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Postpartum Depression: A Review of Prevalence, Etiological Factors, Treatment Approaches, and Stress-Related Pathways

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Abstract. Postpartum depression (PPD) is a multifaceted mood disorder influenced by a combination of physiological, psychological, and social factors. It not only compromises maternal well-being but may also adversely impact infant neuro-development and social learning capacities. This paper explores the etiological determinants, therapeutic interventions, and stress-related neurobiological mechanisms underlying PPD. The findings underscore that PPD arises from a complex interplay of hormonal fluctuations and dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis. Moreover, it is associated with significant developmental outcomes in offspring, particularly in relation to brain maturation and early social functioning. Prenatal stress is also shown to exert detrimental effects on infant health. These findings reinforce the view that maternal mental health during and after pregnancy has lasting intergenerational implications. This study advances the current body of knowledge by synthesizing recent literature on the hormonal, biological, and psychosocial dimensions of PPD, while addressing a critical gap concerning the interaction between prenatal stress and maternal mental health.

Keywords: Postpartum Depression, Prevalence, Etiological Factors, Maternal Well-being

1. Introduction

In recent years, people have been growing recognized the impact of postpartum depression stress on women and newborns development.

Postpartum depression is a serious mental illness. Published articles show that it affects approximately 10%-20% of women worldwide. Postpartum depression not only impairs women's emotional regulation ability but also affects infant brain development and social learning ability through complex neurobiological and psychological mechanisms [1].

Postpartum depression usually occurs four weeks after delivery [2]. Postpartum depression is not classified as a separate diagnosis in DSM-5. It is a subtype of Major Depressive Disorder (MDD), with peripartum onset specifier. The main characteristics and diagnostic criteria must meet the requirements of persistent depression mood or loss of interest in most activities almost every day, and at least 5 of the following symptoms lasting for a minimum of two weeks: obvious changes in appetite or weight, sleep disorders, loss of energy, feeling worthless, and repeated suicidal thoughts [2].

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Through a systematic literature review, this study examines the mainstream academic perspectives and recent findings on the etiological factors, treatment approaches, and stress-related pathways of postpartum depression. Its primary significance lies in approaching the topic from multiple angles, including neurobiology and hormonal mechanisms, highlighting the multifactorial interactions underlying postpartum depression and reflecting the complexity of mental disorders. This study provides a theoretical foundation and directional guidance for future research, emphasizing the importance of larger sample sizes and cross-cultural investigations.

2. Causing factors and symptoms

2.1. Prevalence

The destructive impact of postpartum depression to woman's family and relationships is evident. It increases the risk of anxiety, substance abuse and suicide thought, and reduce the mother's ability to care for the baby and emotional feedback to the child. This will also affect the early brain development and cognitive ability of the infant, particularly in regions such as the amygdala and prefrontal cortex and will also increase the risk of emotional dysregulation and social learning disorders in the infant. Globally, about 16.6%-18.8% of women in labor experience postpartum depression [3]. 15.6% of women in low and lower-middle-income countries experienced a mental disorder during pregnancy [4]. In the United States, about 10% to 20% of new mothers are diagnosed with postpartum depression each year [5].

2.2. Etiology from the perspective of neuroscience

2.2.1. Hormonal changes

During pregnancy, estrogen and progesterone levels increase significantly and drop rapidly after delivery. This drastic fluctuation of hormones is considered to be one of the important factors inducing PPD. In addition, changes in neurosteroid levels during pregnancy and postpartum may also affect the brain's emotional regulation function [6].

Postpartum depression can reduce the receptor binding potential of the patient's serotonin system. Serotonin is an important tool to help people regulate their own emotions. It can also cause changes in the levels of estrogen (E2) and progesterone (P). Women are very sensitive to changes in these two hormones [6].

2.2.2. Neurotransmitter system dysregulation

Patients with PPD often show abnormalities in the serotonin (5-HT) system, which plays a key role in emotion regulation. Studies have found that the 5-HT1A receptor binding potential of PPD patients is significantly reduced in multiple brain regions, indicating that dysfunction of the serotonin system may be closely related to the occurrence of PPD [6].

Eydie's study shows differences in 5-HT1A receptor binding potential (Logan BP) between two groups (likely depressed and control individuals) across three brain regions: LLO (left lateral orbitofrontal cortex), MTC (medial temporal cortex), and SUB (subgenual singulate cortex). In each region, the control group) consistently shows higher receptor binding potential than the depressed group), indicating a significant reduction in 5-HT1A receptor availability in depressed individuals. This shows that depression has a significant effect on these brain regions [6]. Serotonin is a critical

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neurotransmitter for emotion regulation, and its dysfunction is closely associated with depressive moods.

2.2.3. Effects of chronic stress and HPA axis activation

The hypothalamus-pituitary-adrenal (HPA) axis plays a central role in stress response. PPD patients often show abnormalities in HPA axis function, such as elevated cortisol levels and weakened negative feedback regulation, which may lead to emotional regulation disorders. In addition, chronic inflammatory response is also believed to be related to the occurrence of PPD [7].

