Depression in Pregnancy: Biological, Clinical, and Psychosocial Effects

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Rebecca H. Bind, Kristi Sawyer, and Carmine Pariante

1.1 Introduction

Major Depressive Disorder (MDD) is a common psychiatric disorder that is one of the biggest contributors to disability worldwide [1]. It affects millions of people globally and can be recurrent and chronic [2]. The core symptoms of MDD can alter mood, affect, sleep, appetite, cognition, and psychomotor activity [3] and can lead to decreased quality of life, comorbid diseases, substance use, and burden on health-care services [2]. Furthermore, according to the Organisation for Economic Co-operation and Development, mental illness including depression costs the UK alone almost £100 billion every year.

MDD can occur at any point in life, including during a woman's perinatal period, that is, during and/or after pregnancy. When MDD is experienced during pregnancy, it is referred to as antenatal MDD. Antenatal MDD may occur as either a continuation of symptoms that began prior to conception or as an episode that specifically began during the pregnancy. It can occur both in women with and without a history of depression and affects up to 20% of pregnant women [4].

When MDD is experienced following childbirth, it is referred to as postnatal MDD. Postnatal MDD is thought to be the most frequently reported complication related to childbirth [5]. With regard to mental illness during the perinatal period, postnatal MDD has been much more widely studied than antenatal MDD and has been found to affect not only mother, but also her baby, and not only in the short term, but also potentially in the long term. Of note, though, is that a significant risk

R. H. Bind · K. Sawyer · C. Pariante (✉)
Department of Psychological Medicine, Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, UK
e-mail: rebecca.bind@kcl.ac.uk; Kristi.m.sawyer@kcl.ac.uk; a.sawyer@brighton.ac.uk; carmine.pariante@kcl.ac.uk

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factor for postnatal MDD is antenatal MDD. Furthermore, it is thought that up to 39% of women with postnatal MDD experience a continuation of symptoms from the antenatal period [6], and thus it is important to consider the effects that antenatal depression may also have. This chapter will discuss the maternal and offspring biological, clinical, and psychosocial outcomes in the context of women who are depressed in pregnancy.

1.2 Background on Antenatal MDD

In order to understand the effects that antenatal MDD may have on both mothers and their offspring, it is first important to discuss the aetiology, epidemiology, classification and clinical features, and treatment options for women experiencing depression in pregnancy. These concepts will be discussed below.

1.2.1 Aetiology of Antenatal MDD

While the aetiology of MDD is still not fully disentangled, it is thought that it primarily occurs as a result of genotype, environmental stress [7], epigenetics, or an interaction between genes and environment [8]. Population-based twin studies have identified that genes are responsible for about 40% of depression, while the rest is likely due to environmental triggers [9]. Furthermore, with regard to heritability of depression, women are found to be more susceptible than men (42% of depression vs 29%, respectively) [10], suggesting there is a hormonal component and rendering the perinatal period sensitive.

With regard to environmental stress, it is thought that those who develop MDD in the face of environmental triggers are genetically predisposed to handle stress differently [7]. For example, some who develop MDD have overactive hypothalamic–pituitary–adrenal (HPA) axes [7], a hormonal pathway that is set in utero, and can be influenced by maternal cortisol activity during pregnancy [11]. Additionally, other pathophysiological mechanisms have been identified, including inflammation, vitamin D levels, and neurotrophic growth [12]. Finally, it is thought that epigenetic changes may contribute to risk for MDD as a result of environmental, hormonal, or stochastic factors leading to intergenerational predisposition for disease [8, 13].

While there is not a plethora of research investigating the specific aetiology of antenatal MDD, it is thought that a combination of social and biological factors may underpin the emergence of symptoms during a period when hormones are already rapidly changing [4]. Notable risk factors include a history of maternal childhood maltreatment, a history of MDD, low socio-economic status (SES), young age, lower education, and lack of social support [14]; and, furthermore, biological factors such as HPA axis changes and inflammation [11].

