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## **The Role of Hormonal Regulation and Brain Neurotransmitters in Baby Blues Syndrome: A Systematic Literature Review**

**Ika Novita Sari<sup>1\*</sup>, Susanti<sup>2</sup>**

<sup>1</sup>Nursing Study Program, Faculty of Medicine, Universitas Batam, Batam, Indonesia

<sup>2</sup>Midwifery Study Program, Faculty of Medicine, Universitas Batam, Batam, Indonesia

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#### **\*Corresponding author:**

Ika Novita Sari

#### **E-mail address:**

[ikanovitasari@univbatam.ac.id](mailto:ikanovitasari@univbatam.ac.id)

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### **ABSTRACT**

These hormonal fluctuations affect various aspects of maternal health and well-being, including brain neurotransmitters such as serotonin, dopamine, and oxytocin. This is an important aspect in understanding the emotional changes and psychological responses that mothers often experience during this period. This study aimed to present the role of hormonal regulation and brain neurotransmitters in baby blues syndrome. The literature search process was carried out on various databases (PubMed, Web of Sciences, BASE, Cochrane Libraries, and Google Scholar). This study follows the preferred reporting items for systematic reviews and meta-analysis (PRISMA) recommendations. The period of pregnancy and childbirth brings significant hormonal changes in the mother's body. A sharp drop in hormone levels, such as estrogen and progesterone after giving birth, can affect the mother's mood and emotions. Decreased levels of serotonin, a neurotransmitter involved in mood regulation, may contribute to the feelings of sadness and anxiety often experienced by mothers with Baby Blues. Dopamine, a neurotransmitter involved in the regulation of motivation and emotional responses, can also fluctuate due to postnatal hormonal changes, affecting the mother's mood and motivation. Increased cortisol levels in response to physical and emotional stress can impact the mother's mood and can affect the activity of neurotransmitters such as serotonin. Prolactin plays a role in bonding between mother and baby, as well as in breast milk production. These hormonal fluctuations can affect the mother's emotions and feelings.

### **1. Introduction**

Baby blues syndrome is an emotional condition that is often experienced by mothers after giving birth. Usually, baby blues appear within a few days to a few weeks after delivery. The main symptoms include feelings of sadness, irritability, anxiety, and mood swings. Although the symptoms can be bothersome, the condition is generally temporary and subsides on its own. This condition can be understood as an emotional response to major changes in the

mother's life after giving birth. Factors such as hormonal changes, lack of sleep, changing roles in the family, and stress associated with caring for a newborn can contribute to the baby blues. although baby blues is mild and common, it is important to understand the important role hormonal regulation and brain neurotransmitters play in the onset of this symptom. In some cases, baby blues can progress to more serious emotional disorders,

such as postpartum depression or anxiety disorders.<sup>1-3</sup>

Hormonal and neurotransmitter regulation are two main aspects involved in postnatal changes in maternal mood, emotions, and psychological responses. Pregnancy, labor, and postnatal periods are complex stages in a mother's life that affect the hormonal balance and neurotransmitters in her brain. This has a significant impact on the emotional and psychological well-being of the mother. The period of pregnancy and childbirth presents significant hormonal fluctuations in the mother's body, which affect brain neurotransmitters such as serotonin, dopamine, and oxytocin. These hormonal fluctuations affect various aspects of maternal health and well-being, including brain neurotransmitters such as serotonin, dopamine, and oxytocin. This is an important aspect in understanding the emotional changes and psychological responses that mothers often experience during this period.<sup>4-6</sup> This study aimed to present the role of hormonal regulation and brain neurotransmitters in baby blues syndrome.

## 2. Methods

The literature search process was carried out on various databases (PubMed, Web of Sciences, EMBASE, Cochrane Libraries, and Google Scholar) regarding the role of hormonal regulation and brain neurotransmitters in baby blues syndrome. The search was performed using the terms: (1) "hormonal" OR "neurotransmitter" OR "baby blues" OR "regulation hormonal" AND (2) "baby blues" OR "neurotransmitter." The literature is limited to preclinical studies and published in English. The literature selection criteria are articles published in the form of original articles, an experimental study about the role of hormonal regulation and brain neurotransmitters in baby blues syndrome, studies were conducted in a timeframe from 2013-2023, and the main outcome was the role of hormonal regulation and brain neurotransmitters in baby blues syndrome. Meanwhile, the exclusion criteria of the study were not related to the role of hormonal regulation and brain neurotransmitters in baby blues syndrome and duplication of publications. This study follows the preferred reporting items for systematic reviews and meta-analysis (PRISMA) recommendations.

