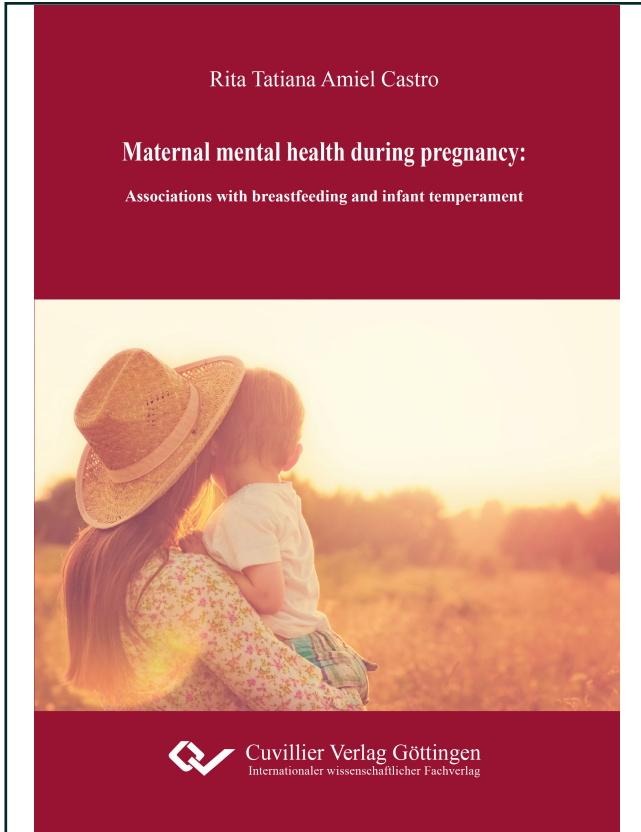




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**Maternal mental health during pregnancy: associations with breastfeeding and infant temperament**



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## Chapter 1

### Mental health disorders and the childbearing period

"Depression is living in a body that fights to survive, with a mind that tries to die."  
- Neil Lennon

Mental health is conceptualized as a state of psychological wellbeing in which individuals can realize their own capacities, live a productive life, cope with normal life stress, and contribute to their communities (WHO, 2010). The WHO further states that mental health is an essential part of general health and wellbeing and can be affected by a number of factors.

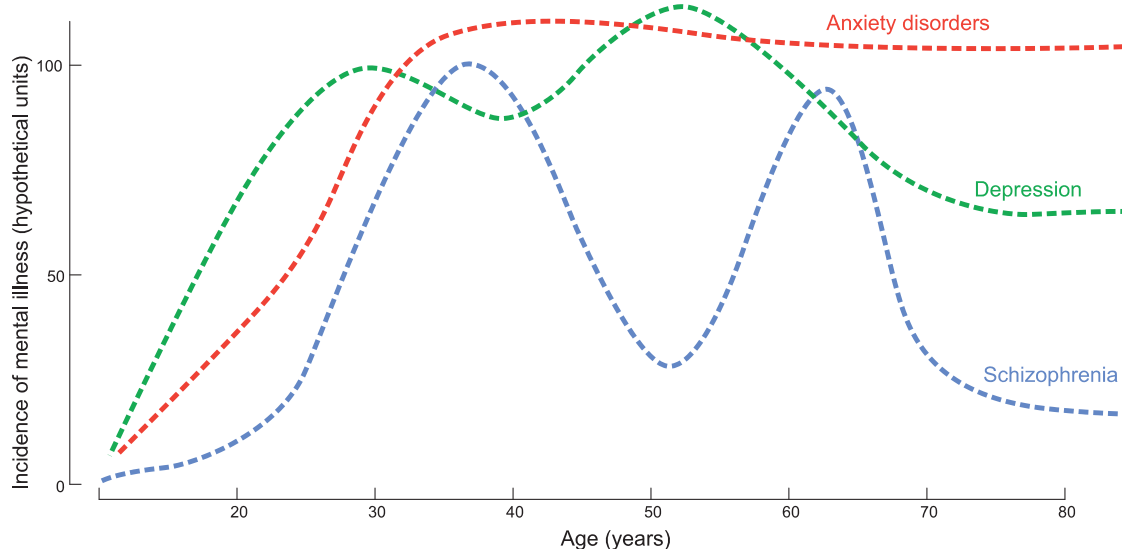
Over the last years, several studies have shown how women in their reproductive years in general and during pregnancy and postpartum in particular, were more vulnerable to mental health problems (Yonkers et al, 2011; Tolin & Foa, 2002). These disorders not only affect women, but also their families, partners, the developing foetus, and later the newborn (Kulkarni, 2006). The important biopsychological changes brought by the perinatal period require constant attention from health workers since they carry relevant risk factors for the mother's health and for the infant's neurodevelopment (Schetter & Tanner, 2012).