1.2.2 Epidemiology of Antenatal MDD

According to the World Health Organization (WHO), MDD is classified as the greatest contributor to disability globally, and affects upwards of 300 million people, or about 4.5% of the global population [1]. Additionally, it negatively impacts the individual not only on a psychological and physical level, but also on a financial and social level [15]. The greatest risk factors for depression have been identified as poverty, unemployment, childhood history of abuse, stressful life events, illness, and substance use [1]. Furthermore, MDD is often associated with morbidity and mortality [16]. Epidemiological studies indicate that MDD typically begins earlier in life and has a propensity to reoccur [15]. Moreover, twice as many women experience MDD as men, largely due to the fact that women go through hormonal changes at various points in life, particularly during the perinatal period [17].

In fact, up to 20% of women in high-income countries experience an episode of MDD during their antenatal period, with rates even higher in middle- and low-income countries [4]. Studies have been mixed as to which trimester poses the greatest risk for depression: Some have found that the first trimester has the highest prevalence [18], while others have found that the second and third trimesters have a higher prevalence [19]. Furthermore, women who experience depression during pregnancy are at heightened risk for the depression to continue into the postnatal period [4] and 20% of new mothers meet criteria for postnatal MDD [20].

1.2.3 Classification and Clinical Features of Perinatal MDD

The main two symptoms of MDD, classified by the *Diagnostic and Statistical Manual, Fifth Edition* (DSM-V) are depressed/irritable mood as well as decreased interest or pleasure in everyday activities [21]. Additionally, further symptoms may include changes in weight or appetite, sleep patterns, activity level, energy level, feelings about oneself including guilt or worthlessness, and concentration abilities. Furthermore, it has been found that women with higher depressive symptoms during pregnancy are less likely to engage in self-care and have poorer health and functionality during their pregnancies [22]. Finally, these changes may be accompanied by thoughts of, or plans for, suicide.

In order for a diagnosis of MDD to be made, five of the aforementioned symptoms, including the main two, must be met, and must have been present for most of the day, nearly every day, for at least a 2-week period. Furthermore, the symptoms must cause significant distress and/or impairment in everyday function. Finally, it is important to disentangle whether the symptoms are that of depression, or stem from something else, such as physical illness, substance use, or bereavement. An episode of MDD can be categorised as mild, moderate, or severe (with or without psychotic features), according to the person's severity of symptoms, and can occur as a single-episode MDD, recurrent episodes of MDD, or chronic MDD.

1.2.4 Treatment for Antenatal MDD

Treatment options for MDD include pharmacological, psychological, and physical interventions [23]. Pharmacological treatments are most commonly antidepressants [ADs] (selective serotonin reuptake inhibitors [SSRIs], serotonin noradrenalin reuptake inhibitors [SNRIs], tricyclic antidepressants [TCAs], and monoamine oxidase inhibitors [MAOIs]) or mood stabilisers (lithium or sodium valproate). Psychological treatments recommended are cognitive behavioural therapy (CBT) or psychotherapy. And, finally, physical treatments utilised are electroconvulsive therapy (ECT), transcranial magnetic stimulation (TMS), or vagal nerve stimulation (VNS). The recommended treatment for mild depression is typically psychological therapy, alongside exercise and lifestyle changes, while the gold standard for moderate to severe depression is antidepressant therapy. In treatment-resistant patients, the addition of mood stabilisers may be recommended, or a second AD. And finally, if all above fails, physical interventions may be recommended.

As women with antenatal MDD are pregnant and psychotropic medication can cross into the placenta, though, treatment of symptoms may not follow the same protocol as with MDD outside the pregnancy period. With regard to antidepressants, patients must decide with their healthcare practitioner whether the benefit of taking medication during pregnancy for symptom relief outweighs the cost of any potential effect on the developing foetus [24]. If women do not opt for antidepressant treatment, non-drug alternatives are available, including psychotherapy [25], exercise [26], and non-traditional medicine [27]; however, there is a paucity of literature to support whether these interventions are as effective as drug therapy. Surprisingly, one study identified that 86% of pregnant women with depression in their sample were not receiving any treatment for their symptoms [28], highlighting the need for more widespread mental health screening during the perinatal period.

