CHAPTER 10

Postnatal Depression and Young Children's Development

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We focus in this chapter on effects of parental, and specifically maternal, depression occurring during the child's infancy, that is, postnatal depression (PND), and consider both its short- and long-term effects. First, we outline the nature of PND and review its effects on maternal interactions with the infant and young child. We then consider the development of children of mothers with PND in the domains of cognitive, emotional–behavioral, psychiatric, and neural and physiological functioning. Finally, we review intervention and treatment studies.

Postnatal Depression

Postnatal depression is a mood disorder that occurs in the postnatal period. It should be distinguished from both "maternity blues" and postpartum psychosis. Having the blues is a common (50–80%), mild, and transient disturbance, typically occurring around 3 days following delivery, and characterized by marked lability of mood. Postpartum psychosis, by contrast, is a rare (0.1–0.2%), acute, and severe psychiatric disorder, with onset typically within the first 2 weeks after childbirth.

The symptoms of PND are similar to those of depression outside the perinatal period (O'Hara & McCabe, 2013); that is, they include a prolonged period of low mood, and a profound loss of interest and enjoyment. Other symptoms are mood-related disturbances in sleep, irritability, concentration impairment, retardation, agitation, feelings of guilt and hopelessness, and suicidal thoughts or impulses. The possibility of a "pure" form of PND is raised by two studies. First, the Cambridge Longitudinal Study (referred to below as the Cambridge study) showed that women who had depression for the first time after childbirth were at increased risk for future PND episodes but not for depression at other times; by contrast, women whose PND represented a recurrence of a previous non-postnatal episode were not at increased risk for future PND, but they were at increased risk for depression occurring outside the postnatal period (Cooper & Murray, 1995). Second, a study of sister pairs with recurrent major depression found concordance with respect to early-onset PND (within 4 weeks of delivery), but not for later-onset depressions (Forty et al., 2006). These findings require replication, but they do suggest a possible distinctive subgroup of PND.

Estimates of the prevalence of PND in high-income countries (HICs) vary widely, depending on assessment methods, the period covered, and the population location. A meta-analysis of postnatal depression in North American and European general population samples reported a prevalence of 13% (O'Hara & McCabe, 2013), and in a systematic review, Gavin

and colleagues (2005) reported a prevalence within the first 3 postnatal months of 7.2% for full depressive disorder, and 19.2% when subthreshold episodes were included. It is unclear whether the prevalence of depression is raised after childbirth, as studies have not generally been rigorously controlled. Nevertheless, on the basis of current research, although there does appear to be a higher prevalence of depression in the early months following delivery compared to the months toward the end of the first postnatal year, there is no compelling evidence for a raised prevalence over the whole postnatal year relative to an equivalent nonpuerperal period. In lower- and middle-income countries (LMICs), the prevalence of PND has been found to be two to three times higher than that in HICs (Parsons, Young, Rochat, Kringelbach, & Stein, 2012). These LMIC rates emerge from communities under high levels of social and economic stress, and there is no evidence that, in these contexts, the postpartum period is associated with raised risk for depression. A similar argument may be made for the high rates of PND found in low socioeconomic status (SES) samples within HICs (e.g., Sharp et al., 1995).

The course of PND is variable. For about half the women with depression occurring at some time in the year following delivery, the onset predates the birth. Furthermore, the few studies that have made repeated postnatal assessments have found that while the majority of women with PND show steady improvement over the postnatal year, for around one-third of the women, PND is the prelude to chronic depressive disorder, and these chronic cases tend to be more severe. As we review below, these episodes pose most risk for adverse child outcomes; therefore, their identification is of particular importance.

Risk factors for PND are largely the same as those for depression at other times. Thus, meta-analyses identify associations, albeit of only of moderate size, with a history of depression (including depression in pregnancy), stressful life events, personality factors (i.e., neuroticism and low self-esteem), a poor marital relationship, and poor social support (O'Hara & McCabe, 2013). None of these factors individually confers substantial risk, however; and collectively, their predictive power is limited (Cooper, Murray, Hooper, & West, 1996). Indeed, reliable antenatal identification of those at risk for PND is currently not possible. This is partly because early postnatal factors may also increase risk, such as severe maternity blues and difficult infant temperament (e.g., Murray, Stanley, Hooper, King, & Fiori-Cowley, 1996). Efforts are therefore better directed at early postnatal identification of disorder than at prediction.

There has been interest in whether hormonal changes associated with parturition influence PND. However, despite the dramatic alterations following delivery—notably, the sudden withdrawal of estradiol and progesterone—there is no convincing evidence that these are involved in the onset of postnatal mood disturbance. Indeed, the postnatal levels of these hormones do not differ between depressed and nondepressed women. The idea persists, nevertheless, that there may be a subgroup of women who are particularly sensitive to the mood-destabilizing effects of perinatal changes in gonadal steroid levels but, while this may turn out to be the case, the evidence to date is not compelling.