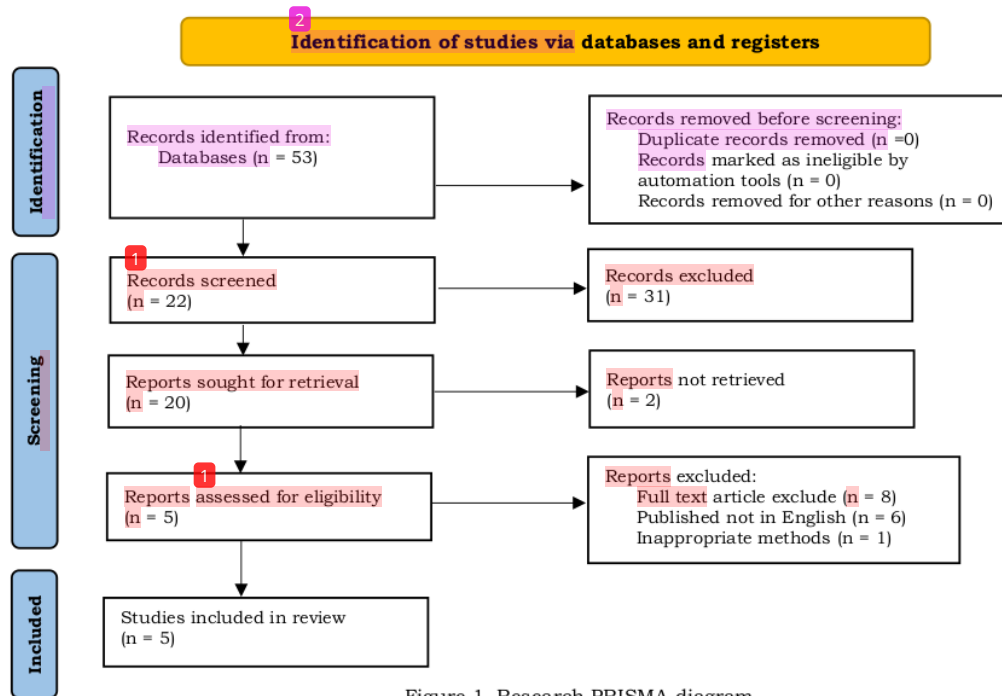


Figure 1. Research PRISMA diagram.

### 3. Results and Discussion

#### The role of the hormone estrogen

The hormone estrogen has a significant role in baby blues syndrome. During pregnancy, estrogen levels in the mother's body increase dramatically, reaching their highest peak in the third trimester. The main role of estrogen during pregnancy is to support the growth and development of the fetus and prepare the mother's body for the birth process. However, after giving birth, there is a sharp decline in estrogen levels, and these changes can affect the mother's mood and emotions. A sharp drop in estrogen levels after giving birth can impact the central nervous system and brain neurotransmitters, such as serotonin. Low estrogen levels can disrupt the balance of these neurotransmitters, which can cause mood swings, feelings of sadness, and anxiety that mothers with baby blues often experience. Estrogen can also influence the body's response to stress. Low levels after giving birth can make the mother more susceptible to stress and make her feel more anxious. Estrogen interacts with other hormones in the body, such as progesterone and the stress hormone cortisol. This imbalance between estrogen and other hormones can affect the mother's mood and emotions.<sup>7-10</sup>

#### The role of the progesterone hormone

Progesterone is a very important hormone during pregnancy because it supports fetal development and keeps the pregnancy stable. Progesterone levels usually increase during pregnancy, along with increasing levels of the hormone estrogen. However, after giving birth, there is a drastic decrease in estrogen levels, which is also followed by a decrease in progesterone levels. These changes in estrogen and progesterone hormone levels after birth can have a significant impact on the mother's body and brain. A decrease in progesterone levels may affect mood and emotions, and this is one of the factors that can contribute to the onset of baby blues, such as feelings of sadness, anxiety, or emotional tension. Progesterone does have a calming effect on the nervous system and plays a role in maintaining lower anxiety levels during pregnancy. This hormone helps relax the uterine muscles, reduces unwanted uterine