1.2.5 Summary

Overall, MDD is a global health problem, and of particular concern with regard to the perinatal period and beyond. Despite the paucity of evidence about the aetiology of MDD during the perinatal period, the identification and treatment as soon as possible is of the utmost importance, given its potential to affect both mother and baby, both in the immediate as well as in the long term, as well as the social and economic burden placed upon society by lack of identification and treatment. As such, in this chapter we will discuss the biological, clinical, and psychosocial effects of depression in pregnancy on not only mothers, but on their offspring as well.

1.3 Biological Effects of Depression in Pregnancy

Depression across all life stages is associated with marked alterations in a number of biological systems, including the HPA axis, immune system, and other endocrine systems. This is also true of the perinatal period, which is further complicated by the profound biological changes associated with healthy pregnancy and the postpartum period. Pregnancy is a period in which biological communication between mother and baby is essential, therefore it is perhaps not surprising that biological changes in the mother are 'transmitted' to the developing foetus and can be measured in the offspring postnatally. This section reviews evidence for such biological changes in both the mother and offspring in the context of maternal perinatal depression.

1.3.1 Effects on the Mother

The biological aetiology of depression during pregnancy is complex and displays considerable heterogeneity. This may, in part, be due to the use of antidepressant medications during pregnancy, which may mitigate some of the biological changes associated with antenatal depression.

1.3.1.1 In Pregnancy

One of the most well-studied biological systems in the context of depression, the hypothalamic–pituitary–adrenal (HPA) axis, has shown inconsistent trends in association with antenatal depression. Indeed, a systematic review [29] reported that only half of studies found higher cortisol levels in those experiencing antenatal depression, when compared with pregnant controls, while a handful of studies reported the opposite effect. A further review concluded that the majority of papers do not show an association between antenatal depression and cortisol levels [30]; however, of those that do, differences were most often found in the second and third trimesters. When investigating diurnal cortisol levels, the most common pattern found, where there is one, is that women suffering antenatal depression show a blunted cortisol awakening response, but higher overall levels throughout the day, which remain elevated in the evening [11, 31, 32].

More recently, a role for the maternal immune system has been suggested. Studies often find that, when compared with healthy pregnant women, women suffering antenatal depression show higher levels of peripheral cytokines such as interleukins-6 and -10, tumour necrosis factor alpha and vascular endothelial growth factor [11, 33]. Furthermore, women reporting higher levels of depressive symptoms may also show an exaggerated inflammatory responses to the immune challenge of vaccination [34].

1.3.1.2 In the Postpartum

Depression in the postpartum is often a continuation of antenatal symptoms; however specific biological predictors of postnatal mood have also been proposed. The drastic changes in sex hormones post-birth are often associated with the precipitation of mood symptoms [35]. More specifically, it seems that rather than having differing sex hormone levels, women at greater risk of postnatal depression show enhanced sensitivity to normal pregnancy–related fluctuations in sex hormones levels. Research has shown that if non-pregnant, euthymic women with a history of postnatal depression are administered oestradiol and progesterone that mimic pregnancy levels, then these hormones are withdrawn at similar magnitudes to that experienced after childbirth, 60% of those with a history of postnatal depression develop mood symptoms, while none without a history of postnatal depression experience such symptoms [36].

Oxytocin, the neuropeptide associated with childbirth, maternal attachment, and lactation [37], has also been shown to be associated with postnatal depressive symptoms. Interestingly, antenatal depressive symptoms, although not associated with concurrent oxytocin levels, were negatively associated with oxytocin levels 3 months post-birth [38]. Furthermore, lower oxytocin levels during pregnancy are associated with the development of postnatal depression in the early postnatal period [39]. This relationship between oxytocin levels and depressive symptoms is particularly important, as antenatal oxytocin levels are associated with maternal care [40], and may therefore be associated with the quality of the mother–child relationship formed. Indeed, there is some evidence that mother–child synchrony in oxytocin levels exists post-birth [41, 42], and may underpin successful bonding and attachment.