Effects of PND on Mother–Child Relationships

Caregiving

As we described, depressive disorder is associated with a range of emotions, cognitions, and behaviors that are likely to affect a mother's interpersonal relationships, including her relationship with her infant, and research over several decades has confirmed this to be so in both HIC and LMIC contexts. Difficulties in bonding with the infant have been found when mothers are depressed, as have problems with general caregiving, including reduced breastfeeding, inappropriately accessing medical services, poor sleep management, and, in one U.S. study, poorer safety practices (Field, 2010).

Early Social Interactions

Studies in the first few postnatal months have generally focused on face-to-face engagements between mothers and infants. A key problem is that depressed mothers are often caught up in their own experience (Goodman & Gotlib, 1999), and this makes it difficult for them to focus on their infant and notice their signals and interests, thereby making it harder for them to respond appropriately and provide support. These difficulties are particularly likely if the mother experiences additional problems, as studies of interactions between depressed mothers and infants in high-risk communities in both HICs and LMICs have shown consistently (e.g.,

Cohn, Matias, Tronick, Connell, & Lyons-Ruth, 1986; Cooper et al., 1999, respectively). In these cases, rather than the intuitive adjustments normally shown during face-to-face engagements (imitating infant expressions, adjusting responses to support the infant's attention and affect; e.g., Murray et al., 2016; Papousek & Papousek, 1987), depressed mothers tend to show one of two kinds of interaction difficulty. On the one hand, they may withdraw from their infants, and become unresponsive and self-absorbed; on the other hand, they may behave in an intrusive, sometimes even hostile manner, overriding the infant's signals and behavior. Both these interaction patterns cause clear signs of infant distress, behavioral dysregulation, and disengagement from the interaction (Field, 2010).

While research with low-risk samples has shown less marked interaction disturbance, subtle effects of depression have been found nonetheless. These mainly involve reductions in mothers' sensitivity to infant signals (e.g., Murray, Fiori-Cowley, Hooper, & Cooper, 1996), as well as reduced physical touching and signs of affection (Ferber, Feldman, & Makhoul, 2008). Mothers' speech to their infants is also affected by depression, being slower and less responsive, and lacking the exaggerated, modulated intonation contours normally seen in speech directed to infants (e.g., Bettes, 1988). The disturbances in maternal responsiveness in low-risk samples are most evident when the depression is severe and persistent (e.g., Campbell, Cohn, & Meyers 1995), or during interactions taking place under challenging conditions (Weinberg, Olson, Beeghly, & Tronick, 2006), as is any accompanying infant disengagement, distress, and dysregulated behavior.

Mother–Child Relationships in Later Infancy and Beyond

Studies of older infants of postnatally depressed mothers have often examined the quality of attachment to the mother, and have generally found an increased likelihood of insecurity. Just as with earlier interactions, however, background risk and the chronicity of depression are associated with particularly low levels of maternal sensitivity and, correspondingly, increased risk for infant insecurity. By contrast, the risk of insecure infant attachment is reduced when, despite being depressed, mothers remain sensitive (Campbell et al., 2004), or are securely attached themselves (McMahon, Barnett, Kowalenko, & Tennant, 2006). Notably, while most studies have been conducted in HICs, the association between depression and insecure attachment, and its relationship with maternal insensitivity, has also been found in an LMIC context (Tomlinson, Cooper, & Murray, 2005).

Aside from attachment in late infancy and early childhood, studies have examined effects of PND on later mother–child interactions. A number have found continuing difficulties, including reductions in child responsive engagement in the preschool years, despite remission of the maternal depression and improvements in maternal responsiveness; in the Cambridge study, this effect of PND was found to be mediated by the child's insecurity of attachment in infancy (Murray et al., 1999). Nevertheless, such child engagement problems are likely to be exacerbated in the context of PND that becomes chronic, even in low-risk populations (Apter-Levi et al., 2016).

Although difficulties in mother–infant relationships in the context of PND have been highlighted, it should be stressed that this does not apply to all depressed mothers, and some, despite their depression, are highly sensitive to their infants and young children and have good relationships with them (e.g., Feldman et al., 2009). It is also the case that parenting difficulties, and even depression itself, can arise as a function of *infant* characteristics, such as irritable behavior or excessive, inconsolable crying (e.g., Murray, Stanley, et al., 1996; Radesky et al., 2013), reflecting the complex, bidirectional nature of early relationship processes.

