

## THE USE OF ESSENTIAL OIL OF BERGAMOT IN THE PREVENTION OF POSTPARTUM DEPRESSION: LITERATURE REVIEW

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**Abstract:** This paper presents an analysis of the therapeutic properties of bergamot essential oil, with particular emphasis on its potential effects on mental health, including postpartum depression. The data discussed reveal that bergamot has several bioactive properties that can alleviate the symptoms of anxiety and depression. Additionally, we address the possibility of using bergamot essential oil as a preventive or therapeutic strategy for postpartum depression. The integrative bibliographic research resulted in a total of 78 articles as likely sources to provide technical-scientific bases, through a search in different databases. The research considered complete articles, in Portuguese and English, published between 2013 and 2023. Despite the promising findings, we emphasize the need for more rigorous clinical research to solidify the efficacy and safety of bergamot oil in the treatment of postpartum mental health.

**Keywords:** Anxiety, Aromatherapy, Postpartum depression, Bergamot essential oil, Mental health.

## INTRODUCTION

Postpartum depression (PPD) is a serious and prevalent medical condition, which in addition to physical and emotional challenges, can result in negative consequences for the mother's relationship with her baby, and also for family dynamics. This is a form of major depression that usually appears within a year of giving birth, and is more common in the first few weeks or months after giving birth. Symptoms can range from mild to severe and can include profound sadness and hopelessness, lack of interest in things, inability to care or connect with the baby, as well as feelings of guilt or inadequacy as a mother (Brasil, 2020; World Health Organization, 2020).

It is estimated that globally around 13% of women who give birth suffer from some

form of mood disorder in the postpartum period, with depression being one of the most common. However, many of these women are not diagnosed or treated, which can have lasting consequences for them. Furthermore, lack of knowledge regarding the disease can prevent women from seeking help (Howard et al., 2014).

Puerperal depression can cause serious problems, risk factors include unplanned and unwanted pregnancy leading to a low mother-baby bond, impact on the mother's mental health causing stressful life events, low socioeconomic status, stigma and social isolation due to lack of understanding (Dagher et al., 2020). The prevention of postpartum depression is therefore a public health issue of great importance. Effective preventive interventions can reduce the prevalence of the disease, improve the quality of life of affected mothers and babies and reduce associated health costs, and must be applied by an experienced professional who guarantees, through qualified essential oils, their desired therapeutic effects with its proper use (Camargo, 2019).

Bergamot, a citrus hybrid scientifically known as *Citrus bergamia*, is widely cultivated in the Calabria region of southern Italy. Bergamot essential oil (OEB) is extracted from the rind of its fruit and is widely used in aromatherapy due to its distinctly pleasant aroma and its relaxing and antidepressant properties.

Bergamot essential oil is a greenish or brownish-yellow volatile oil with a bitter aromatic taste and pleasant odor, in addition to containing several health-beneficial bioactive molecules. In their chemical composition they include monoterpene limonene (25-53%) and high amounts of oxygenated compounds such as linalool (2-20%), linalyl acetate (15-40%),  $\gamma$ -terpinene and  $\beta$ -pinene (Navarra et al., 2015).

There is growing evidence indicating that inhaling OEB can reduce levels of stress, anxiety and depression, likely through mechanisms involving the limbic system and the production of neurotransmitters such as serotonin. With regard to aromatherapy, a systematic review with the theme “The Effects of Aromatherapy in Postpartum Women”, found that the aromatherapy intervention improved postpartum physiological and psychological health, with positive effects on anxiety, depression, anguish, fatigue, mood, nipple fissure pain, physical pain, post-cesarean section pain, post-cesarean section nausea, post-episiotomy pain, post-episiotomy recovery, sleep quality and stress (Rombolà et al., 2017; Tsai; Wang; Chou, 2019).

Thus, this literature review aims to explore current evidence on the use of OEB as an alternative treatment for PPD.

## LITERATURE REVIEW

Postpartum depression is a mental disorder that affects women in the puerperal period, being a specific subtype of depression related to childbirth. It is characterized by intense and persistent feelings of sadness, anxiety, or despair that interfere with the mother’s ability to perform daily tasks for herself and her baby. It can appear at any time after childbirth, although it is more common in the first few weeks after birth, as in this period the woman develops more vulnerability to mental health disorders (APA, 2013; Dagher et al., 2020).