1.3.2 Effects on the Offspring

The ‘Fetal Origins of Mental Health’ discussed by O’Donnell and Meaney in their ‘Developmental Origins of Health and Disease Hypothesis’ [43] suggests that the quality of foetal growth and development, as well as the in utero environment in which a foetus develops may predict an offspring’s risk of non-communicable chronic illnesses, including mental health disorders, by programming the growing foetus in a manner which predisposes to later psychopathology [44]. As such, the effect of antenatal depression on the foetus in utero is of particular interest in the context of the intergenerational transmission of psychopathology, in which the offspring of antenatally depressed mothers are more likely to develop mental health problems themselves later in life [45].

1.3.2.1 HPA Axis

The most well-studied foetal programming mechanism in the context of mental health disorders is the HPA axis. It is likely that the foetuses of antenatally depressed

mothers are exposed to elevated cortisol levels in utero, both because, as discussed above, maternal circulating cortisol levels are higher, but also due to the downregulation of the enzyme 11-beta-hydroxysteroid dehydrogenase type 2 in the placenta, resulting in a reduced metabolism of cortisol into its less active form, cortisone, and thus more active cortisol reaching the developing foetus [46]. Indeed, various studies have reported associations between maternal cortisol levels during pregnancy and offspring neonatal cortisol levels and cortisol reactivity to stressors [47–52]. This association has been shown to persist into infancy [11, 53], and perhaps even into childhood, although the literature is mixed at this stage [54–56]. Taken with the associations reported between HPA axis functioning and mental health disorders, this could be an important mechanism to target in order to improve offspring mental health outcomes.

1.3.2.2 Brain Development

Antenatal depression has been associated with slower foetal growth, particularly of the head [57, 58]. This is important, given the suggestion that foetal head circumference can be used as a proxy for brain size, and therefore development [59]. Indeed, there is some evidence that maternal antenatal depression may influence foetal brain development. For example, antenatal depressive symptoms have been associated with neonatal right hippocampal morphology [60] and right amygdala volume [61]. Interestingly, in infants born to antenatally depressed mothers, a pattern of greater functional connectivity of the amygdala was observed, which was consistent with patterns observed in adolescents and adults with major depressive disorder [62]. Finally, in childhood, evidence of sex-specific effects has been reported, such that antenatal depressive symptoms were associated with larger volume and functional connectivity of the amygdala in girls, but not in boys [63, 64].

1.3.3 Section Summary

Maternal depression in the perinatal period is often associated with alterations in cortisol levels and immune functioning, although results show some inconsistency. Furthermore, women experiencing depression show altered functioning and sensitivity of the oxytocin and reproductive hormone systems, which are particularly relevant in the postpartum period. These alterations, along with others, both biological and psychosocial, are likely to underlie alterations observed in the offspring of depressed mothers. From a biological viewpoint, these include alterations in the HPA axis and in physical growth and brain development. It is important that these are studied in further detail, including with reference to sex-specific effects, in order that the chain of transmission of biological risk factors for mental health disorders from mother to child can be broken.

1.4 Clinical Effects of Depression in Pregnancy

Depression in pregnancy carries clinical implications not just for mothers, but also for their babies: Women who experience antenatal depression are at risk to have a continuation of their depression beyond pregnancy, potentially creating long-lasting difficulties with mental health and increased need for clinical and health services. Furthermore, research suggests that offspring of antenatally depressed women are at risk to experience mental health difficulties themselves throughout the course of their lives. This section will discuss the literature on the clinical implications of depression in pregnancy on both mothers and their offspring.

1.4.1 Effects on Mother

Studies find that women who are depressed in pregnancy are at greater risk for subsequent depressive episodes: It is thought that up to 39% of women with postnatal MDD experience a continuation of symptoms from the antenatal period [6], and, furthermore, that 25% of mothers who experience antenatal depression will go on to experience MDD beyond their infant's first year of life [20]. Finally, those who experience MDD during the perinatal period are much more likely to experience subsequent depressive episodes across the first 5 years of their children's lives [65, 66]. Unfortunately, one grave consequence of perinatal MDD is suicide, and it is in fact found to be the leading cause of maternal death in the postnatal period [67].

It is thus imperative to identify and treat maternal antenatal depression, as it can profoundly impact both mother and developing child. As mentioned above, women who do not receive treatment for their mood are at risk of entering into a chronic depressive state [68], which has deleterious effects on not only their mental health, but also on physical health.