Neural Processes and Their Association with PND and Related Interaction Disturbances

PND and related interaction disturbances are associated with changes in not only infant behavior but also infant frontal cortical electroencephalic (EEG) activity (e.g., Field, Fox, Pickens, Nawrocki, & Soutullo, 1995). A meta-analysis of 13 studies showed enhanced frontal asymmetry due to relatively greater right versus left activation in depressed mothers' infants from birth to 17 months (d = 0.61; Thibodeau, Jorgensen, & Kim, 2006), with stability through to early childhood (Field & Diego, 2008; Diego, Jones, & Field, 2010). Although frontal EEG asymmetries might be influenced by antenatal exposure or genetic traits, research indicates that this pattern of activity may be partially mediated by the infant's experience of interaction

with the mother. Thus, infant EEG asymmetries appear to become more pronounced with increasing infant age, particularly when maternal depression persists and is characterized by noncontingent and withdrawn behavior (Diego, Field, Jones, & Hernandez-Reif, 2006). Importantly, by 13–15 months differences between depressed and non-depressed mothers' infants are not confined to periods of interaction with the mother, but extend to both baseline conditions and positive interactions with an unfamiliar stranger. Furthermore, such altered EEG activity is associated with more negative infant behavior (reduced approach behavior, and more inhibition and negative affect (Dawson et al., 1999), and predicts behavior problems at age 3 years (Dawson et al., 2003).

Hormonal Functioning, PND, and Interactional Disturbances

Child hypothalamic–pituitary–adrenal (HPA) axis functioning can be influenced by early relationships, and cross-sectional studies examining its association with maternal PND have generally confirmed elevated basal cortisol and/or reactivity to a stressor in offspring of affected mothers, in samples ranging from a few months of age up to adulthood (Barry et al., 2015; Halligan, 2014). Notably, the disturbance in interaction quality associated with PND has been found to relate to offspring cortisol levels, in both infancy and early childhood (e.g., Apter-Levi et al., 2016; Feldman et al., 2009), but also in the longer term. Thus, in the Cambridge study, the higher morning cortisol secretion in children of mothers with PND at 13 years (Halligan, Herbert, Goodyer, & Murray, 2004) was predicted by maternal withdrawal during early interactions (Murray, Halligan, Goodyer, & Herbert, 2010). Nevertheless, in spite of the emerging consensus across samples and evidence for persistence of effects, the extent to which cortisol alterations are a function of exposure to maternal depression rather than genetic or other environmental influences remains unclear.

The oxytocin system is also potentially important in the context of maternal depression, as it plays a central role in regulating the mother–infant relationship. To date, rather little evidence is available in relation to PND, although in the context of chronic maternal depression, at 6 years of age, children's oxytocin systems have shown poor functionality, and have been linked to low levels of child empathy and social engagement (Feldman, 2015).

In summary, research indicates that there may be long-term sequelae to the early interaction difficulties associated with PND, including neurological, HPA axis and, possibly, oxytocin effects, especially when maternal responsiveness and sensitivity are particularly impaired. Such difficulties are important, as they may lead to further problems in child development, as described below.

Psychological Development of Children of Mothers with PND

In the sections that follow, we consider the longer-term development of children exposed to PND in different domains of psychological functioning. Since the quality of parenting is a key influence on child development, with specific effects of different parenting difficulties on different child outcomes, we not only document the evidence on child development but also consider the particular mechanisms whereby disturbances in parent–child relationships associated with PND might contribute to any child problems.

Cognitive Development

Several longitudinal studies that have examined cognitive functioning in preschool- and school-age children of mothers with PND, and in comparison with children of nondepressed mothers, indicate that these children show poorer performance on a wide range of measures, including language, IQ, learning ability and academic achievements. As for infant attachment, these associations with PND apply in both LMIC (e.g., Black et al., 2007) and HIC contexts. Nevertheless, effects are not uniform: Thus, although one study found both male and female 2-year-olds to have lower cognitive scores if the mother had PND (even when accounting for other risks and subsequent depression; Sutter-Dallay et al., 2011), as did Pearson and colleagues (2016) for 16-year-olds' math performance, in the main, poorer functioning has been found to be confined to boys (e.g., Hay et al., 2001; Murray, Fiori-Cowley, et al., 1996), and/or those exposed to other risks (e.g., low maternal education or SES, neonatal problems), or subsequent episodes of maternal depression (e.g., Evans et al., 2012).

Parenting Mechanisms Mediating Cognitive Effects of Postnatal Depression

Evidence from normal populations shows the importance for child cognitive development of parentally responsive, or contingent, interactions, and the lower rates of depressed mothers' responsivity may therefore contribute to poor cognitive functioning in their children. This process has been confirmed in a number of studies. For example, Stanley, Murray and Stein (2004) found that depressed mothers' reduced contingent responsiveness during interactions in the first 2–3 postnatal months predicted poorer infant operant learning; similarly, in the study by the National Institute of Child Health and Human Development (NICHD) Early Child Care Research Network (1999), in which responsiveness in depressed mothers experiencing adversity was particularly low, the risk for poorer child cognitive outcome was substantial. Furthermore, in a study by Milgrom, Westley, and Gemmill (2004), low maternal responsiveness at 6 months mediated the adverse effect of maternal depression on boys' IQ at 42 months. Finally, in their LMIC study, Black and colleagues (2007) found that difficulties in mother–infant interactions accounted for the adverse effects of PND on child cognitive outcome. Notably, long-term effects of impaired interactions have been found. Thus, in the Cambridge study, reduced maternal responsiveness at 2 months mediated the adverse effects of PND on boys' performance on Bayley Scales at 18 months (Murray, Kempton, Woolgar, & Hooper, 1993), an effect still evident at 16 years in these boys' substantially poorer results in public exams, even when subsequent exposure to maternal depression and the quality of later mother–child interactions was taken into account (Murray, Halligan, et al., 2010).