Symptoms of PPD vary in intensity and duration, but generally include persistent sadness or frequent crying, feelings of worthlessness or guilt, loss of interest or pleasure in activities that were previously enjoyable, and difficulty concentrating.

Other physical symptoms can include changes in appetite, changes in sleep, and lack of energy. Thoughts of harming herself or the

baby may also arise, which is considered a medical emergency (APA, 2013).

The diagnosis of PPD is based on clinical and psychiatric evaluation. It is essential that mothers are asked about their emotional well-being during postpartum follow-up visits, and that they are referred for psychiatric evaluation if they experience symptoms of PPD. Screening tools, such as the Edinburgh Postpartum Depression Scale (Table 1), are commonly used to identify possible cases of PPD and function as a self-assessment questionnaire that does not confirm a diagnosis, but rather identifies a suspected depression condition. After obtaining the tracking results, each item and added to the rest to obtain the final score and a score of 12 or more indicates the possibility of a DDP (BOSKA et al., 2016).

Area (%)	Probable Compound
38.29	limonene
31.49	linalyl acetate
14.83	Linalool
5.74	Y-terpinene
4.92	β-pinene
0.89	β- phellandrene
0.86	α-pinene
0.74	myrcene
0.39	o-cymen

Table 1. Chemical composition of bergamot essential oil (*Citrus bergamia*) quantified by gas chromatography.

Source: Analysis Center of Instituto de Biotecnologia da Universidade de Caxias do Sul (UCS), 2020.

The impacts of the DPP are deep and far-reaching. In addition to causing significant suffering for the mother, puerperal depression can also interfere with the infant’s development and, due to a lack of connection, mothers with PPD may have difficulties interacting with the baby in a loving and responsive way, which can lead to problems with attachment

and delays in the child's cognitive, emotional, and social development. The effects of PPD on society are also significant and the costs associated with PPD are substantial, including the direct costs of treatment, the indirect costs of lost productivity, and the long-term costs associated with the impact of PPD also linked to child development. (Dagher et al., 2020).

Conventional treatments for PPD usually include psychotherapeutic and pharmacological interventions. Cognitive behavioral therapy (CBT) and interpersonal therapy (IPT) are the most effective forms of psychotherapy to treat PPD. Both help the mother identify and modify negative thoughts and behaviors, develop coping strategies, and improve her social and interpersonal relationships. Regarding medication, antidepressants are the most common medication used to treat PPD, however they have potential side effects and not all women are willing or able to use antidepressants, especially those who are breastfeeding. In addition, access to these services can be limited, especially for women in rural areas or with limited financial resources, preventing some women from seeking or continuing treatment and afterwards, drug therapy is not always effective and can lead to some consequences such as abuse of drugs, delayed response, dependence, long-term tolerance and there is also a risk of side effects, which can range from mild to severe.

Aromatherapy has aroused interest as an integrative therapeutic approach to prevent postpartum depression, and must be applied by an experienced professional who, through qualified essential oils, has its desired therapeutic effects and appropriate use. In addition to being a low cost modality, it is also a non-invasive practice of complementary and alternative medicine. Specifically, the use of Bergamot essential oil is effective because it has antidepressant properties, aiming to

stimulate the emotional and mental well-being of mothers in the postpartum period. Aromatherapy is a form of complementary and alternative medicine that uses essential oils with properties that affect the patient's health.

These oils play a beneficial and important role in neurotransmitter pathways and may have antidepressant effects (Camargo, Tsai; Wang; Chou, 2019; 2019; Sánchez-Vidaña et al., 2017; Watanabe et al., 2015).

The chemical composition of bergamot essential oil (Table 1) is complex and depends on several factors, including the place of growth, climate and time of harvest. Among the main constituents are monoterpenes such as limonene, linalool and  $\gamma$ -terpinene (Table 2), and furanocoumarin compounds such as bergapten. Bergamot oil is the only citrus oil that contains appreciable amounts of linalool and linalyl acetate, substances that contribute to its unique properties. The use of bergamot essential oil in aromatherapy is appreciated for its fresh, citrusy scent and is used to reduce stress and anxiety, improve mood, and alleviate symptoms of depression. In general, essential oil compounds have a better entry route when treatment is through the respiratory tract, including the treatment using Bergamot essential oil, it is more feasible to use through the respiratory tract, since in its composition there are substances that, when in contact with the skin can cause irritation (Bilia et al., 2014; Ni et al., 2013).