This chapter aims to discuss biological and psychological aspects of pregnancy, the most common mental diseases in the perinatal period and the negative outcomes they may have for birth and the newborn.

#### 1.1 Definition of mental health disorders in the perinatal period

Mental health disorders denote a range of mental and behavioural dysfunctions that cause disease, suffering and poor ability to function in normal life (WHO, 1992). Commonly recognized mental disorders include depression, bipolar affective disorder, schizophrenia, anxiety disorders, intellectual disabilities, substance use disorders, and dementia (WHO, 2010). People with mental illnesses have higher rates of disability and mortality and are more likely to be affected by diseases such as cancer, diabetes, cardiovascular problems and human immunodeficiency virus (HIV) or to acquire immune deficiency syndrome (AIDS). Suicide is also a more frequent cause of death among people with mental disorders than in the general population (WHO, 2010).

Evidence from epidemiology, genetics, and neuroscience studies (Angermeyer & Kuhn, 1998; Haefner et al., 1998; Fink, Sumner, Rosie, Wilson & McQueen, 1999) emphasizes differences between sexes in the onset of some mental disorders such as depression and anxiety. Women are more prone to develop them and have more intense symptoms than men (Kulkarni, 2006). These differences suggest gender-specific causal mechanisms for the aforementioned disorders with different development, duration, and progression (Kulkarni, 2006). The incidence of mood disorders is increased in the childbearing years and the recurrence of past disorders is common during reproductive events (Figure 1; Kendler, Walters & Kessler, 1997), such as menarche, pregnancy, postpartum and menopause. Mood disorders might occur in different intensities, requiring different treatment approaches. Several studies have supported this hypothesis, showing associations between premenstrual symptoms and postpartum depression (Bloch et al., 2005; Warner et al., 1991) as well as between premenstrual and early pregnancy (10-12 weeks gestation) somatic symptoms (Winkel et al., 2013). However, pregnancy and postpartum present very specific issues in terms of treatment types due to associated risks for the baby (Tolin & Foa, 2002).



**Figure 1. Theoretical incidence of women's mental disorders over time (adapted from Kulkarni, 2006).**

Mental disorders in childbearing women have been studied since the 19<sup>th</sup> century (Brockington & Kumar, 1982), when Jeanne Etienne Esquirrol and Louis Victor Marcè established perinatal psychiatry as a sub-field of psychiatry. It investigates the complexity of the physiological, psychological and environmental processes involved in the perinatal period and the adverse consequences to the foetus and infant based on their distinct epidemiology, aetiology, treatment and



outcomes (Appleby, Kummar & Warner, 1996). Since its foundation, this sub-field has evolved greatly with hundreds of papers published in the area, dozens of research groups working with this topic around the world and an international society exclusively dedicated to the study of perinatal mental health.

## **1.2 Biological and psychological aspects of pregnancy, birth and postpartum**

Pregnancy brings about many physiological, psychological and social changes in a woman's life (Nelson, 2003). Biologically, pregnancy requires a dramatic alteration in almost all maternal body systems to allow sustenance and growth of the foetus (Horan, 2007). It can be defined as "the development of an unborn within a woman's uterus and the accompanying physical, biochemical and developmental changes that occur on both mother and child from conception until birth" (Kalumuck, 2014; p.320). Limited in time, pregnancy has a mean duration – counting from the first day of the last menstrual period – of 284 days and is divided into three different phases called trimesters. Each trimester lasts about three months and is considered an important time point for pregnancy progression. All three are associated with specific physical and biochemical characteristics and foetal development stages (Kalumuck, 2014).

