



Research Trends in Postpartum Post-Traumatic Stress Disorder Among High-Risk Pregnancies: A CiteSpace Bibliometric Analysis

Juan Zhu ¹, Faridah Mohd Said ^{1,*}, Chun Hoe Tan ²

Abstract

Background: High-risk pregnancies are associated with increased complications that can jeopardize maternal and fetal health, leading to adverse outcomes such as intrauterine growth restriction and preterm labor. Postpartum psychiatric challenges, including postpartum depression and post-traumatic stress disorder (PTSD), often emerge due to hormonal shifts and physical trauma during childbirth. Previous research indicates that postpartum PTSD is more prevalent among high-risk pregnancy populations, yet the field lacks centralization. **Methods:** This study utilized CiteSpace software to analyze 175 relevant publications on postpartum PTSD in high-risk pregnancies retrieved from the Web of Science Core Collection (2004–2024). A systematic literature review, employing a Boolean search strategy, ensured comprehensive data collection. The analysis included citation patterns, keyword co-occurrence, and clustering to identify key trends and emerging research areas. **Results:** Findings revealed a marked increase in research output, particularly from 2019 onward, with the United States leading in publication volume and centrality. High-frequency keywords included "posttraumatic stress

disorder," "postpartum depression," and "risk factors," indicating primary focus areas in this domain. Cluster analysis identified eight thematic areas, with significant attention on factors influencing PP-PTSD, clinical symptoms, and prevention strategies. Keyword emergence maps highlighted evolving interests, particularly the impact of adverse childhood experiences and traumatic childbirth. **Conclusion:** The study underscores the urgent need for targeted mental health interventions for women with high-risk pregnancies, as these populations are particularly susceptible to postpartum PTSD. Continued research into risk factors and the development of predictive models is essential for improving maternal mental health care, ensuring that interventions are tailored to the specific needs of this vulnerable group. Enhanced understanding of the interplay between maternal health and postpartum outcomes is critical for optimizing care strategies.

Keywords: Postpartum PTSD, High-risk pregnancy, Maternal mental health, Neonatal outcomes, Psychological stress.

Introduction

High-risk pregnancies are associated with an increased likelihood of complications that can jeopardize the health of both mother and child, potentially leading to adverse outcomes during the perinatal period. This risk is often heightened by the emergence of new health conditions or pre-existing factors that complicate pregnancy (Majella et al., 2019). Such pregnancies pose serious threats to both the mother and the fetus, exacerbating discomforts and increasing

Significance | Analyzing postpartum PTSD in high-risk pregnancies shows critical research trends, emphasizing early intervention to improve maternal and neonatal outcomes.

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the likelihood of complications like intrauterine growth restriction, preterm labor, and various neonatal disorders (Isaacs et al., 2020; Rodrigues et al., 2016).

Postpartum, women may face various psychiatric challenges, including postpartum depression and postpartum post-traumatic stress disorder (PTSD), both of which can be triggered by hormonal shifts, physical trauma, and the adjustment to motherhood (Holt et al., 2018; Seng et al., 2018). PTSD following childbirth typically manifests with delayed symptoms such as reliving the labor experience, avoiding childbirth-related topics, heightened alertness, and increased stress (Yanfang et al., 2021). This condition may lead to breastfeeding difficulties, strained mother-infant relationships, and challenges in the infant's emotional development (Ying, 2021). Multiple studies have shown that postpartum PTSD is more common in high-risk pregnancies compared to those with lower risk (Harrison et al., 2021). With increasing attention from the scientific community, research on postpartum PTSD in high-risk pregnancies has grown steadily, exploring a wide range of subjects. However, the field lacks centralization. This study uses CiteSpace software to analyze the current state, key focus areas, and emerging trends in this research domain, aiming to predict future directions and support early intervention for postpartum PTSD in mothers with high-risk pregnancies.

Methodology

Data Collection

Data for this study were obtained from the Web of Science Core Collection database, using a Boolean logic search strategy to retrieve relevant English-language publications. The search focused on articles and literature discussing postpartum post-traumatic stress disorder (PP-PTSD) in high-risk pregnancies. The search covered the period from 2004 to May 31, 2024, yielding a total of 209 records. The detailed search strategy is outlined in Table 1.