contractions, and has a general calming effect on the mother's body during the pregnancy period. However, after giving birth, when progesterone levels drop drastically, the mother's body undergoes significant hormonal changes. This progesterone deficiency can affect the nervous system, which in some cases can lead to higher levels of anxiety and mood swings that contribute to baby blues syndrome. A decrease in progesterone levels after giving birth is one hormonal factor that can contribute to the emotional fluctuations experienced by new mothers after giving birth. Progesterone does interact with the brain neurotransmitter GABA (gamma-aminobutyric acid), which has an important role in controlling anxiety and tension in the nervous system. GABA is an inhibitory neurotransmitter that works by reducing the activity of neurons in the brain, resulting in a calming effect. During pregnancy, high progesterone levels can amplify the effects of GABA in calming neuronal activity, which in turn helps maintain lower anxiety levels in pregnant women. However, after giving birth and decreasing progesterone levels, the GABA system may not function as effectively as before, which can contribute to baby blues symptoms, such as feelings of anxiety and emotional tension.<sup>11-13</sup>

#### The role of the cortisol hormone

Cortisol is a stress hormone produced by the adrenal glands in response to stressful or threatening situations. The role of cortisol in baby blues syndrome is related to the stress response experienced by the mother after giving birth. Giving birth and caring for a newborn is a challenging and stressful experience, both physically and emotionally. The body's natural response to stressful situations, such as giving birth and caring for a baby, is increased production of cortisol. Cortisol is a stress hormone that plays an important role in preparing the body to deal with stressful situations and threats. Elevated cortisol levels in stressful situations are an important adaptation mechanism. It increases alertness, increases energy, and allows the body to respond to emergency situations. However, when stress is ongoing or excessive, sustained increases in cortisol levels can have negative effects on emotional and

physical well-being. In the context of baby blues, this can contribute to the feelings of anxiety, tension, and mood swings that mothers often experience postpartum.<sup>14,15</sup>

Sustained increases in cortisol levels can have a significant impact on the nervous system and brain neurotransmitters, including key neurotransmitters such as serotonin. Increased cortisol levels can interfere with the activity of this neurotransmitter, and decreased serotonin levels in the brain can contribute to the feelings of sadness and anxiety often experienced by mothers with the Baby Blues. Serotonin is a neurotransmitter involved in mood regulation, sleep, and feelings of well-being. When serotonin levels are low, a person can experience symptoms of depression, anxiety, and low mood. Therefore, changes in serotonin levels associated with the stress response and hormonal fluctuations during the postnatal period may influence how the mother feels. A significant lack of sleep is one factor that can worsen baby blues symptoms or even contribute to the onset of the condition. The process of giving birth and caring for a newborn often disrupts the mother's sleep patterns, which can have a negative impact on her emotional and physical well-being. Lack of sleep can make a person more irritable and feel angry or frustrated quickly. Sleep deprivation can worsen feelings of anxiety and increase sensitivity to stress. Lack of sleep can also affect mood, making someone feel sad or down. Sleep disorders can interfere with concentration abilities and affect cognitive function. Feeling tired due to lack of sleep can reduce energy and motivation, making mothers feel weaker and less enthusiastic about carrying out daily activities.<sup>16,17</sup>

#### **The role of the prolactin hormone**

Prolactin is a hormone that plays an important role in baby blues syndrome in several ways. Prolactin **13** increases significantly after birth and has an impact **on the mother's physical and emotional well-being.** Prolactin is a hormone that stimulates breast milk production. After giving birth, prolactin levels in the mother's body increase to support the production and release of breast milk. This is important for feeding the baby and ensuring its healthy growth. Adequate and

effective breast milk production is an important factor in caring for a baby, but it can also be a source of stress and anxiety for some mothers who have difficulty breastfeeding. Elevated prolactin levels can also have an emotional impact. This hormone can have a relaxing and calming effect, which can help reduce stress. However, some mothers may experience changes in mood and emotions due to prolactin fluctuations, especially if they are having difficulty breastfeeding or dealing with feelings of fear or anxiety related to new motherhood.<sup>18</sup>