Aside from overall contingency, the *quality* of parental responsiveness is important for child cognitive development. One feature that may be particularly important is the parent's ability to capture and support the infant's attention. This element of contingent responsiveness typically involves vocal modulations that help both to attract and to maintain infant attention. As noted, this kind of adjustment to the infant is also reduced in the context of depression, and it is associated with less efficient infant learning (Kaplan, Bachorowski, Smoski, & Hudenko, 2002). More generally, depressed parents are less likely to engage in practices that scaffold and enrich their child's experience of the environment, such as book sharing, a technique that is particularly beneficial to child language development and attention. Finally, emotion regulation processes during parent–infant interactions may also be important, with infant dysregulated affect, often arising in the context of intrusive maternal contacts, being likely both to impair attention and disrupt infant information retrieval (Fagen, Ohr, Fleckenstein, & Ribner, 1985).

Emotional and Behavioral Problems

Infancy and Childhood

Researchers have often used maternal reports to investigate whether PND is associated with child emotional and behavioral problems from late infancy through the preschool and school years, and these have consistently shown raised rates of difficulties. However, as with cognitive development, it is important when assessing the contribution of depression in the postnatal period to take into account subsequent episodes of depression, as well as background risk factors associated with the maternal disorder. Considering such well-controlled studies, it appears that, for general and externalizing behavior problems, associations with PND are, albeit with some exceptions (e.g., Dawson et al., 2003; Murray et al., 1999), better accounted for by chronic (and particularly severe) or concurrent maternal depression, and by associated risk factors, rather than by the postnatal episode itself (e.g., Fihrer, McMahon, & Taylor, 2009; Letourneau, Tramonte, & Willms, 2013). For internalizing problems, by contrast, more consistent evidence has emerged for raised rates of difficulties in children of mothers with PND, even when researchers control for subsequent maternal depressive episodes and background risk (e.g., Bagner, Pettit, Lewinsohn, & Seeley, 2011; Fihrer et al., 2009; Verbeek et al., 2012).

This general pattern of findings is also reflected in assessments of child problems other than by maternal report alone. Again, considering studies that have taken subsequent maternal depression and/or other risk factors into account, the overall conclusion is that raised rates of child externalizing problems are better explained by the combination of PND and ongoing difficulties rather than the occurrence of PND alone (e.g., Fihrer et al., 2009), with boys possibly being more vulnerable (e.g., Essex, Klein, Cho, & Kraemer, 2003; Hipwell, Murray,

Ducournau, & Stein, 2005; Sinclair & Murray, 1998).

With regard to internalizing problems, and in line with maternal reports, there is more evidence for a specific association with PND. Thus, while such problems have been reported for 6-year-olds whose mothers' postnatal episodes were chronic (Apter-Levi, Feldman, Vakart, Ebstein, & Feldman, 2013), they have also been found to occur independent of subsequent maternal episodes and other risk factors: Teacher reports have shown, for example, increased rates of withdrawn and anxious behavior, low ego resilience, and poor social competence (Kersten-Alvarez et al., 2012); combined maternal, teacher, and self-reports have also shown an overall increase in internalizing problems (Verbeek et al., 2012). Evidence of internalizing problems has emerged from other kinds of assessment, too. These include observations of behavior during free play at school, in which reduced social responsiveness was observed in children of mothers with PND in the Cambridge study (Murray et al., 1999), as well as both self-reported and spontaneously occurring child cognitions reflecting vulnerability (e.g., hopelessness, self-denigration [Murray, Woolgar, Cooper, & Hipwell, 2001], and low self-competence and acceptance [Maughan, Cicchetti, Toth, & Rogosch, 2007]).

Parenting Mechanisms Mediating Child Behavioral and Emotional Problems

Individual differences in infant proneness to negative emotionality can be somewhat independent of parenting. However, the self-regulation of behavioral and emotional states that is key to subsequent good adjustment is more responsive to parental care, and particularly its sensitivity, that is, the extent to which it is appropriate and well attuned to the infant's behavior.