Literature Screening and Processing

A comprehensive screening process was conducted by two independent researchers who meticulously reviewed the titles, abstracts, and full texts of the identified publications. The focus was on studies that explored PP-PTSD in high-risk pregnancies. The following types of documents were excluded: abstracts, short commentaries, notices, conference proceedings, news reports, experience summaries, and non-English literature not directly relevant to postpartum PTSD in high-risk pregnancies.

After the initial screening, 34 articles were excluded, leaving 175 records deemed valid for the study. These records were downloaded in "full record with cited references" format and included essential bibliometric information such as author names, article titles, abstracts, keywords, and citations. When disagreements arose regarding the inclusion or exclusion of a particular study, both

researchers engaged in discussions until a consensus was reached. Figure 1 illustrates the literature selection process.

Research Tools

This study employed CiteSpace (version 6.2.R7), a software tool developed by Prof. Meichao Chen of Drexel University, to visualize and analyze citation data. CiteSpace is widely recognized for its utility in generating scientific knowledge maps that depict the evolution and interconnectivity of research within a specific field. It was used to create visual representations of the data, including citation patterns, keyword co-occurrence, and clustering analyses. Additionally, Excel 2016 was used to quantify and analyze the publication count.

Parameter Settings

In CiteSpace, the analysis was performed for the period between 2004 and May 31, 2024, with each year serving as a time slice. The modularity index (Q value) and silhouette value (S value) were used to assess the clustering quality. A Q value greater than 0.3 indicated a meaningful modular structure, while an S value greater than 0.5 indicated reliable clustering results. Key nodes within the knowledge network were identified based on their centrality values, with a centrality threshold of 0.1 used to highlight influential nodes within the research landscape.

Results

Research Publications on Postpartum Post-Traumatic Stress Disorder in High-Risk Pregnancies

The analysis of 175 English-language publications from 2004 to May 2024 provides insights into the research trends related to postpartum post-traumatic stress disorder (PP-PTSD) in high-risk pregnancies. As shown in Figure 1, the first research publication on PP-PTSD in this cohort appeared in 2004. Over the years, there was a gradual increase in the number of publications, particularly noticeable from 2019 onwards. A significant surge in articles occurred in 2023, marking the peak of research activity. This trend highlights an escalating interest in understanding PP-PTSD in high-risk pregnancy populations over the past decade. It is important to note that the number of publications in 2024, based on the current search, may continue to increase as the year progresses.

Number of Publications by Authors and Countries

The geographic distribution of publications and contributions from individual authors also reveals significant insights. Table 1 outlines the countries with the top 10 highest publication counts in this area. The United States, the United Kingdom, and Germany emerge as the leading nations in PP-PTSD research, with the USA producing the largest body of work (78 publications) and having the highest centrality (0.59), indicating its pivotal role in shaping this research domain. The UK ranks second with 22 publications and a centrality of 0.42. The time gap in research initiation between these countries

is notable, as the USA published its first article on this topic in 2004, while the UK began contributing nine years later, in 2013. Germany ranks third in terms of publication volume but continues to contribute significantly to the field.

The dominance of the USA in this research area aligns with the country's broader focus on maternal health and its advanced healthcare systems, which have facilitated more extensive research into maternal mental health outcomes. Meanwhile, the UK's contributions reflect a growing recognition of the importance of psychological care in obstetric care practices.

High-Frequency Keyword Co-Occurrence Analysis

Keywords are a critical tool in understanding research topics and trends. In this study, a keyword co-occurrence analysis was conducted to identify high-frequency keywords associated with PP-PTSD research in high-risk pregnancies. Figure 2 illustrates the co-occurrence map, highlighting key terms such as "posttraumatic stress disorder," "postpartum depression," "risk factors," "prevalence," and "pregnancy." Of these, "posttraumatic stress disorder" had the highest co-occurrence frequency (102 instances), followed closely by "postpartum depression" (99 instances) and "risk factors" (87 instances). These keywords indicate the primary research focus areas, with an emphasis on the intersection of PTSD, depression, and pregnancy-related risks.

Table 2 provides a detailed breakdown of high-frequency keywords. It is evident that keywords such as "postpartum depression," "prevalence," "pregnancy," "mental health," and "childbirth" are at the center of contemporary research on PP-PTSD in high-risk pregnancies. The centrality values of these keywords, particularly "mental health" (0.28), "prevalence" (0.20), and "postpartum depression" (0.17), indicate their prominent role in shaping the network of studies within this field.