1.4.2 Effects on Offspring

With regard to the developing infant, research has begun to identify effects of antenatal MDD on offspring at many stages of development. For example, a few studies have found that neonates born to mothers who were depressed in pregnancy had less optimal neonatal behaviour [11, 69]. Furthermore, as infants exposed to antenatal MDD develop into children and adolescents, they are at greater risk for psychopathology, including depression [70] and behavioural problems [71]. And finally, when the reach adulthood, they continue to be at greater risk for psychopathology [72].

Increasing attention has been given recently to the possibility for mothers who experience depression antenatally to transmit this vulnerability during pregnancy, thereby rendering their offspring susceptible to developing psychopathology themselves. While much of the literature on the effects of antenatal MDD on offspring

mental health previously focused on psychopathology emergence in adolescence through to adulthood, and have assessed maternal depression retrospectively, recent literature has investigated psychopathology earlier on, in childhood.

In a recent study, Barker et al. [73] reported that the presence of antenatal depressive symptoms in mothers was associated with an increased likelihood for externalising problems, encompassing conduct, and oppositional disorders as well as attention-deficit hyperactivity disorder in their children. Interestingly, the authors also found that antenatal anxiety symptoms were associated with internalising problems, including anxiety and depression, indicating that different types of psychopathology in pregnancy may manifest differently in offspring. And, furthermore, they found sex differences, whereby girls of depressed mothers were more likely to develop internalising disorders.

In a subsequent study, Plant et al. [74] found a significant association between maternal childhood maltreatment (CM) and child psychopathology—both internalising and externalising disorders—at 10 years which persisted to 13 years, and was directly mediated by antenatal MDD, and further compounded by postnatal MDD. The findings of this study are important, as they underline the importance of maternal CM in the relationship between antenatal MDD and child mental health problems. The authors posited that their findings are indicative of a pathway, whereby a mother who has been maltreated in her childhood is at increased susceptibility to becoming depressed in pregnancy, and through foetal programming effects, due to her own HPA axis dysregulation, may induce HPA axis changes in her foetus, rendering her offspring vulnerable to becoming emotionally labile due to a maladaptive stress response [75].

Many studies have identified an association between antenatal depression and offspring psychopathology all the way through to adulthood [70, 72, 76]. These findings indicate that the effects of antenatal depression on offspring outcomes are long lasting, stressing the importance of intervention during pregnancy in order to prevent ongoing, enduring mental health problems in offspring. Additionally, it is important to note that many of the studies that have examined the relationship between antenatal MDD and offspring psychopathology have found that the intergenerational transmission of psychopathology is in fact present independently of postnatal MDD, and thus antenatal symptomology may carry biological consequences over and above the effects of the postnatal environment.

1.4.2.1 Biological Mechanisms Underpinning Intergenerational Transmission of Psychopathology

In a review that summarised literature on the relationship between maternal antenatal stress/depression and child psychopathology, the authors identified the most likely mechanistic candidates involved [77]: Firstly, they discussed the maternal HPA axis as one possibility; as mentioned above, it believed that depression during pregnancy elevates circulating cortisol levels, and given that cortisol can cross the placental barrier, elevated cortisol levels in the mother passes into the developing

foetus and impacts foetal development [78]. One consequence of heightened maternal cortisol during pregnancy is increased offspring cortisol in the postnatal period [11], and thus a dysregulated stress response system may predispose offspring to future victimisation and psychopathology.

Another putative mechanism they identified is changes in uterine blood flow: Stress during pregnancy activates adrenaline hormones, which can induce constriction of blood vessels and thereby reduce oxygen to the foetus, potentially leading to neurodevelopmental problems and subsequent psychopathology in offspring [79]. Furthermore, studies have identified that psychiatric problems during pregnancy are associated with altered foetal behaviour, possibly due to sympathetic nervous system activation [80]. Finally, another recognised mechanism is inflammation as a result of stress during pregnancy: Animal studies have found that inflammation during pregnancy is associated with altered foetal neurodevelopment, thus increasing vulnerability to psychopathology later in life [77].