Depression is characterized by reduced activity of neurotransmitters, primarily norepinephrine, dopamine, and serotonin, in the brain. Early identification of postpartum depression allows for the creation of a better intervention strategy. The cause of depression is triggered by physiological factors associated with hyperactivity of the hypothalamic-pituitary-adrenal (HPA) axis.

In the structure (Figure 1) the hippocampus

limonene	Linalool	Y-terpithene
<chem>CC1=CC=C(C)CC1</chem>	<chem>CC(C)=CC(C)C=C</chem>	<chem>CC1=CC=C(C)C(C)C1</chem>

Table 2. Monoterpenes found in the chemical composition of bergamot essential oil

Source: author, 2023.

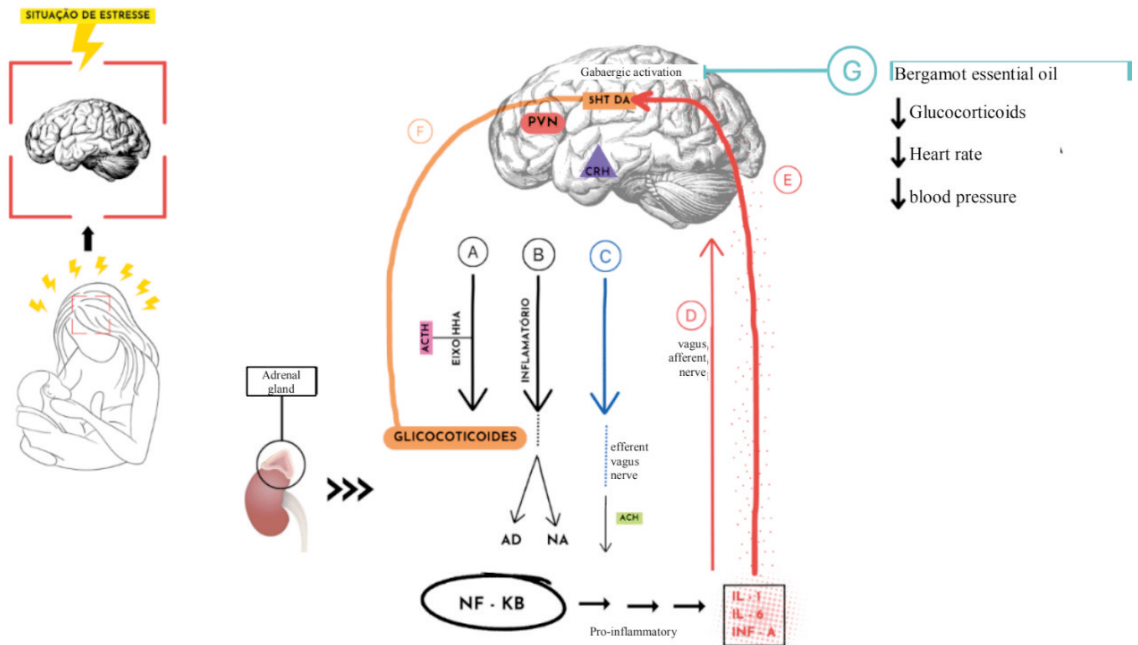


Figure 1. Mechanism of action of bergamot essential oil in the prevention of postpartum depression.

Source: Adapted from Lizarraga (2020) and Santos et al (2021).

Studies and effects of bergamot essential oil	Reference
- Increased positive feelings with significant improvement in mood.	Han et al., 2017.
- Reduces anxiety and decreases heart rate, variability and blood pressure.	Liu et al 2017
- Bergamot essential oil decreases anxiety, stress, depression and other mood disorders.	LV et al., 2013
- Positive reaction to the use of bergamot essential oil. Its use has been reported to be helpful in reducing anxiety and stress.	Navarra et al., 2015
- All patients in the experimental condition of bergamot essential oil showed a greater reduction in anxiety than those in the control group. And aromatherapy using bergamot essential oil can be a positive approach to reducing preoperative anxiety.	Ni et. al., 2013
- Exposure to bergamot resulted in an anxiolytic effect, suggesting a potential use of this essential oil in the treatment of anxiety disorders	WATANABE et al. 2015
- Reduction in cortisol levels in saliva.	

Chart 1. Main studies and effects of bergamot essential oil

Source: author, 2023.

is part of the system that is related to emotion, in addition to containing high levels of glucocorticoid receptors that regulate the HHA axis, making the triggering of stress and depression more likely (Liu et al., 2017; Kamusheva et al., 2020).