This pattern of keyword occurrence demonstrates that much of the current research focuses on identifying risk factors for postpartum PTSD, the prevalence of the condition, and its relationship with depression, mental health outcomes, and pregnancy-specific stressors.

Keyword Cluster Analysis

To further refine the understanding of research trends, a keyword cluster analysis was performed using the Log-Likelihood Ratio (LLR) algorithm. This analysis generated eight major clusters that depict the thematic areas of PP-PTSD research (Figure 3). The clusters are numerically ordered by size, with larger cluster labels indicating smaller, more specific research areas.

Cluster #0, which includes terms such as "pregnancy" and "childbirth experience," reflects studies focused on identifying factors contributing to PP-PTSD. This cluster highlights that a significant portion of the literature examines maternal experiences during and after childbirth and the impact of high-risk pregnancies on psychological outcomes. Cluster #2, which focuses on "clinical

symptoms," includes studies that investigate the manifestation of PP-PTSD symptoms, while cluster #6 is concerned with "prevention" strategies for reducing the incidence of postpartum PTSD.

The clustering analysis produced a modularity index (Q value) of 0.6109, indicating a meaningful division between research topics, and a silhouette index (S value) of 0.8936, reflecting the strength and consistency of the identified clusters. Table 4 provides a summary of the clustering information, which suggests that current research primarily centers on three key areas: factors influencing the occurrence of PP-PTSD, clinical symptoms, and prevention strategies.

Keyword Emergence Map Analysis

The keyword emergence map analysis, shown in Figure 4, traces the evolution of key research trends over the past two decades. This analysis reveals that interest in postpartum PTSD in high-risk pregnancies began in 2004, with a long-term focus on predicting the condition. Between 2010 and 2015, the primary research areas included maternal depression, comorbid conditions, antenatal anxiety disorders, and the impact of natural disasters on mental health.

From 2016 to 2020, the research focus shifted toward psychological factors, particularly prenatal and postpartum depression, as well as the assessment of mental health disorders during this period. Studies during this time emphasized the role of intimate partner violence and the aftermath of childbirth in the development of postpartum PTSD.

The most recent frontier, from 2021 to 2024, has seen an emerging focus on personal experiences, adverse childhood experiences, and traumatic childbirth. Scholars have increasingly turned their attention to how childhood traumas and the nature of childbirth itself contribute to the development of PTSD in postpartum women. The emergence of "validation" studies reflects a growing emphasis on developing and testing tools for screening and diagnosing postpartum PTSD in clinical settings.

The results of this study highlight the growing body of literature on postpartum PTSD in high-risk pregnancies. Research in this area has surged over the past decade, with a marked increase in publications from 2019 onwards. The United States, United Kingdom, and Germany have emerged as the leading contributors to this research, with a focus on identifying risk factors, understanding clinical symptoms, and developing prevention strategies. High-frequency keywords, cluster analyses (Table 3), and keyword emergence maps suggest that research is converging on a deeper understanding of the interplay between maternal mental health, childbirth experiences, and postpartum PTSD, particularly in high-risk pregnancies. This growing body of work underscores the importance of addressing mental health in maternal care,

Table 1. Search strategy

Step	Search Strategy	Result
#1	TS (High Risk Pregnancy) OR (High-Risk Pregnancy) OR (High-Risk Pregnancies) OR (High Risk Pregnancy)	17920
#2	TS (Stress Disorder *) OR (Post-Traumatic Stress Disorder*) OR (PTSD) OR (“Posttraumatic Neuroses”)	87466
#3	TS (Postpartum) OR (Postnatal) OR (“Perinatal Period”)	36142

Note: Retrieval time range: 2004 to 31 May 2024. TS = topics.