In a subsequent review, Sawyer et al. [45] identified that genetics also plays a large role in the intergenerational transmission of psychopathology, given that the heritability of MDD is 40% in women and 30% in men [10], and thus genetic predisposition cannot be discounted as a possible mechanism. However, one study attempted to disentangle whether this transmission is more due to genetic profiling or to foetal environment exposure, and followed women who had gone through in vitro fertilisation and become pregnant with a child that they were either related or unrelated to [81]. Interestingly, the authors found differences in heritability, whereby offspring, both related and unrelated, to mothers stressed in pregnancy were more likely to develop internalising disorders, while only related offspring to stressed mothers were more likely to develop behavioural disorders, suggesting that different disorders may have different aetiologies.

1.4.3 Section Summary

Maternal depression during pregnancy puts women at great risk of continuing to remain unwell into the postnatal period and beyond into their children's early years unless they are identified and treated. Furthermore, offspring of antenatally depressed mothers are more likely to develop psychopathology themselves, beginning as early as childhood through adulthood.

1.5 Psychosocial Effects of Depression in Pregnancy

Antenatal depression has psychosocial implications on both mothers and their infants. Mothers experiencing depression in pregnancy may experience difficulties with self-care, relationships, stress, and coping. Furthermore, women are at risk for difficulties interacting with their infants in the postpartum period. This section will discuss the literature on the psychosocial effects of depression in pregnancy on mothers and their infants.

1.5.1 Effects on Mother

Women experiencing antenatal depression are less likely to feel supported, both socially and medically [82]. With regard to medical care, depressed women typically do not access adequate health care services and are also less likely to engage in proper self-care. This unfortunately puts expectant mothers and their babies at risk for adverse birth outcomes, and thus it is important to identify women who are not taking adequate self-care. Furthermore, antenatally depressed women report feeling a lack of social support from family, friends, and partners, and subsequently experience low self-esteem [14]. It is thought that lack of social support is associated with depression as women are without adequate practical and emotional support, thereby hindering their abilities to cope and lowering their threshold for stress associated with parenting [83]. Moreover, pregnant women who perceive low social support are less likely to engage in self-care, highlighting the importance of partner and peer support for pregnant women's emotional and physical well-being.

Studies show that antenatal depression not only impacts the mother who is suffering, but also her network around her. For example, research has found that partners of women experiencing depression are profoundly impacted [84], and in fact are at risk of becoming depressed themselves [85]. Furthermore, presence of maternal depression may inadvertently place added pressure on her partner to compensate with regard to home and childcare duties [86]. And, moreover, studies have found strong correlations between maternal depression and marital conflict [87], and that this discord may in fact be one mediator in the relationship between maternal depression and adverse outcomes in children [88].

One of the most commonly identified psychosocial effects of antenatal depression is difficulty coping with stress. In fact, women who are depressed during pregnancy are more likely to experience parenting stress once giving birth [14]. More specifically, it has been found that depression during the third trimester is associated with increased parenting stress at both 3 months and 6 months postpartum, and that usage of antidepressants in pregnancy does not buffer against this effect [89]. One suggested mechanism behind this finding is that via foetal programming, antenatal depression is associated with increased infant difficult behaviour, which may in turn drive maternal stress. Studies suggest that increased parenting stress can strain the mother–offspring relationship [90], which will be discussed below.

1.5.2 Effects on the Dyad

As mentioned above, women who are depressed in pregnancy are at risk of increased stress, which may affect their developing relationship with their offspring. As such, studies have found that women who are depressed during their pregnancies are at risk to have greater difficulty in bonding with their unborn babies [91]. For example, women who exhibit heightened depressive symptoms during pregnancy are also

more likely to ruminate and excessively worry, two phenomena that are predictive of difficulties with foetal bonding [92], that is, the act of a mother emotionally connecting with her unborn baby and preparing for motherhood [93]. Furthermore, additional studies have found that women who are clinically depressed in pregnancy display reduced maternal–foetal attachment in the second and third trimesters [94], measured as 'a woman's own reflections on pregnancy and motherhood, her enjoyment of pregnancy, excitement about motherhood, and hopefulness for the future.' It is thus unsurprising that depression, which manifests as withdrawal and disconnectedness, can render a woman unable to connect with, and care for, her foetus.