Three aspects of lowered sensitivity have been proposed to impede the development of emotional and behavioral regulation in the context of PND. First, Field (1995) suggested a "contagion effect," whereby infants show increased sad affect and distress either by modeling their mothers' depressed behavior, or by being directly affected by the mother's sad presentation. This suggestion is consistent with the matching of negative emotional expressions in depressed mother–infant interactions (Field, Healy, Goldstein, & Guthertz, 1990) and in the Cambridge study, the prediction of later child affective disorder as a result of depressed mothers' sad voice quality at 2 months postpartum (Murray, Marwick, & Arteche, 2010). Second, maternal "failures of interactive repair" have been highlighted. In normal populations, mothers generally support infants' immature capacities to regulate their behavior and affect by repairing disruptions to infant engagement (e.g., when the infant becomes distressed, or turns away; Tronick & Gianino, 1986), and providing a kind of emotional scaffolding, but this is something depressed mothers do less often, particularly with male infants (Weinberg et al., 2006). Finally, the hostility and coercive behavior characteristic of some depressed mothers (especially those experiencing marked adversity) may directly provoke infant distress and behavioral dysregulation. A microanalysis of face-to-face interactions between depressed and well mothers and their infants in the Cambridge study showed that episodes of infant behavioral dysregulation were immediately preceded by the mother's negation of the infant's experience, often through intrusive or hostile interventions (Murray, Fiori-Cowley, et al., 1996). Long-term associations were also found in this sample, with early maternal hostility predicting negative child self-cognitions at age 5 years (Murray et al., 2001), and this association was similarly identified in the study by Maughan and colleagues (2007). A path analysis of mother–infant/child interactions and child behavior, assessed over 8 years in the Cambridge study, showed that infant emotional and behavioral dysregulation at 2 months, assessed independently of the mother, was unrelated to depressed mothers' hostile and coercive interactions at this time, but that by 4 months an association was present. This difficult infant behavior began to show continuity over time, and in turn precipitated further maternal negativity and intrusiveness, with the ensuing vicious cycle culminating in raised rates of conduct problems and attention-deficit/hyperactivity disorder (ADHD) symptoms by ages 5–8 years (Morrell & Murray, 2003). Such findings are consistent with more general research with older children that indicates disruptive behavior disorders are associated with parental hostility and coercive control.

Psychiatric Disorders in Adolescence

Children of depressed parents are at substantially raised risk for depression and anxiety themselves (Weissman et al., 2006). However, since

first episodes of depression typically occur only from adolescence onward, long-term follow up is required to examine specific associations with maternal PND, and rather few studies are available. Nevertheless, associations have consistently been identified: Hammen and Brennan (2003) found that depression in 15-year-olds was related to the occurrence of maternal depression at any time in the first 10 years, including during infancy, particularly if it was severe or became chronic. In the Cambridge study, at 13 years, children who had been exposed to PND were at increased risk of both depression and anxiety disorder, although the number of episodes of depression by this age was small (Halligan, Murray, Martins, & Cooper, 2007); but by age16, risk for depression in the PND group was increased, with almost half having experienced an episode, more than four times the rate among offspring of women without PND (Murray et al., 2011). In this study, chronic maternal depression and marital conflict were also influential, although neither accounted for the impact of PND on adolescents' mental state. Pearson and colleagues (2013) similarly found that PND predicted offspring depression in adolescence (18 years), controlling for earlier (although not concurrent) maternal depression, but this association did not apply when mothers had a high level of education. Two other studies have examined problems other than diagnosed depression in adolescence: Naicker, Wickham, and Colman (2012) found no PND effects on 12- to 15-year-olds' "emotional disorder," although maternal depression occurring between ages 2 and 5 years did raise risk, even when they controlled for current maternal depression. Finally, Korhonen, Luoma, Salmelin, and Tamminen (2012) found that externalizing problems at age 16–17 years were associated with PND, as was lower social competence, although, as in the study of Pearson and colleagues (2013), this effect was reduced by higher maternal education, as well as older age.

Mediators of Adolescent Disorders

While research indicates that PND is associated with increased rates of psychiatric disorder in offspring, there is only limited evidence concerning the mechanisms accounting for increased risk. Genetic and wider environmental factors are likely to be important, but there are also a number of potential pathways concerning the parent–child relationship and its effects on biological processes and child psychological development.

Biological Processes

As noted, the unresponsive, or withdrawn, interactions with the infant seen in subgroups of mothers with PND have been found to predict particular infant EEG profiles (i.e., frontal asymmetry). Notably, this same profile is elicited in adults when they are exposed to negative emotion stimuli (e.g., fear, disgust) and is associated with adult depressive disorder itself (Davidson, Pizzagalli, Nitschke, & Putnam, 2002; Henriques & Davidson, 1990). Nevertheless, although the parallels between EEG responses in infants of depressed mothers and those of adults experiencing depression are striking, it is important that follow-up studies of the infant populations be conducted to establish whether there are indeed direct links between early EEG profiles and subsequent disorder.