The increase in inflammatory activity creates symptoms like depression, taking into account postpartum depression. With regard to the figure of the mechanism of action of bergamot, adapted from Santos (2021) and Lizarraga (2020) (Figure 1), the systems that arise as stress responses are identified as A, B, C, D and E. O (A) HPA axis and (c) Efferent vagus nerve is an anti-inflammatory response to stress, unlike (B) sympathetic nervous system which is an inflammatory response. In a stressful situation, such as sleep disturbances and lack of energy, and stimulating the release of the hormone that releases corticotropin (CRH) in the paraventricular nucleus (PVN), causing the elimination of adrenocorticotrophic hormone (ACTH) by the pituitary that leads to the synthesis and release of glucocorticoids from the adrenal glands.

The release of glucocorticoids together with acetylcholine (ACh), bind to receptors on cytokine-producing cells and have anti-inflammatory effects. (FG) With HHA activation, corticosteroids reduce dopamine (DA) and serotonin (5HT) levels in the brain, altering behaviors that include mood disorders, motivation, sleep and wake rhythms, and social behavior. (Santos, 2021; Lizarraga 2020; APA 2013; Slavich; Irwin, 2014). The sympathetic nervous system (B) releases noradrenaline (NA) and adrenaline (AD) from sympathetic nerves and the adrenal gland stimulated by stressors. NA and AD activates the transcription of the nuclear factor Kappa-Light Chain-Enhancer (NF- $\kappa$ B) and thereby stimulates the transcription and, consecutively, the release of pro-inflammatory cytokines (IL-1, IL-6 and TNF- $\alpha$ ). These

released cytokines stimulate the afferent vagus nerve by interacting with serotonergic and dopaminergic neurotransmitter systems. This reduces the levels of serotonin in the synaptic cleft, which is a characterization of depression, including postpartum depression, since the alteration in the metabolism of neurotransmitters such as serotonin (5HT) and dopamine (DA) is related to the entry of cytokines into the brain ( Santos, 2021).

Research has shown that essential oils produce several pharmacological responses in the central nervous system (CNS) such as anxiolytic effects. These oils interact in the CNS to stress, anti-inflammatory and pro-inflammatory responses. Specifically, bergamot essential oil can affect the hypothalamic-pituitary-adrenal axis by reducing glucocorticoid levels, causing a calming effect and decreasing heart rate (HR) and blood pressure (BP). Bergamot oil, in relation to its potentiating and stimulating mechanism of action, activates the GABAergic (G) system, generating anxiolytic effects (Chen et al., 2016; Lizarraga, 2020).

Bergamot essential oil contains linalool (Table 2) that act on GABA receptors, requiring an antidepressant and anxiolytic effect. Inhalation is the most suitable route of entry when it comes to using essential oils. The process begins in the nasal cavity and connects to the olfactory bulb and with that and odors are transmitted that, being close to the brain, create connections with various regions, such as the hippocampus and hypothalamus.

Vapor molecules have the potential to reach various regions of the respiratory system by diffusion, that is, they break down in the respiratory epithelium and spread to the alveoli and blood. Small amounts of chemical molecules present in essential oil particles can cross the axons of sensory cells or the mucosa and be taken directly to the central nervous system, modifying the emotional response



(Fung et al., 2021; Wang; Heinbockel, 2018; Selvaraj; Gowthamarajan; Karri, 2017).

When considering the antidepressant and anxiolytic effects of bergamot essential oil, it is essential to remember that mental health treatments for postpartum depression must be comprehensive and individualized. While some women may benefit from the use of aromatherapy with bergamot oil, others may require different treatment approaches because they have greater resistance to not believing in the results of aromatherapy due to the lack of common practice in everyday life, despite numerous positive reports. Therefore, it is of paramount importance that any woman suffering from postpartum anxiety or depression seek guidance from qualified mental health professionals to discuss appropriate treatment options (Belfort; Pedrosa; Lima, 2019).

## METHODOLOGY

This article consists of an integrative bibliographical research, which occurred through a search in different databases such as PUBMED, Google academic and SciELO, using the descriptors: “Anxiety”, “Aromatherapy”, “Postpartum depression”, “Essential oil of bergamot”, “Mental health”, and their correspondents in the English language. The research considered complete articles, in Portuguese and English, published between 2013 and 2023, without considering the timeframe of documents relevant to the topic. The research resulted in a total of 58 articles, as likely sources to provide technical-scientific foundations, which were qualified according to their abstracts, through observational studies or studies that compiled relevant information on the subject in the form of reviews, that is, studies examining the use of bergamot essential oil in the context of postpartum depression. Articles that were not available in full and/or that did not clearly

present the methodology adopted to obtain the results were excluded from the analysis (figure 2).