After fertilization, the genetic material of the sperm and egg combine to form the zygote. Within the zygote the embryogenesis - the process of cell division and cell differentiation of the embryo in the early stages of pregnancy - starts. The human embryo implants in the maternal endometrium. For approximately ten weeks the embryogenic process - which also creates the placenta and the umbilical cord - progresses. After the tenth gestational week, the embryo becomes known as a foetus. Organs and tissues undergo major growth and mature until birth. Hormonal alterations are also taking place in the mother, with higher production of oestrogen, estradiol and progesterone. The pituitary gland expands in order to produce prolactin, oxytocin, follicle stimulating, and luteinising hormone that will be released later in gestation. The thyroid gland activity is also increased to control the complex feedback systems of the hormonal organs that determine the course of pregnancy. The complete gestational period normally lasts from 38-40 weeks and after the release of several hormones from the ovaries, placenta and the pituitary gland, the maternal body is prepared for birth (Kalumuck, 2014).

For most women, the gestational period is a natural and joyful event. It is recognized as a time in which several psychological processes occur, new levels of personal maturity may be achieved and the transition to motherhood commences (Zager, 2009). A certain amount of anxiety is usual and expected (Chalmers, 1983) due to the far-reaching adjustments an expectant mother will face in the



following nine months. Fear of birth was reported in the literature as a worry for some pregnant women and increases when the delivery date gets nearer (Harder, 2013). Preparation for changes in social and partner relations are also recognized as tasks of pregnancy, which may lead to concerns and uncertainty (Raynor, 2006). According to Darvill et al. (2010), social support is a strong predictor of successful transition to the new maternal role. Other research (Beck, 2002; Chalmers, 1983; Waldenstrom et al., 2004) indicates that having support increases self-confidence in the motherhood role, facilitates a healthy obstetric outcome and reduces the prevalence of depressive symptoms in the postpartum phase.

Mood changes and psychological distress can also be part and associated with the psychological adjustments related to the gestational period (Raynor, 2006). A potential causal link between hormonal alterations occurring during pregnancy and changes in mood has been suggested by various authors, since they correlate in time (Steiner, 1998). The singularity of psychiatric disorders triggered by pregnancy and postpartum has been acknowledged by the American Psychiatric Association (APA; 1994) with their inclusion and specific designation in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; Purnine & Frank, 1996). Since then, research in this area has increased considerably (APA, 2000). As part of the psychobiological changes experienced during pregnancy, a bond between mother and baby begins to develop already in utero (Raynor, 2006). Recent studies provide evidence with regard the functioning of the neurobiology of maternal behaviour during pregnancy (Brunton & Russel, 2008; Insel & Young, 2001). These studies focus on the essential role of oxytocin, vasopressin and the hypothalamic-midbrain-limbic-paralimbic-cortical circuits of the brain as the main sources for the early activation of maternal behaviour (Swain et al., 2007; Brunton & Russel, 2008). Animal studies have reported the importance of oestrogen and progesterone in the initial expression of maternal behaviours in pregnant rats (Rosenblatt, Mayer & Giordano, 1988; Kinsley, 1994). However, although it is possible to build a neurobiological model of early maternal behaviour, interaction with the newborn appears to be essential to maintain postnatal caregiving (Kelley, 1988; Klaus, Kennel & Ballard, 1982).

Regarding the postpartum period, Lyon (2008) states that the significant physical and emotional changes needed to return to the nonpregnant condition are often under-evaluated. The postpartum is a time of rapid change during which all body systems undergo major restructuration. This may lead to increased maternal fatigue (Katz, 2007). Additionally, the new mother needs to attend the demands of a new baby and become familiar with breastfeeding as well as with the specific care of the breasts that now are secreting milk (Neville, 2001). Metabolic and hormonal alterations are also



happening in a fast pace and the sharp decrease of oestrogen and progesterone after delivery may play a role in mood changes and disorders frequently presented during the postpartum period (Halbreich & Kahn, 2001; Stahl, 2001).

### **1.3 Mental health disorders in pregnancy and postpartum: an overview**

The reproductive experience - gestation, birth, and lactation - is marked by an intense fluctuation and high exposure to psychoactive hormones (Lommatzsch et al., 2006). These hormonal fluctuations can cause somatic and affective symptoms, since, for example, estradiol levels during pregnancy are 30 times higher than during the menstrual cycle. Cortisol levels are also as high as in major depressive disorders (Glynn, 2012). Most women can cope with the hormonal changes without much disturbance, but others seem more predisposed to experience mental disorders in this period (Halbreich, 2010; Soares & Zitek, 2008).