#### **Role of the neurotransmitter serotonin**

Serotonin **11** is a neurotransmitter that plays an important **role in the** regulation of **mood and** emotions **in the human** body. **The role of serotonin** in baby blues syndrome **is related to changes in levels of** this neurotransmitter in **the mother's brain after birth.** Serotonin is a major neurotransmitter that plays **an** **important role in the regulation of mood and** emotional mood **in** general. Balanced levels of these neurotransmitters help maintain a stable and positive mood. Serotonin helps control feelings of happiness, well-being, and other positive feelings. However, after giving birth, hormonal changes in the mother's body are a factor that influences serotonin levels. Decreased estrogen and progesterone levels, which are significant hormonal changes after childbirth, can affect the production, use, and regulation of serotonin in the brain. Decreased serotonin levels can cause mood changes, such as feelings of sadness, anxiety, and emotional tension, that are often associated with baby blues syndrome.<sup>15-17</sup>

Apart from mood regulation, serotonin also has an important role in controlling anxiety levels. When serotonin levels are low, a person can become more susceptible to feelings of anxiety and tension. Serotonin interacts with the nervous system involved in stress regulation and response to anxiety-provoking situations. After giving birth, when hormones such as estrogen and progesterone undergo dramatic changes in the mother's body, this can also affect serotonin levels. These changes may contribute to the increased levels of anxiety often associated with baby blues syndrome. The anxiety experienced by mothers after

giving birth can vary in severity, but feelings of uncertainty, restlessness, and excessive worry are symptoms that may appear. It is important to be aware of serotonin's role in controlling anxiety and understand that the baby blues can cover a spectrum of emotional symptoms involving low mood and increased anxiety levels. Changes in serotonin levels can impact sleep patterns, and sleep disorders are common in many new mothers. Decreased serotonin levels can affect the body's circadian rhythm, which plays a role in regulating sleep and wakefulness patterns. The sleep disorders often associated with baby blues, such as difficulty falling asleep or intermittent sleep due to baby care, can worsen the emotional symptoms experienced by the mother. Lack of sleep or restless sleep can make a person feel more tired, irritable, and less able to handle stress. This can worsen feelings of sadness, anxiety, and tension associated with baby blues.<sup>16-18</sup>

#### **Role of the neurotransmitter dopamine**

Dopamine is a neurotransmitter that also has an important role in baby blues syndrome and postnatal maternal emotional regulation. Dopamine is a neurotransmitter that is closely related to the reward system in the brain. This reward system plays a role in providing feelings of enjoyment and providing incentives for individuals to carry out certain behaviors that are considered satisfying or enjoyable. When a person feels something that is considered a reward or positive experience, such as seeing their baby's face or interacting with them, the brain responds by releasing dopamine. This creates feelings of enjoyment and happiness, which in turn provides a positive incentive to engage in behaviors that support care and concern for the baby. However, after giving birth, hormonal fluctuations in the mother's body can affect dopamine levels and the response of the reward system. Dopamine imbalances can contribute to emotional and mood changes, including baby blues symptoms such as feelings of sadness and anxiety.<sup>19</sup>

Dopamine also plays a role in motivation and mood regulation, in addition to its role in the reward system. This hormone influences a person's energy levels, motivation, and emotional response to the

surrounding environment. After giving birth, hormonal fluctuations in the mother's body, including a decrease in estrogen and progesterone levels, can affect dopamine levels. This can have an impact on the mother's mood and motivation. Changes in motivation and emotional responses can affect the way a mother feels and interacts with her baby, as well as with the daily tasks associated with caring for the baby. When dopamine levels are out of balance or experience significant fluctuations, mothers may feel less motivated, less enthusiastic, or experience changes in their emotional response to baby care. This can be one of the factors that contribute to Baby Blues symptoms, such as feelings of sadness, anxiety and emotional tension.<sup>20</sup>

#### **4. Conclusion**

The period of pregnancy and childbirth brings significant hormonal changes in the mother's body. A sharp drop in hormone levels such as estrogen and progesterone after giving birth can affect the mother's mood and emotions. Decreased levels of serotonin, a neurotransmitter involved in mood regulation, may contribute to the feelings of sadness and anxiety often experienced by mothers with baby blues. Dopamine, a neurotransmitter involved in the regulation of motivation and emotional responses, can also fluctuate due to postnatal hormonal changes, affecting the mother's mood and motivation. Increased cortisol levels in response to physical and emotional stress can impact the mother's mood and can affect the activity of neurotransmitters such as serotonin. Prolactin plays a role in bonding between mother and baby, as well as in breast milk production. These hormonal fluctuations can affect the mother's emotions and feelings.

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