The HPA axis is fundamental to human stress responding (see Thompson, Kiff, & McLaughlin, Chapter 5, this volume), and elevated basal cortisol concentrations, previously noted in adolescent offspring of mothers with PND, have also been associated with the occurrence of depressive disorder itself (Knorr, Vinberg, Kessing, & Wetterslev, 2010). However, although increased basal cortisol secretion, or cortisol reactivity, could, in principle, be a marker of *risk* for psychological disorder, this possibility has been little studied in the context of maternal depression. In the Cambridge study, cortisol elevations in offspring of mothers with PND did predict depressive symptoms at age 16 years (Halligan, Herbert, Goodyer, & Murray, 2007), but there is contradictory evidence on this point (Carnegie et al., 2014). Furthermore, elevations in cortisol reactivity in the Cambridge study at age 22 years, although associated with PND, were unrelated to offspring depression history or current symptoms (Barry et al., 2015). The longer-term functional significance of cortisol disturbances in offspring associated with PND therefore remains unclear.

Social Cognitions

Aside from physiological processes, particular cognitions concerning close relationships and the self increase risk for depression. Such child cognitive vulnerability was found to be associated with PND in the Cambridge study. At age

13 years, there was an increase in negative social cognitions in female offspring of mothers with PND; this was predicted by insecure infant attachment and negative child family representations at age 5 years, and was associated with concurrent depressive symptoms (Murray, Halligan, Adams, Patterson, & Goodyer, 2006). Furthermore, at age 16 years, the raised rate of depressive disorder in offspring of mothers with PND was accounted for by a similar developmental trajectory, starting with insecure infant attachment, that progressed through low cognitive resilience in the face of a social challenge at ages 5 and 8 years (Murray et al., 2011). Finally, in the same sample, functional magnetic resonance imaging (fMRI) scans during a social cognition task at age 22 years also revealed an effect of PND on neural responding to maternal, as opposed to nonmaternal, autobiographical narrative memories (Macdonald et al., 2016).

Summary

Findings from both biophysiological and social-cognitive research suggest that difficult patterns of interaction in the early postpartum months in the context of PND, along with the development of insecure infant attachment, may set in place developmental processes that confer increased risk for depressive disorder in adolescent offspring. Whether such risk is translated into actual disorder is likely to be affected by subsequent adverse experiences and the presence of other risk factors, such as exposure to further maternal depression and parental conflict.

Prevention and Treatment of PND

Prevention

There would be considerable benefit to mothers and, potentially, their children, if PND could be prevented. However, the preventive research to date has been disappointing. A review of pharmacological studies identified only two studies concerning prophylactic efficacy of antidepressants in the postnatal period, yielding insufficient evidence to evaluate their preventive benefits (Howard, Hoffbrans, Henshaw, Boath, & Bradley, 2005). The review also raised concerns, including the impact of antidepressants on fetal and infant development. Indeed, there is some evidence that fetal exposure to antidepressants is associated with risk to the newborn, especially of persistent pulmonary hypertension (Grigoriadis et al., 2014). Furthermore, there appears to be a neonatal behavioral syndrome associated with antidepressant use late in pregnancy, which includes irritability, vomiting, constant crying, and sleeping difficulties (Moses-Kolko et al., 2005), as well as more frequent clinical admissions. Accordingly, it is important to consider evidence for the preventive impact of psychological and psychosocial interventions. An early meta-analysis of 15 trials concluded that there is no overall preventive effect of such interventions for PND (Dennis, 2005). Similarly, in a preventive trial that targeted high-risk women antenatally, and provided them with counseling support and an intervention to enhance sensitivity to the infant, Cooper, De Pascalis, Woolgar, Romaniuk, and Murray (2015) found no benefit to maternal mood, mother–infant interactions, or infant outcome. Furthermore, although researchers in two recent systematic reviews (Dennis & Dowswell, 2013; Sockol, Epperson, & Barber, 2013) concluded that psychological and psychosocial interventions do reduce depressive symptoms and the rate of PND, two important caveats are required. First, many of the studies in these reviews included women who were already depressed, either antenatally or in the immediate postnatal period, and any evidence of reduced subsequent depression confounds preventive with treatment effects. Second, the impact of the preventive interventions, while significant overall, was generally modest (a mean effect size across studies of 0.18; Sockol et al., 2013). Indeed, in a systematic review of 86 quantitative trials, Morrell and colleagues (2016) concluded that there is no clear evidence for a preventive effect. It therefore remains questionable whether preventive interventions are effective in relation to PND. In any event, the major impediment to prevention is that there is, as yet, no reliable means of identifying women in pregnancy who are at significantly raised risk for the disorder. Without such identification, even if a preventive intervention of established efficacy and potential clinical utility were available, no coherent targeted preventive strategy is currently possible.