This section provides an overview of the most common mental health disorders during pregnancy and postpartum since they are the foundation of the topics here discussed as well as the empirical papers.

#### ***1.3.1 Prenatal depression***

Depression is generally regarded as the most common psychological complication during pregnancy (Cunningham et al., 1997) and is considered a serious mental health concern (Brock et al., 2014). Prenatal depression does not differ in its clinical symptomatology from depression outside the pregnancy period (Bitzer & Riecher-Rössler, 2005). Its symptoms include, but are not limited to low mood, decreased interest and enjoyment, changes in appetite, sleep, weight, energy and memory, lowered self-esteem, and feelings of guilt (Cantwell & Cox, 2006). During gestation, depression is often overlaid by somatic pregnancy-related discomforts making it challenging to diagnose (Bader et al., 2010).

Important changes in biological (e.g. thyroid functions, hormone levels, hypothalamic-pituitary-adrenal [HPA] axis function; Soldin et al., 2005), social, and psychological functions in every pregnancy trimester are likely to predispose the development of depressive symptomatology during pregnancy (Su et al., 2007). Maternal hormone concentrations play an important role regarding mood states (Da Costa, Brender & Larouche, 1998) and their variation can alter the prevalence of depression per trimester (Fan et al., 2009). Although up to 70% of pregnant women complain about negative mood symptoms (Cantwell & Cox, 2006), Bennet et al. (2004) reported a depression incidence of 7.4% ([95% CI] 2.2-12.6) in pregnant women in the first, 12.8% ([95% CI] 10.7-14.8)



in the second, and 12% ([95% CI], 10.7-14.8) in the third trimester. Evans et al. (2001) similarly reported a significant increase in depression scores between the 18<sup>th</sup> and 32<sup>nd</sup> gestational week when compared to early pregnancy.

While the first onset of depression may commonly occur during pregnancy, women are at increased risk if they have previously experienced depression, have a family history of depression or suffer from any other mood disorder (APA, 2000). Risk factors for depression during pregnancy include stressful life events, lack of social support, domestic violence (Lancaster et al. 2010), maternal anxiety, unwanted or unplanned pregnancy, low income, low education level and nicotine consumption (Frisch & Riecher-Rössler, 2011). Prenatal depression has also been associated with a history of previous abortions, ambivalent feelings towards pregnancy, high-risk pregnancy, and consideration of abortion (Kent et al., 1997).

Frequently, symptoms of depression remain undetected (Hatton et al., 2007) and only about 20% of pregnant women are properly diagnosed (Hatton et al., 2007). If left untreated, depression can cause a number of adverse consequences for the gestation, including alcohol and drug use, poor nutrition, and lack of compliance with prenatal care recommendations (Carter & Kostaras, 2005). Additional implications are potential negative effects on the foetus and on how a woman perceives her baby, potentially compromising the mother-baby relation and the postpartum care (Edwards et al., 2008).

Treatment for prenatal depression relies on the same methods used for depression at any other time (Carter & Kostaras, 2005). Psychoeducation, supportive therapies, and psychotherapies such as cognitive behavioural therapy (CBT) and interpersonal psychotherapy (IPT) have been shown to be effective treatments for prenatal depression (Dennis, Ross & Grigoriadis, 2007). Antidepressant drug therapy is also recognized as an effective treatment and recently has been shown to carry minor risks for the baby with benefits outweighing the risks (Wisner et al., 2009). Additionally, prenatal depression is a strong predictor of postpartum depression, as it will be further described in the section 1.3.4, almost doubling the overall risk of a new onset (Cantwell & Cox, 2006).

### ***1.3.2 Maternal prenatal anxiety***

The occurrence of anxiety states during pregnancy and following delivery is frequent (Oates, 2006) with 7- 21% of women showing clinically relevant anxiety levels in these phases (Grant, McMahon & Austin, 2008). During pregnancy, anxiety has an overall prevalence of 10% (Bennett et al., 2004; Gavin et al., 2005) and the concerns usually relate to the course of pregnancy, wellbeing of the foetus and complications at delivery (Evans et al., 2001). Furthermore, anxiety is commonly



comorbid with depressive symptoms pre and postpartum (Beck, 2002; Matthey et al., 2003; Ross et al., 2003).

