English language articles or local journals that are not indexed. In addition, this study does not involve direct human participation, but only utilizes secondary data in the form of publication metadata, so it does not require ethical approval of the research. With these various stages, this research method is expected to be able to provide an objective overview of the trends, key actors, and frontiers of PPD research in the last nine years.

RESULT

Bibliometric analysis of postpartum depression (PPD) research in the period 2016–2024 provides an overview of global trends, research hotspots, and future directions. The results of density visualization showed that the dominant keywords were *adult*, *psychology*, *pregnant woman*, *mental health*, *infant*, and *cesarean section*. This confirms that the main focus of research is still centered on maternal mental health, psychosocial factors, and obstetric complications related to the incidence of PPD.

The visualization overlay map reveals temporal dynamics with color gradations from blue (old topic) to yellow (new topic). At the beginning of the period, research emphasized classical aspects such as psychology, obstetric procedures, and general mental health. However, since 2020, new topics have emerged that are more current, including *pandemics*, *social media*, *digital health*, *screening*, and *mental health services*. This shift reflects the scientific community's response to the COVID-19 pandemic as well as the growing interest in digital interventions and the integration of mental health into maternal services.

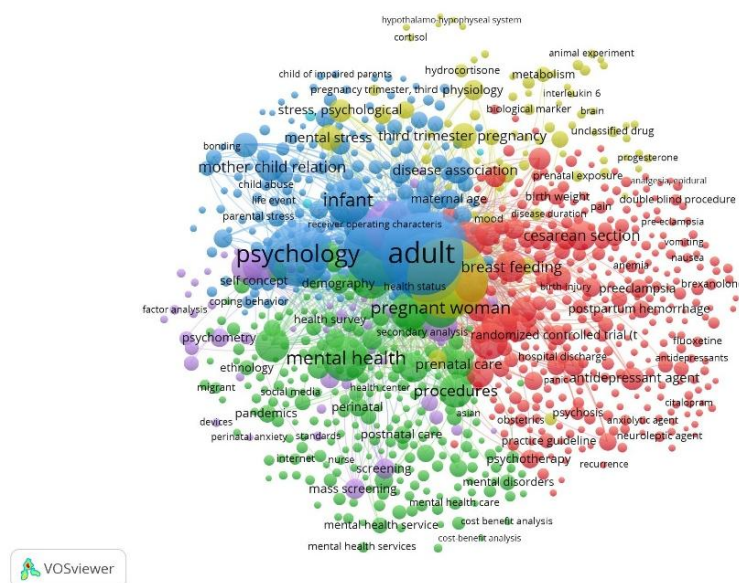


Figure 1. Overlay Map

This bubble chart visualizes research trends over time, with bubbles representing different topics. The size of the bubble indicates the volume of research, and the color gradient shows the year, ranging from 2019.5 (dark purple) to 2025 (yellow). The most prominent cluster in the center includes 'psychology' and 'adult'. Below this, 'pregnant woman' and 'prenatal care' are significant. To the right, 'disease association' and 'cesarean section' are notable. At the bottom, 'mental health services' and 'cost benefit analysis' are visible. A color scale legend at the bottom right confirms the temporal mapping.

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Overall, this visualization confirms that PPD research hotspots are still centered on maternal mental health and obstetric outcomes, while new frontiers are moving towards digital technology-based interventions, mass screening, predictive biomarkers, and more integrated mental health services. These findings provide an important direction for research and policy development, particularly in expanding access and strengthening global collaboration in the field of maternal health.