The synopses of the articles obtained were compiled, analyzed and classified separately as “out of scope” or “within scope”. After the complete reading of each article, 23 were selected and used as a theoretical basis for the preparation of this work.

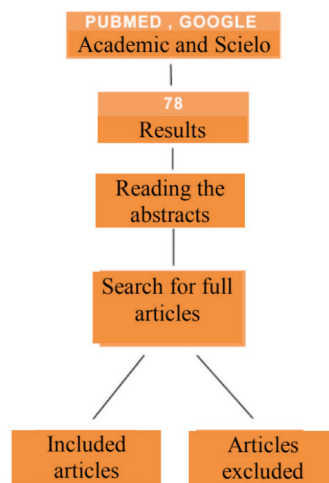


Figure 2. Articles compiled for this review.

Source: author, 2023.

## DATA PRESENTATION AND ANALYSIS

In one study they proposed that the beneficial effects of bergamot oil on depression may be due to its ability to regulate the release of neurotransmitters such as serotonin, which plays an important role in mood regulation. This study indicates that the administration of bergamot oil can influence serotonin levels in the brain, which can have positive effects on the symptoms of depression, in this sense, puerperal depression is also included. (Rombolà et al., 2017).

According to the proposed hypotheses, it is possible to associate the use of bergamot oil with improvements in the symptoms of postpartum depression. Bergamot oil’s ability to relieve anxiety and improve mood can be particularly helpful for women suffering from

postpartum depression, as these symptoms are common with this condition. The possible regulation of serotonin levels by bergamot oil is also a promising aspect, given that imbalances in serotonin levels have been linked to postpartum depression.

Inhaling bergamot essential oil, in one study, was shown to have positive psychological and physiological effects. After 15 minutes of inhalation, followed by 10 minutes of rest, salivary cortisol values significantly decreased (Watanabe et al., 2015 ).

The components of essential oils are small soluble lipid molecules, with potential for pharmaceutical applications, being able to cross cell membranes and exhibit pharmacological effects. The possibility of using bergamot essential oil as an alternative in the treatment of postpartum depression opens up a new field of research and intervention. The results of the analyzed studies suggest that the use of this oil can have positive effects in relieving common symptoms of depression and anxiety (Agatonovic-Kustrin et al., 2020).

In summary, the results of the analyzed studies suggest that bergamot essential oil may have potential to help in the prevention and treatment of postpartum depression, but more research is needed to confirm these findings and determine how this oil can be safely integrated. and effective in treatment strategies (Chart 1).

In view of the analyzed studies, it is noticeable that bergamot essential oil has the potential to serve as a complement in the treatment of postpartum depression, mainly due to its anxiolytic and antidepressant effects. The analysis of the existing literature shows that bergamot oil has shown promising effects in preliminary studies, but also reveals the need for more research to confirm and better understand these results. It is crucial to consider the complexity of the clinical picture

of postpartum depression and individual variability in response to treatment. Therefore, the Ministry of Health in relation to integrative and complementary practices informs that, while bergamot oil can be a promising complementary alternative, it must not be seen as a unique solution or to replace conventional treatments (Brasil, 2022).

## **FINAL CONSIDERATIONS**

Postpartum depression is a mental health problem that affects many women around the world, with significant consequences for society as a whole. The search for effective and accessible treatments is therefore of great importance.

The analysis of the literature carried out in this work showed that bergamot essential oil can be a promising alternative for the treatment of postpartum depression. The analyzed studies indicate that bergamot oil may have antidepressant and anxiolytic effects, which are very pertinent to alleviate the symptoms of this condition. However, it is critical to note that more research is needed to confirm the effectiveness of bergamot oil in the treatment of postpartum depression and to better understand its mechanisms of action. Therefore, future studies must assess the safety of its use, especially by breastfeeding women, and investigate possible side effects and interactions with other treatments.

This work contributes to expanding knowledge about alternative treatments for postpartum depression using aromatherapy. It is hoped that the information presented here can stimulate further research in the area and, eventually, contribute to improving the quality of life of women who suffer from this condition. Caring for mothers' mental health is an important investment for society, as it brings benefits not only to them, but also to their children and their families.



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