Treatment

Given the evidence for the adverse impact of PND on mother–infant relationships and child development, there has been considerable interest in developing treatments, and a number of approaches have been explored.

Pharmacological Interventions

Two studies of pharmacological medication for PND have compared a selective serotonin reuptake inhibitor with a psychological treatment (counseling: Appleby, Warner, Whitton, & Faragher, 1997; cognitive-behavioral therapy [CBT]: Misri, Reebye, Corral, & Milis, 2004) or a combined treatment condition. Both found the two modes of treatments to be similarly beneficial, and neither found additive effects. Nevertheless, conclusions are limited by small sample sizes, limited follow-up, and, in Misri and colleagues (2004), the lack of a nontreated control group. Importantly, the possibility of drug transmission to the infant requires investigation, as elevations of the drugs in breast milk have been reported. Furthermore, there is no convincing evidence that treating PND pharmacologically improves the mother–child relationship, despite some claims to the contrary (e.g., Goodman, Broth, Hall, & Stowe, 2008). In summary, the efficacy of antidepressant medication for PND requires further evaluation, including its impact on the mother–child relationship and child outcome.

Psychotherapeutic Interventions

An early review of randomized controlled trials (RCTs) concluded that psychological interventions (CBT, interpersonal therapy, and nondirective counseling) are moderately effective and beneficial in terms of recovery from depressive symptomatology (Dennis & Hodnett, 2007). In a meta-analysis of psychotherapeutic interventions, including CBT, social support, interpersonal therapy, nondirective counseling, and psychoanalytic therapy, Cuijpers, Brannmark, van Straten, Warmeerdam, and Andersson (2008) came to broadly the same conclusion. To date, despite a focus on CBT interventions, there is no evidence favoring one form of intervention over another. It is important to note that treatments have generally been brief, and there is little information on the impact of more intensive treatments or, indeed, on long-term outcome. In addition, intervention research has principally been conducted with women with moderate depression occurring in the early postpartum months rather than those with more persistent disorder. This omission is important because PND that is persistent carries particular risk for recurrence (Netsi et al., 2018). One recent study indicates, however, that good outcome for these more chronic episodes can be achieved with intensive, well-tailored treatment (Stein et al., 2018). This RCT included women who, at the start of treatment 4.5–9 months postpartum had been depressed for at least the previous 3 months. In the majority of cases, the depression was severe. All women received home-based CBT for depression, together with either video-feedback training (VFT) or progressive muscle relaxation (PMR), over the course of 11 sessions within the first postnatal year, with an additional two booster sessions delivered in the second postnatal year. With this treatment, remission rates from depressive disorder for both arms of the trial were over 85% at the second postnatal year. These clinical outcomes are impressive, especially given the persistence and severity of disorder, but they do suggest that to be effective, intervention needs to be intensive and prolonged. The findings require replication, since they have important implications for policy.

Further work is also needed on the impact of interventions for PND in LMICs, where an adverse impact on the mother–infant relationship and child development has also been shown (e.g., Black et al., 2007; Cooper et al., 1999; Tomlinson et al., 2005). To date, consistent with findings from HIC studies, the evidence suggests that although short-term benefits can be obtained (Rahman, Mali, Sikander, Roberts, & Creed, 2008), these are not sustained (Maselko et al., 2015).

Intervention Effects on the Mother–Infant Relationship and Child Outcome

A critical question regarding the treatment of PND concerns the extent to which it also brings about improvements in the mother–infant relationship and infant developmental outcomes. A nine-study meta-analytic review of the effects of psychological treatment of maternal depression on offspring (including school-age children, as well as infants) reported small- to moderate-size benefits (Cuijpers, Weiyz, Karyotakie, Garber, & Andersson, 2015). However, this review was highly selective in terms of the variables considered, with a bias toward reporting positive findings. In fact, results of treatments for mothers with PND have generally been disappointing. For example, in one of the studies cited by Cuijpers and colleagues (2015), a comparison of CBT, counseling, or an attachment therapy, delivered to mothers with PND between 8 and 18 weeks postnatally,

found that, compared to nontreated controls, while all active treatments were moderately effective in alleviating depressive symptoms and brought about short-term benefits in maternal reports of their relationship with their infants, observations of mother–infant interactions showed no effect of any of the treatments. Furthermore, there was no consistently positive impact of intervention on 18-month infant outcomes for any of the treatment conditions (only maternal reports of behavior problems showed a benefit, while there was no benefit for infant attachment or cognitive development); moreover, there were no clear long-term benefits at 5-year follow-up (Cooper, Murray, Wilson, & Romaniuk, 2003; Murray, Cooper, Wilson, & Romaniuk, 2003).