DISCUSSION

This study shows a substantial growth in publications on postpartum depression (PPD) over the period 2016–2024. This increase not only reflects the growing breadth of academic attention, but is also in line with the global recognition of the postpartum psychosocial burden and the growing policy push in the field of maternal mental health (Hahn-Holbrook et al., 2013). The surge in publications since 2020–2021 is primarily correlated with the COVID-19 pandemic, which changed the maternal health landscape and created an urgent need for distance-based interventions as well as family resilience (Almeida et al., 2016; Shorey et al., 2019). Thus, the development of this publication can be read as a reflection of the relationship between global social dynamics and academic research priorities. The dominance of the United States in PPD research productivity, accompanied by significant contributions from the University of California network, underscores the importance of an established research infrastructure, the availability of large funding, and a culture of multidisciplinary collaboration (Dennis et al., 2017). Central figures such as Samantha E. Meltzer-Brody, who emerged as the most prolific author, have championed research that drives the clinical agenda, including universal screening, the integration of mental health services into maternal care, and the evaluation of new therapies such as brexanolone (Goodman, 2009). The presence of these kinds of key researchers accelerates the translation of knowledge from the laboratory to health policy and services.

Keyword analysis revealed that research hotspots were a mix of clinical and epidemiological terms—such as anxiety, risk factors, cesarean section, and demographic terms such as female and pregnant woman. This confirms that PPD is viewed in a multidimensional risk framework, where biological, psychosocial, obstetric, and demographic factors interact with each other (Sockol et al., 2011). This trend is in line with the global agenda of expanding perinatal screening as well as strengthening stepped care models that allow interventions to be tailored to individual risk levels (Norhayati et al., 2015).

The overlay visualization shows a boundary shift. Classic themes such as psychology, mental health, and cesarean section were dominant at the beginning, while since 2020 research has moved towards contemporary issues such as pandemics, digital health, social media, screening, and mental health services (O'Hara & Wisner, 2014). This shift is inseparable from the impact of the COVID-19 pandemic which highlights the vulnerability of pregnant women/postpartum women due to social isolation, barriers to access services, and economic pressure (Yim et al., 2015). The response of the research community is the exploration of technology-based solutions—CBT-based digital therapy, blended therapy, and the use of social media as a means of support (Sockol et al., 2011).

Network visualization groups PPD research into four major clusters. The psychology and mental health clusters emphasize stress factors and mother-child relationships (Almeida et al., 2016). The obstetrics cluster focuses on clinical complications such as preeclampsia, postpartum hemorrhage, as well as the role of antidepressants (Yim et al., 2015). The health service cluster shows efforts to screen, service standards, and the integration of mental health services into maternal care (Pearlstein et al., 2009). The biological cluster opens up space for the exploration of hormonal biomarkers such as cortisol, progesterone, interleukin-6, and DNA methylation as predictors of PPD risk (O'Hara & Wisner, 2014).

Future research frontiers include: (1) integrating clinical, social, and biological data into point-of-care-based predictive models (Biaggi et al., 2016), (2) testing the effectiveness of digital interventions across service levels (Sokol et al., 2011; Stowe & Nemeroff, 1995), (3) ensuring equity through language and cultural adaptation (Slomian et al., 2019), and (4) expanding international collaborations to make outcomes more relevant in low-middle-income settings (Chmielewska et al., 2021).

The policy implications are quite significant. For developed countries, the future direction of research is universal screening, task-sharing with non-specialists, and referrals to specialist services (Yim et al., 2015). For developing countries, including Indonesia, these results are the basis for building national research consortiums, integrating PPD screening in the ANC/PNC, and funding for implementation research (Chmielewska et al., 2021). Although comprehensive, this study has limitations. String-based institution and state parsing has the potential to overcount, keyword normalization is still limited, and advanced network analysis (e.g. burst detection, thematic evolution) has not been carried out. This is in line with methodological records in previous bibliometric studies. Some of the most cited articles in this period reinforce the findings. Biaggi et al. emphasize the importance of identifying antenatal risk factors, especially anxiety, a history of depression, and lack of social support [2]. Slomian et al. expanded the evidence regarding the consequences of PPD, which affects not only mothers but also infants and partners (Slomian et al., 2019). In the pandemic era, two key articles were particularly influential: Chmielewska et al. showed an increased risk of maternal-perinatal outcomes (Lebel et al., 2020), while Lebel et al. reported a high prevalence of depressive symptoms and anxiety in pregnant women (Yim et al., 2015). On the policy side, ACOG affirms the recommendation of universal PPD screening (Lebel et al., 2020), which reinforces the urgency of implementing screening in antenatal and postnatal services.