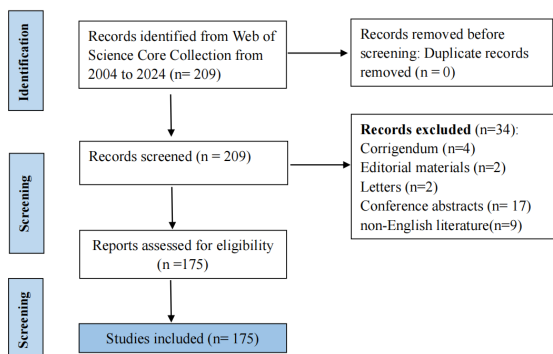


Figure 1. Document screening flow chart

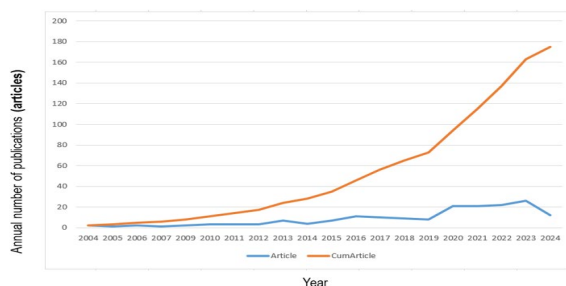


Figure 2. Number of English literature publications about postpartum PTSD in high-risk pregnancy women from years 2004–2024

Table 2. Number of articles published by authors and countries (TOP 10)

Rank	Author's number of publications		Number of national publications			
	N	Author	N	Centrality	Year	Country
1	6	Garthus-niegel	78	0.59	2005	USA
2	4	Ayers	22	0.42	2013	ENGLAND
3	4	Bick	18	0.06	2014	GERMANY
4	3	Harville	14	0.01	2009	ISRAEL
5	2	Dikmen-Yildiz	11	0.18	2004	CANADA
6	2	Isosavi	10	0.10	2004	NORWAY
7	2	Elkind-Hirsch	9	0.08	2013	AUSTRALIA
8	2	Fairbrother	7	0.00	2010	TURKEY
9	2	Janssen	6	0.05	2011	NETHERLANDS
10	2	Biron-shental	5	0.06	2015	SOUTH AFRICA

Table 3. High-frequency keywords and centrality of postpartum PTSD in high-risk pregnancy women

Rank	N	Centrality	Keyword	Year
1	102	0.04	Post-traumatic stress disorder	2006
2	99	0.17	postpartum depression	2004
3	87	0.08	risk factors	2004
4	68	0.2	prevalence	2004
5	64	0.13	pregnancy	2009
6	47	0.28	mental health	2007
7	45	0.13	childbirth	2004
8	34	0.27	symptoms	2004
9	27	0.27	anxiety	2005
10	27	0.19	impact	2004

Table 4. Termediate centrality ≥ 0.1 keywords

Rank	Centrality	Keyword	Year
1	0.28	mental health	2007
2	0.27	symptoms	2004
3	0.27	anxiety	2005
4	0.24	disorder	2004
5	0.2	prevalence	2004
6	0.19	impact	2005
7	0.18	low birth weight	2006
8	0.17	postpartum depression	2004
9	0.17	health	2013
10	0.15	fear	2004
11	0.13	pregnancy	2009
12	0.13	childbirth	2004
13	0.13	trauma	2006
14	0.12	predictors	2004
15	0.12	glucocorticoid receptor	2006
16	0.11	validation	2017
17	0.1	experiences	2006

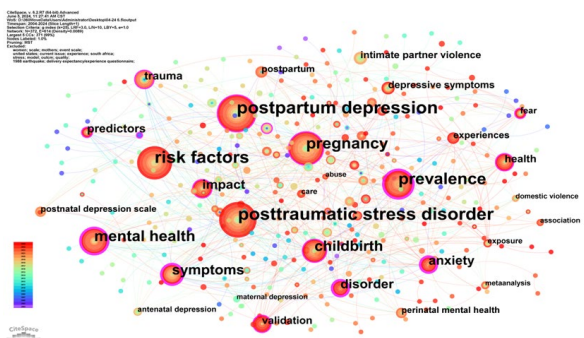


Figure 3. Keyword co-occurrence map for postpartum PTSD high-risk pregnancy women from the years 2004–2024

Table 5. Keyword clustering of postpartum PTSD in high-risk pregnancy women research

Rank	Size	Silhouette	Clustering noun	Year
0	49	0.81	pregnancy	2018
1	43	0.858	symptoms	2017
2	33	0.882	childbirth experience	2015
3	30	0.924	high-risk pregnancy	2016
4	28	0.899	birth	2011
5	27	0.91	new mother	2016
6	25	0.855	parent-infant relationship	2016
7	23	0.914	prevention	2015
8	23	0.925	stillbirth	2017