It is important to identify difficulties in foetal attachment, as it is a known predictor of maternal sensitivity and the quality of the mother–infant relationship in the postpartum period [95], and thus it is thought that women who are antenatally depressed and are having difficulties bonding with their unborn baby will be at heightened risk for suboptimal mother–infant interactions postnatally and reduced sensitivity. In fact, studies confirm that antenatal depression is associated with disruptions in the mother–infant relationship in the postpartum, independently of postnatal depression. In one study, mother–infant interaction was assessed in the context of both antenatal and postnatal depression, in an effort to elucidate whether there was a difference in dyadic interaction based on timing of maternal symptoms [96]. The authors found that women who exhibited high levels of depression during mid pregnancy, but not postnatally, were less responsive toward their infants than women with no antenatal depression. Interestingly, they also found that women who did not experience antenatal depression and who experienced only postnatal depression early in the postpartum, did not have altered responsiveness, but that women whose postnatal depression persisted into the late postpartum did exhibit less responsiveness. Overall, this study's findings are important, as they show that mother–infant interaction is affected by antenatal depression independently of postnatal depression, and that postnatal depression only affects the interaction if its occurrence coincides with the timing of the interaction.

Another study investigated the continuity of maternal sensitivity across the first 2 years of life [97] and found that 80% of mothers who scored in the low range of sensitivity throughout the 2 years, had reported symptoms of antenatal depression. Indeed studies have shown that the association between postnatal depression and less optimal mother–infant interaction may be attributable to a continuation of impaired foetal attachment (that is, in pregnancy) into the postnatal period [98], and that mothers' unresponsiveness may actually begin during pregnancy, not postnatally [96], and furthermore, that foetal attachment has been found to be highly predictive of postnatal bonding [98, 99]. As the early mother–infant interaction is highly predictive of infant attachment status after 12 months [100], and early attachment has long been associated with subsequent offspring outcomes [101], it is thus important to identify mothers at risk of difficulties in their interactions and provide support and guidance.

1.5.3 Section Summary

Women who are depressed during pregnancy are less likely to feel emotionally and physically supported, engage in adequate self-care, and are more likely to experience relationship difficulties and stress. Furthermore, antenatal depression puts women at risk of not properly bonding with their foetus, and in turn creates difficulties in establishing an optimal relationship with their babies in the postpartum.

1.6 Conclusion

Perinatal mental health problems are one of the leading causes of maternal mortality, and, as mentioned above, suicide is the leading cause of death for women suffering from mental illness during the perinatal period [67]; however, with proper identification and treatment, symptoms can be alleviated and deleterious outcomes for both mother and infant can be prevented. As of 2014, it was estimated that perinatal mental illness costs the UK at least £8 billion per each year's cohort of births, with 72% of these costs allocated towards the children and 28% towards the mothers. With regard to perinatal depression specifically, each dyad is thought to cost a total of £74,000. Additionally, it has been found that partners of women experiencing perinatal depression are at risk of becoming unwell themselves [102], making the relationship more likely to end. Because of the great cost burden on society stemming from mental illness during the perinatal period, it has become imperative to better identify and treat women as soon as possible, including more widespread mental health assessments, mother and baby units, and parent–infant interventions. Indeed, there has been an incredible public interest in perinatal mental health, with women voluntarily sharing the experience of their suffering in public outlets [103].

Economically, it was projected in 2017 that untreated mood and anxiety disorders among new mothers will cost the US$14.2 billion for all births in that year alone [104]. This figure estimated the cost burden of not treating a mother's mental health, spanning from pregnancy until her child reaches the age of 5, and anticipated that roughly $7.5 billion of the costs for mothers and their babies born in 2017 would occur in the perinatal period, while the remaining $6.7 billion of the costs would occur in the proceeding 4 years of the child's life. Taken all together, maternal mental health should be treated with high priority, as it not only impacts a mother's biological, clinical, and psychosocial outcomes, but it impacts those of her baby as well.

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