Clinical symptoms can be very heterogeneous and are caused by a number of factors such as pre-existing disorders, symptoms developed during pregnancy, symptoms triggered by gestational physiological changes, pregnancy-related anxiety, and pregnancy complications (Alder & Urech, 2011). Women with a previous history of severe anxiety (e.g. phobias, obsessive-compulsive disorder, panic disorders) are at increased risk of relapse during pregnancy and postpartum (Oates, 2006; Carter & Kostaras, 2005; Kulkarni, 2006).

Although pregnancy is commonly associated with certain levels of anxiety disorders, a considerable amount of variation in anxiety during pregnancy cannot be explained by general anxiety (Orr et al., 2007). Pregnancy-related anxiety, characterized by pregnancy specific fears and worries (Brunton, Dryer, Saliba & Kohlhoff, 2015), may constitute an important source for this variation. In 2004, Huizink et al. reported “fear of giving birth”, “fear of bearing a physically or mentally handicapped child”, and “concern about one’s appearance” as specific anxiety factors in the pregnant population investigated. Moreover, they noted that general anxiety and depression accounted for only 8-27% of variance in concerns related to birth and foetal health. These findings suggest that it might be caused by a specific type of anxiety present during gestation (Huizink et al., 2004). It has been suggested that pregnancy-related anxiety may be more strongly associated with maternal and child negative outcomes than general anxiety and depression (Bayrampour et al., 2015). Cognitive-behavioural therapy, relaxation techniques, massage therapy, and social support are some of the methods that can help reduce levels of anxiety at the perinatal period (Alder & Urech, 2011).

### ***1.3.3 Postpartum Blues***

Postpartum blues, also commonly called the “baby blues”, occurs in 50-80% of women in the first week after delivery (Cantwell & Cox, 2006) with a peak incidence at the fifth day postpartum (Henshaw, 2003). It is a dysphoric and usually self-limiting condition that resolves fairly quickly (Zager, 2009) and it has been suggested to occur more often among primipara (Felber Piso, 2006; Riecher-Rössler, 2001).

Typical symptoms are lability of mood, sleep disturbance, irritability, tearfulness, fatigue, and hostile thoughts towards the newborn (Henshaw, 2003; Heron et al., 2005). Increased anxiety and depression in late pregnancy may predict postpartum blues (Cantwell & Cox, 2006) as well as marital conflicts, high levels of trait anxiety, menstrual dysregulation and difficulty to accept





motherhood (Ehlert et al., 1990). Furthermore, women experiencing postpartum blues were shown to present higher morning cortisol levels compared to women not presenting this disorder (Ehlert et al., 1990). This period is understood as a temporary and normal reaction to the significant changes occurring after birth. It is expected to resolve without major interventions (Schönberner, 2013). However, severe postpartum blues can be a risk factor for later postpartum depression (Reck et al., 2009).

#### ***1.3.4 Postpartum depression***

Postpartum depression (PPD) is defined as a “major depressive disorder (MDD) with a specifier of postpartum onset within one month after childbirth” (APA, 2000). Some studies, however, have found it has a peak at six weeks postpartum and can last several months (Cantwell & Cox, 2006). It is the most well-known perinatal mental disorder and has an overall prevalence of 10-15% (Nonacs, Viguera & Cohen, 2002; Schönberner, 2013). Similarly to depression in any other life period, postpartum depression is characterized by a combination of physiological, affective, and behavioural symptoms that may alternate during the disease course (APA, 2000). Specific symptoms of this time are lack of interest in the baby and fear of harming the baby (Murray et al., 1996).

The aetiology of PPD may be in part connected to the endocrine system, with the HPA axis playing a main role. It seems that levels of the placental corticotropin-releasing hormone (pCRH) at 25 weeks gestation, may predict postpartum depression (Yim et al., 2010; McCoy et al., 2003; Bloch et al., 2000). Other risk factors include prenatal maternal depression, prenatal anxiety, previous major depression, premenstrual dysphoria, stressful life events during pregnancy or shortly after delivery, poor social support, marital conflict, low income, immigrant status, and young maternal age (Beck, 2001; Robertson et al., 2004). First time mothers tend to feel isolated, guilty or ashamed in the occurrence of PPD (APA, 2000).