Clark, Tluczek, and Wenzel (2003) conducted a pilot study comparing a 12-week intervention of mother–infant psychotherapy or interpersonal psychotherapy (IPT), starting approximately 6 months postnatally, to a waiting list control condition. Although treatments were effective in improving depression, consistent effects on subsequent mother–infant interactions were not observed, and infants in the treatment groups did not differ from controls in terms of cognitive development or observed temperament. Similarly, Forman and colleagues (2007) reported that an IPT treatment for PND, delivered over a 12-week period approximately 6 months postpartum, while improving maternal mood, was of no benefit in terms of observed mother–infant interactions, infant negative emotionality, and attachment security; and at the 18-month posttreatment follow-up, the same pattern of results held, even when treatment responders were considered separately.

Although these negative findings are borne out by examination of studies included in a recent review by Letourneau, Dennis, Cosic, and Linder (2017), the trial by Stein and colleagues (2018) for women with persistent maternal PND produced more promising findings: The successful treatment of PND was associated with child attachment, cognitive development, and behavior problems at 2 years, in line with population norms. It is notable that the intensity and duration of treatment delivered in this study was greater than that in most previous studies, and this may have contributed to the favorable outcome. It is also possible that delivery of the intervention through the latter half of the child's first year and into the second year was important given that this is an age when core developmental milestones are being consolidated.

An alternative approach to improving child outcome by treating maternal depression has been to focus directly on improving parenting, using techniques such as interactive coaching (Horowitz et al., 2001; Van Doesum, Riksen-Walraven, Hosman, & Hoefnagels, 2008), relationship facilitation based on maternal administrations of the Neonatal Behavioral Assessment Scale (NBAS; Hart, Field, & Nearing 1998), and infant massage (Glover, Onozawa, & Hodgkinson, 2002). Three meta-analyses involving between eight and 17 studies that aimed to improve parenting sensitivity of depressed mothers indicated modest improvements overall (Kersten-Alvarez, Hosman, Riksen-Walraven, Van Doesum, & Hoefnagels, 2010; Poobalan, Aucott, Ross, Smith, & Helmes, 2007; Tsivos, Calam, Sanders, & Wittkowski, 2015). Nevertheless, publication bias has been a concern (Kersten-Alvarez et al., 2011), and the limited evidence available on the mother–child relationship and child outcome in the longer-term has, as for treatment of depression itself, shown a lack of sustained benefits (e.g., Kersten-Alvarez et al., 2010; Murray et al., 2003). One possible explanation for these disappointing results is that interventions have mostly been brief, and conducted in the early postnatal months. As such, they have been of sufficient intensity and duration to address effectively the more prolonged and severe difficulties that carry the greatest risk for poor child outcome (Netsi et al., 2018). This interpretation is supported by the findings of Cicchetti, Toth, and colleagues (Cicchetti, Rogosh, & Toth, 2000; Toth, Rogosch, Manly, & Cicchetti, 2006). Here, mothers who had been depressed in the first postpartum year received prolonged toddler–parent psychotherapy (average 57 weeks), starting on average at 20 months. The intervention, which focused on promoting positive maternal attachment representations and mother–infant interactions, showed significant benefits in terms of both child cognition and attachment relative to a nontreated control group. Nevertheless, while the work of Cichhetti and colleagues shows the benefit of mother–infant therapy alone, it is not clear whether such intervention adds to the benefits of effective treatment for depression itself. This issue was addressed directly by Stein and colleagues (2018). In the context of effective treatment for maternal depression,

no additional benefit was conferred by the mother–infant VFT intervention.

Summary

A number of interventions for maternal depression have been shown to be effective in helping to resolve PND, although they tend to produce small- to moderate-size effects, and there is no evidence as yet of long-term benefit either to maternal mood or to child outcome. To the extent that many adverse child outcomes associated with PND are particularly likely to occur in the context of chronic, or recurrent, depression, it is perhaps unsurprising that shortening the infant's initial exposure to depression is not sufficient to prevent longer-term problems in child development. Interventions that target early difficulties in mother–infant interactions, rather than the depression, may be beneficial in the short term, but there is little support for the idea that these early improvements are translated into improved longer-term child outcomes. Furthermore, the findings of a recent trial suggest that effective treatment of the maternal mood disorder may be sufficient to effect improvement in child outcome.

It may be the case that for both the maternal mood disorder and parent–infant relationship difficulties, more intensive treatments that continue beyond the first few postpartum months are required to bring about sustained benefits.

Conclusions

PND is a common and disabling disorder associated with a range of adverse infant and child outcomes. These occur principally when the maternal depression is severe, chronic, or recurrent, and in the presence of other background risks. Adverse patterns of parenting associated with PND are likely to play a major role in bringing about poor child outcome. Biological processes are also likely to be important in mediating effects of depression on the child. Attempts to change parental interactions and improve the longer-term outcome for children of mothers with PND have generally involved short-term treatments, and these have had only limited success. Evaluation of longer-term interventions for the mood disturbance and the mother–child relationship difficulties in PND is needed.

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