Overall, this discussion emphasizes that PPD research is at the intersection of clinical, psychosocial, obstetrics, and digital technology. The rapid growth of publications, the dominance of large global institutions, and the emergence of new frontiers provide a great opportunity to strengthen PPD prevention and services. The next challenge is to ensure that research results are truly translated into health policy and clinical practice, while taking into account local contexts and global justice.

CONCLUSION

Bibliometric analysis of postpartum depression (PPD) research for the period 2016–2024 shows a substantial growth in global publications, in line with increasing recognition of maternal mental health. The dominance of the United States, especially the University of California network, underscores the strength of research, funding, and multidisciplinary collaboration infrastructure, while research figures such as Samantha E. Meltzer-Brody serve as the main drivers of the clinical agenda. Research hotspots are centered on psychology, mental health, obstetrics risk factors, and mother-child relationships, while new frontiers are evolving towards digital interventions, mass screening, and exploration of biological biomarkers. These findings confirm the importance of a multidimensional approach in understanding and dealing with PPD.

As a suggestion, future research needs to integrate clinical, social, and biological data into point-of-care-based predictive models, expand the effectiveness of digital interventions at different service levels, and ensure equity through cultural-language adaptation. For Indonesia, a national research consortium of PPD, integration of screening into antenatal-

postnatal services, and funding for implementation are needed, so that maternal mental health becomes a priority in the maternal health system

REFERENCES

- Almeida, C. S. de, Miccoli, L. S., Andhini, N. F., Aranha, S., Oliveira, L. C. de, Artigo, C. E., Em, A. A. R., Em, A. A. R., Bachman, L., Chick, K., Curtis, D., Peirce, B. N., Askey, D., Rubin, J., Egnatoff, D. W. J., Uhl Chamot, A., El-Dinary, P. B., Scott, J.; Marshall, G., Prensky, M., ... Santa, U. F. De. (2016). No 主観的健康感を中心とした在宅高齢者における 健康関連指標に関する共分散構造分析Title. In *Revista Brasileira de Linguística Aplicada* (Vol. 5, Issue 1). <https://revistas.ufrj.br/index.php/rce/article/download/1659/1508%0Ahttp://hipatia.press.com/hpjournals/index.php/qre/article/view/1348%5Cnhttp://www.tandfonline.com/doi/abs/10.1080/09500799708666915%5Cnhttps://mckinseyonsociety.com/downloads/reports/Educa>
- Biaggi, A., Conroy, S., Pawlby, S., & Pariante, C. M. (2016). Identifying the women at risk of antenatal anxiety and depression: A systematic review. *Journal of Affective Disorders*, 191, 62–77. <https://doi.org/10.1016/J.JAD.2015.11.014>
- Chmielewska, B., Barratt, I., Townsend, R., Kalafat, E., van der Meulen, J., Gurol-Urganci, I., O'Brien, P., Morris, E., Draycott, T., Thangaratinam, S., Le Doare, K., Ladhani, S., von Dadelszen, P., Magee, L., & Khalil, A. (2021). Effects of the COVID-19 pandemic on maternal and perinatal outcomes: a systematic review and meta-analysis. *The Lancet Global Health*, 9(6), e759–e772. [https://doi.org/10.1016/S2214-109X\(21\)00079-6](https://doi.org/10.1016/S2214-109X(21)00079-6)
- Dennis, C. L., Falah-Hassani, K., & Shiri, R. (2017). Prevalence of antenatal and postnatal anxiety: Systematic review and meta-analysis. *British Journal of Psychiatry*, 210(5), 315–323. <https://doi.org/10.1192/bjp.bp.116.187179>
- Fitelson, E., Kim, S., Baker, A. S., & Leight, K. (2011). Treatment of postpartum depression: Clinical, psychological and pharmacological options. *International Journal of Women's Health*, 3(1), 1–14. <https://doi.org/10.2147/IJWH.S6938>
- Goodman, J. H. (2009). Women's attitudes, preferences, and perceived barriers to treatment for perinatal depression. *Birth*, 36(1), 60–69. <https://doi.org/10.1111/j.1523-536X.2008.00296.x>
- Hahn-Holbrook, J., Cornwell-Hinrichs, T., & Anaya, I. (2018). Economic and Health Predictors of National Postpartum Depression Prevalence: A Systematic Review, Meta-analysis, and Meta-Regression of 291 Studies from 56 Countries. *Frontiers in Psychiatry*, 8(February). <https://doi.org/10.3389/fpsyt.2017.00248>
- Hahn-Holbrook, J., Haselton, M. G., Dunkel Schetter, C., & Glynn, L. M. (2013). Does breastfeeding offer protection against maternal depressive symptomatology?: A prospective study from pregnancy to 2 years after birth. *Archives of Women's Mental Health*, 16(5), 411–422. <https://doi.org/10.1007/s00737-013-0348-9>