Diagnosing postpartum depression is challenging due to the overlap of symptoms with the normal postpartum period. Most depression at this time remains undetected. Of all properly diagnosed women, the majority will be diagnosed by the general practitioner or a health visitor (Boyd & Somberg, 2005). Treatment is often required when symptoms persist for more than two weeks. Several effective methods can be recommended to postpartum women (APA, 2000). Interpersonal therapy (Grigoriadis & Ravitz, 2007), CBT, and psychodynamic therapy (Dennis & Hodnett, 2007) are some examples of what may be offered as treatment. Pharmacological medication is also recommended, however, it may impose a barrier for breastfeeding mothers (APA, 2004). More recent research suggests that a minimal amount of antidepressants are transferred to the



breast milk, but they have not been associated with serious adverse events for the infant (Chad et al., 2013). Further studies highlight that, in general, psychological treatments show moderate recovery effects (Cuijpers et al., 2008) whereas medication has large recovery effects on postpartum depression (Bledsoe & Grote, 2006). In severe cases, inpatient treatment might be indicated. Some centres are able and prepared to receive mother and baby (Glangeaud-Freudenthal, Howard & Sutter-Dallay, 2014).

#### **1.4 Mental health disorders in pregnancy and adverse birth outcomes**

A considerable number of studies have shown the adverse consequences affective states may have on pregnancy and birth outcomes (Schetter & Tanner, 2012; O'Donnel, O'Connor & Glover, 2009). Several studies have demonstrated associations with low birth weight (LBW; < 2500g) and preterm birth (PTB; < 37 weeks) (Glynn et al., 2008; Schetter & Lobel, 2011; Schetter, 2009; Goedhart et al., 2010; Rogal et al., 2007).

Preterm delivery has been shown to be affected by anxiety and depression in pregnancy (Beydoun & Saftlas, 2008; Behrman & Butler, 2006). General anxiety predicts risk of spontaneous PTB with effects comparable to risk factors such as smoking and pregnancy complications. Similarly, prenatal depression also increased the risk of PTB after controlling for income and ethnicity (Schetter & Tanner, 2012). In combination with stress, these psychological disorders are associated with elevated rates of premature birth (Mancuso et al., 2004; Grote et al., 2010).

Birth weight is also influenced by the aforementioned disorders. Recent research has documented that high levels of prenatal anxiety and depression have been associated with low birth weight and smaller head size (a measure of brain development) (Peterson et al., 2000). Other negative effects also have been linked to psychological events in pregnancy. Psychosocial problems have been related to foetal structural malformation (Nimby et al., 1999), although this is rare. Prenatal anxiety and depression are associated with the risk of developing preeclampsia in a later stage of pregnancy (Hobel et al., 1999a; Mulder et al., 2002; Grote et al., 2010). In addition to these complications, prenatal depression was also linked with spontaneous abortion, higher uterine artery resistance, haemorrhage during gestation, and increased risk of instrumental delivery (Bonari et al., 2004).

#### **1.5 Summary**

Mental disorders are associated with a significant burden of disease morbidity and disability. During reproductive phases, extensive hormonal, psychological, and physical changes are related to the occurrence of these disorders. Particularly in pregnancy and postpartum, women are at increased



risk of a new onset or relapse of a mental illness. During gestation, depression is the most common mental disorder with an incidence of 10-12% and often remains underdiagnosed. Anxiety is frequently comorbid, and in combination with depression, contributes to a high level of suffering in pregnant women.

Postnatally, 50-80% of women face postnatal blues, a normal reaction to the drastic physical and hormonal changes after birth, which increases the risk of developing the most well-known reproductive mental disorder: postpartum depression. PPD not only affects the mother, but may potentially compromise the quality of care provided and the type of feeding given to the baby.

In sum, these perinatal mental disorders have deleterious effects on birth outcomes, affecting birth weight, stimulating early delivery and promoting far-reaching adverse neurodevelopmental outcomes. They may also implicate poorer choices of infant feeding and ways of coping with distress.