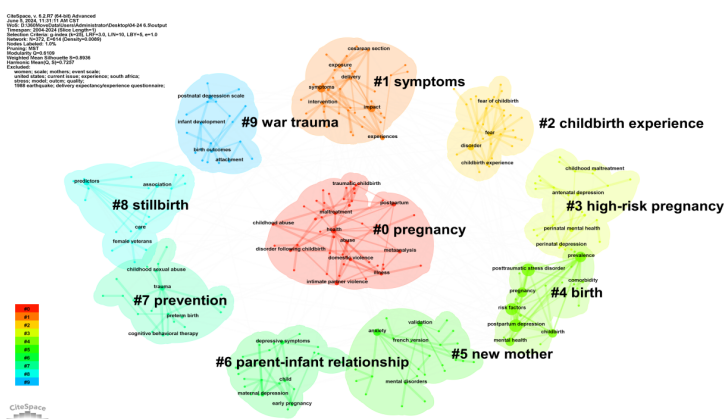


Figure 4. Clustering of keywords in the literature on postpartum PTSD in high-risk pregnancy women from years 2004–2024

particularly for women with high-risk pregnancies, who are at greater risk for developing PTSD following childbirth.

Discussion

Research Status of Postpartum PTSD in High-Risk Pregnancies

Research on postpartum post-traumatic stress disorder (PP-PTSD) in high-risk pregnancies has seen steady growth since its initial investigation in 2004. Over the last five years, there has been a marked increase in the number of published studies, with more than 20 articles per year consistently appearing in academic journals. This trend reflects a growing awareness of the unique psychological challenges that women with high-risk pregnancies face, particularly during the postpartum period. The increase in research output from 2019 onward suggests heightened scholarly interest, as well as recognition of the need for mental health support in maternal care. Based on the current trajectory of publications, the number of studies related to PP-PTSD in high-risk pregnancies is expected to continue growing. This suggests that the topic is gaining traction as a focal point in the broader field of maternal mental health. Researchers have begun to recognize the importance of addressing PTSD in the postpartum period, especially for women with high-risk pregnancies, and this increased focus may lead to more comprehensive care strategies and interventions in the future.

Hotspots in Research on Postpartum PTSD in High-Risk Pregnancies

Keywords and cluster analyses offer valuable insights into the evolving research themes and trends related to postpartum PTSD in high-risk pregnancies. Keywords are a concise representation of research themes, and their co-occurrence patterns help highlight prominent areas of focus. Clustering these keywords provides a snapshot of the interconnectedness of topics within the research field.

The high-frequency keywords identified in this study—such as "postnatal depression," "PTSD," "psychological health," and "high-risk pregnancy"—indicate that exploring the factors influencing postpartum PTSD is a key research area. These keywords reflect the complex interplay of mental health, pregnancy complications, and psychological responses that contribute to the development of PTSD in postpartum women.

Factors Influencing Postpartum PTSD in High-Risk Pregnancies

The literature reveals that several factors contribute to the development of postpartum PTSD in women with high-risk pregnancies. Psychological factors, maternal health, and pregnancy complications are central to this area of research. A study from Brazil found that nearly 30% of women with high-risk pregnancies who experienced severe physical or psychological distress during pregnancy or delivery developed postpartum PTSD (Angelini et al., 2018). This finding underscores the significant impact of psychological and physical strain on maternal mental health.

Similarly, research by Soltani et al. (2015) found that 17% of women with preeclampsia developed PTSD within six weeks postpartum. This study highlights how high-risk pregnancies increase the likelihood of PTSD, as these women often face greater uncertainty, medical interventions, and stress. Psychological distress during pregnancy is not only a trigger for PTSD but can also exacerbate symptoms postpartum.

Depression during the perinatal period is another critical factor in the development of postpartum PTSD. A study by Shen Zichen et al. (2022) found a strong correlation between postpartum depression and PTSD, with higher depression scores corresponding to more severe PTSD symptoms. Women with postpartum depression may be more vulnerable to traumatic birth experiences, increasing their risk of developing PTSD. These findings suggest that addressing postpartum depression could play a significant role in preventing PTSD in high-risk pregnancies.