- Lebel, C., MacKinnon, A., Bagshawe, M., Tomfohr-Madsen, L., & Giesbrecht, G. (2020). Elevated depression and anxiety symptoms among pregnant individuals during the COVID-19 pandemic. *Journal of Affective Disorders*, 277, 5–13. <https://doi.org/10.1016/J.JAD.2020.07.126>
- Louise, M. (2018). *Cardiff*.
- Norhayati, M. N., Nik Hazlina, N. H., Asrenee, A. R., & Wan Emilin, W. M. A. (2015). Magnitude and risk factors for postpartum symptoms: A literature review. *Journal of Affective Disorders*, 175, 34–52. <https://doi.org/10.1016/J.JAD.2014.12.041>
- O'Hara, M. W., & Wisner, K. L. (2014). Perinatal mental illness: Definition, description and aetiology. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 28(1), 3–12. <https://doi.org/10.1016/J.BPOBGYN.2013.09.002>
- Pearlstein, T., Howard, M., Sallsbury, A., & Caron, Z. (2009). NIH Public Access. Postpartum depression (Pearlstein). *AM J Obstet Gynecol*, 200(4), 357–364. <https://doi.org/10.1016/j.ajog.2008.11.033>.Postpartum
- Shorey, S., Chee, C. Y. I., Ng, E. D., Lau, Y., Dennis, C. L., & Chan, Y. H. (2019). Evaluation of a technology-based peer-support intervention program for preventing postnatal depression (Part 1): Randomized controlled trial. *Journal of Medical Internet Research*, 21(8). <https://doi.org/10.2196/12410>
- Slomian, J., Honvo, G., Emonts, P., Reginster, J. Y., & Bruyère, O. (2019). Consequences of maternal postpartum depression: A systematic review of maternal and infant outcomes. In *Women's Health* (Vol. 15). <https://doi.org/10.1177/1745506519844044>
- Sockol, L. E., Epperson, C. N., & Barber, J. P. (2011). A meta-analysis of treatments for perinatal depression. *Clinical Psychology Review*, 31(5), 839–849. <https://doi.org/10.1016/j.cpr.2011.03.009>
- Woody, C. A., Ferrari, A. J., Siskind, D. J., Whiteford, H. A., & Harris, M. G. (2017). A systematic review and meta-regression of the prevalence and incidence of perinatal depression. *Journal of Affective Disorders*, 219, 86–92. <https://doi.org/10.1016/J.JAD.2017.05.003>
- Yim, I. S., Stapleton, L. R. T., Guardino, C. M., Hahn, J., Schetter, C. D., Behavior, S., & Angeles, L. (2015). Depression : Systematic Review and Call for Integration. *Annual Review of Clinical Psychology*, 11, 99–137. <https://doi.org/10.1146/annurev-clinpsy-101414-020426>.Biological