Hantsoo's article shows that the HPA axis of mothers with depression during pregnancy and perinatal period is overactive, and HPA axis dysregulation can cause increased cortisol levels in women. How the HPA axis responds to stress during pregnancy. First, the hypothalamus releases CRH, which stimulates the anterior pituitary to release ACTH. ACTH then triggers the adrenal glands to produce cortisol. Normally, cortisol provides negative feedback to both the hypothalamus and pituitary to prevent excessive release. However, during pregnancy, the placenta creates an additional positive feedback loop by releasing more CRH in response to cortisol. Hormones like estradiol and progesterone also interacts with the HPA axis in complex ways. When the HPA axis becomes overactive, it leads to prolonged cortisol elevation, which can cause changes in metabolism, the brain, the cardiovascular system, and immunity. Critically, high maternal cortisol can affect fetal brain development—especially the hippocampus and amygdala, which are important for emotion and memory. Perinatal stress can also cause HPA axis abnormalities and affect the baby's own HPA axis development [1].

3. The impact of postpartum depression and stress on newborns

High levels of maternal cortisol can cross the placental barrier and affect fetal brain development. Perdue's study found that maternal postpartum depressive symptoms, were significantly associated with smaller amygdala volumes in children at 2–3 years old. Children exposed to either postpartum only or persistent maternal depression showed both side reductions in amygdala volume, particularly among female children [8].

3.1. Effects of postpartum depression on newborns

Research has shown that postpartum depression not only affects the mother's emotions and daily life but also significantly impacts the infant's neurodevelopment and social functioning [9]. Emotional bonding between the mother and the newborn is crucial, and postpartum depression can lead to disruptions in this emotional connection. Emotional bonding impairment in mothers with postpartum depression can result in developmental problems in the newborn, such as low birth weight, difficulties with emotional regulation, and delays in language development [10].

3.2. The impact of maternal stress on newborns

A study conducted at the University of California, San Francisco, found a correlation between maternal stress during pregnancy and the infant's physical health during the first year of life. The results showed that for every one-point increase in the mother's perceived stress level during pregnancy, the infant's illness rate increased by 38%. Stress experienced by the mother during the late stages of pregnancy had an even greater impact, with the infant's illness rate increasing by 55%. This suggests that overactivation of the HPA axis may disrupt the fetus's physical health [11].

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4. Treatment of postpartum depression

There are various treatment methods for postpartum depression, but psychotherapy and pharmacological treatment are the most common.

4.1. Normal treatments

First is Cognitive Behavioral Therapy (CBT), which improves mood by helping patients identify and challenge irrational thoughts and rebuild positive behaviors. CBT has been proven to be the gold standard in the treatment of PPD.

Second is Interpersonal Therapy (IPT), which is suitable for mothers who feel stressed due to interpersonal conflicts or role transitions. It enhances the support system by repairing interpersonal interactions [12].

Selective serotonin reuptake inhibitors (SSRIs) are the most common drugs for the treatment of PPD. SSRIs improve depressive symptoms by increasing serotonin levels in the brain range. However, SSRIs usually takes a long time to have effect and may have some side effects [13].

4.2. Innovative treatments

In 2023, the U.S. Food and Drug Administration (FDA) approved Zuranolone as a treatment drug for PPD, which is the first oral drug. The research has run a Clinical trials for Zuranolone and the results have shown that Zuranolone significantly improved PPD symptoms within a 14-day treatment cycle.

5. Conclusion

Postpartum depression is a complex mood disorder involving multiple It involves complex physiological, psychological, and social factors. It not only affects the health of the mother but may also affect on the newborn's neurodevelopment and social learning ability.

This study aimed to investigate the etiological factors, treatment approaches, and stress-related neurobiological mechanisms of postpartum depression (PPD), and the findings indicate that PPD is not only a complex mood disorder rooted in hormonal shifts and HPA axis dysregulation, but also a condition that may influence infant neurodevelopment and social learning. Stress during pregnancy can also affect the health of the newborn. This article revealed consistent associations between maternal stress and disrupted infant brain development, which help to supports that postpartum mental health has intergenerational consequences.

This research contributes to the existing articles of knowledge by integrating current literature on hormonal, biological, and psychosocial pathways, also filling the gap in understanding how pregency stress interact with maternal mental health.

This study is limited by its reliance on secondary literature rather than empirical data, which may affect the generalizability of the findings. Future studies could In the future, the author will focus on prospective, longitudinal design that also combine infant behavioral tracking and neuroimaging.

With the deepening of neuroscience research, research have been try to developing more new treatment and providing more options for the treatment of PPD. Future research should further explore the causes and treatments of PPD to improve maternal and infant health and focus more on early screening, innovative interventions

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