Additionally, neonatal complications are closely associated with postpartum PTSD. For instance, preterm births, low-birth-weight infants, and other neonatal health issues can exacerbate maternal stress. Xu Chao et al. (2018) found that 33.1% of mothers with premature infants developed postpartum PTSD, a rate significantly higher than that of mothers with full-term infants. Fowler et al. (2019) further supported these findings by showing that mothers of preterm infants, particularly those who spent extended time in neonatal intensive care units (NICUs), were at heightened risk for PTSD due to the emotional and logistical challenges of their infants' care.

Risk Prediction and Validation of Postpartum PTSD in High-Risk Pregnancies

The development of risk prediction tools for postpartum PTSD in high-risk pregnancies is a growing area of interest. Such tools allow for early identification of women at risk, providing opportunities for timely intervention. Hernández-Martínez et al. (2019) conducted a retrospective cohort study in Spain and demonstrated that a constructed prediction model had strong predictive power for identifying women at risk for postpartum PTSD. This model could be useful for clinicians seeking to prevent the disorder through preemptive care.

Polachek et al. (2016) also found that simple prediction models could effectively identify women at risk of postpartum PTSD before delivery. By modifying these models, healthcare providers can better predict the likelihood of postpartum PTSD, allowing for early support and treatment.

Chinese researchers, such as Qi Junli and colleagues (2024), have focused on constructing and validating prediction models tailored to the specific cultural and medical context of postpartum care in China. These models represent a significant advancement in the early identification and management of postpartum PTSD. Prediction tools offer a practical approach to maternal mental

health care, as they help clinicians target interventions to those most at risk, potentially mitigating the long-term impact of PTSD on both the mother and child.

The growing research interest in postpartum PTSD among women with high-risk pregnancies highlights the critical need to understand the unique challenges this population faces. Through the analysis of high-frequency keywords and clusters, it is evident that researchers are primarily focused on psychological factors, maternal health, and neonatal complications as key contributors to the development of postpartum PTSD. As this field evolves, predictive models and early intervention strategies offer promise for improving outcomes and reducing the prevalence of postpartum PTSD in women with high-risk pregnancies. Continued research in this area will be essential to ensure that maternal mental health care becomes more comprehensive and tailored to the specific needs of these high-risk groups.

In this study, CiteSpace was employed to perform an extensive analysis of 175 English-language journal articles focusing on postpartum PTSD in high-risk pregnancies, spanning from 2004 to 2024. The analysis combined qualitative and quantitative methods, offering insights into emerging trends and research hotspots in this field. The findings were presented through a knowledge map and information tables, providing an updated and detailed overview of the research landscape.

Over the past two decades, there has been a significant rise in published studies addressing postpartum PTSD in high-risk pregnancies. Increasingly, medical researchers are focusing on understanding the factors that influence the onset of PTSD in this population and investigating preventive measures. Current research predominantly revolves around identifying early risk factors and clinical indicators of postpartum PTSD in women with high-risk pregnancies. This proactive approach is geared toward facilitating early identification, intervention, and treatment, thereby improving maternal mental health outcomes and minimizing the long-term effects of postpartum PTSD on both mothers and their families.

Conclusion

In conclusion, high-risk pregnancies significantly increase the likelihood of complications that can impact both maternal and infant health. These challenges heighten the risk of postpartum PTSD, which can have lasting effects on a mother's mental health and her relationship with her child. The findings of this study underscore the importance of continued research in this area, focusing on psychological factors, maternal health, and neonatal outcomes. By leveraging predictive models and developing early intervention strategies, there is potential to improve maternal mental health care and reduce the incidence of postpartum PTSD in women with high-risk pregnancies. Such efforts are crucial to

providing comprehensive and effective care tailored to the unique needs of these vulnerable populations.

Author contributions

J.Z. conceptualized the study, curated the data, conducted formal analysis, investigated relevant aspects, developed the methodology, visualized the findings, and wrote the original draft. M. S. F. contributed to the formal analysis, developed the methodology, curated the data, and reviewed and edited the manuscript. C. H. T. also performed formal analysis, assisted with methodology, curated data, and contributed to the review and editing of the manuscript.

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Competing financial interests

The authors have no conflict of interest.

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