

Original contribution

Maternal depressive symptoms in the postnatal period are associated with long-term impairment of mother–child bonding*

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Summary

Background: Postnatal Depression has demonstrated long-term consequences on child cognitive and emotional development, however, the link between maternal and child pathology has not been clearly identified.

Objective: This study examined whether maternal bonding to the infant and young child is impaired by maternal depressive symptoms.

Methods: 101 mothers of newborn infants were recruited from local obstetric units and examined for psychopathology using Symptom Checklist, the Edinburgh Postnatal Depression Scale (EPDS) and the Postpartum Bonding Questionnaire at two weeks, six weeks, four months and fourteen months postpartum.

Results: Maternal depressive symptoms at 2 weeks, 6 weeks and four months postnatally but not at fourteen months of infant's age were found to be strongly associated with lower quality of maternal bonding to the infant and child from two weeks until fourteen months of postnatal age. Even mild and unrecognized maternal depressive symptoms had a significant impact on maternal bonding, if they occurred during the first four months of life.

Conclusions: This gives reason for increased concern for mother–infant dyads in the first few months after birth that could be regarded as a highly sensitive period for the development of the mother–child relationship. The findings warrant further studies and inspire the development of preventive programs focussing on infant and early childhood mental health by emphasizing protection and support during the first critical months.

Keywords: Maternal depressive symptoms; maternal bonding; mother–child-bonding; parent–child-relations.

Introduction

Mother–infant–bonding received scientific attention several decades ago (Klaus & Kennell, 1976). Since then,

research on the subject has been contradictory, with some researchers (Goldberg, 1983; Harmon, 1981) emphasizing a sensitive period immediately after birth, but others arguing against this concept (Eyer, 1994; Lamb, 1983). Social support and early contact have been described to promote mother–infant bonding, however, the methodology to assess mother–infant bonding in the postnatal period has been heterogenous: video-observations (Anisfeld & Lipper, 1983) as well as clinical reports (Kumar, 1997) have been implemented. Other researchers (Taylor et al, 2005) constructed a short questionnaire the 'Mother to Infant Bonding Scale', and were able to demonstrate significant stability over the first twelve weeks.

Incidence of postnatal depression is about 10–15% (Cox et al, 1993). A meta-analysis of studies (O'Hara & Swain 1996) mainly based in developed countries found the incidence of postnatal depression to be 12–13%. Multiple studies on developmental disturbances in children of depressed mothers have given reason for considerable concern. Those children seem to show elevated rates of behavioral, emotional, attentional and/or interpersonal disturbances outlasting the maternal depressive episode throughout childhood. Lyons-Ruth et al (1986) found that increased levels of maternal depression were significantly related to poorer infant mental and motor development as assessed by the Bayley scales. Similarly, a significant difference between infants of postnatally depressed mothers and those

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of well mothers has been described (Murray et al, 1996; Murray, 1992) for several aspects of cognitive development, even though mother's depression had remitted by around six to eight months postpartum.

Behavioral disturbance in the second year of life has been described regardless of maternal remission at the time of assessment. However, so far there has been no clear linkage between postnatal depression and one specific disorder. Rather, different observers have reported emotional, attentional and cognitive disturbances. The mechanism is unclear as well. A genetic effect, a direct effect of exposure to depressive symptoms (Rutter et al, 1989), or a chronic interactional disturbance have been postulated as potential mediators between maternal depression and developmental disturbance in the offspring.

Another line of research on postnatal maternal mood has focussed on infant attachment. An association between insecure attachment in the second year of life and high levels of maternal depression has been described (Lyons-Ruth et al, 1986; Teti et al, 1995). Murray and coworkers confirmed these findings emphasizing avoidance as the prominent type of insecure attachment (Murray, 1988). This association between the postnatal mood disorder and later insecure infant attachment to the mother was also found in a study conducted by Teti et al (1995).

However, the mechanism leading from maternal depression to insecure infant attachment is still not completely clear. The most conclusive evidence has been provided for mother–infant interaction as the mediator of adverse outcome. E.g. disturbed interactions were found to be predictive of poorer infant cognitive outcome at 18 months (Murray et al, 1996).

Field et al (1985) described different alterations of mother–child interaction in depressed mothers as she identified subgroups with withdrawn or intrusive behavior.

Microanalysis revealed a lack of synchrony with higher latencies of responsivity towards the infant (Cohn et al, 1990) in the context of maternal depression. Also, postnatally depressed mothers have been shown to be less sensitive than control mothers when interacting with their children (Campbell et al, 2004). Previous research has suggested that children who have experienced less parental sensitivity early in life are at greater risk for developing insecure attachment relationships (Ainsworth & Bell, 1977), and toddlers with insecure attachment relationships are at higher risk for developing emotional disorders later in childhood and adolescence (Warren et al, 2003).

From a preventive point of view, the potential links between maternal postnatal mood and adverse infant

development need to be identified more closely and in greater detail. Therefore, this study questioned whether even subclinical levels of maternal postnatal depressive symptoms are associated with impaired maternal bonding with their infants constituting a potential link between maternal mood, infant and toddler attachment and childhood behavior and development.

Methods

Participants

The sample of this study consisted of a volunteer sample of healthy Caucasian mothers and their infants after singletons pregnancies recruited in the four major local obstetric units which attract a mixed urban and rural population. Eligibility criteria were full-term deliveries and infant weight above 2500 grams, APGAR Scores >7 and good health of the baby as documented by the first, second and third postnatal exam. Exclusion criteria were inability to speak and read German language as well as the use of drugs or medications posing a risk to the fetus and/or excessive smoking (>5 cigarettes/day) or alcohol consumption during pregnancy. Written informed consent was obtained from all participants.

Power calculation had determined a sample size of 100 mother–infant pairs. Out of 114 mothers who finally decided to take part in the study, 12 dropped out before study inclusion so that 102 mother–infant pairs were included in the study. After study inclusion, one mother decided not to continue with the study after the first assessment, so that 101 mother–infant pairs completed the study.

Study design

The subjects were seen in the laboratory when the infant was two weeks, six weeks, and four and fourteen months of age. Socioeconomic status was documented at the first assessment and infant health status was assessed at every visit. Maternal general psychopathology, depressive symptoms and postpartum bonding was measured at two weeks, two months, four months and fourteen months postnatal age.

Measures

SCL-90R

On each session *maternal psychopathology* was measured via the revised Symptom Checklist (Derogatis et al, 1973; Franke, 1992), consisting of the scales somatization, depression, compulsions, general anxiety, social anxiety, phobic anxiety, psychoticism, paranoia, hostility and global severity index.

EPDS

Symptoms of maternal depression were assessed by the Edinburgh Postnatal Depression Scale. The Edinburgh Postnatal Depression Scale (EPDS) (Bergant et al, 1998; Cox et al, 1987)

is a screening instrument for postnatal depression. It is an internationally accepted 10 item self-report measure of the specific symptomatology of postnatal depression. The analysis of the sensitivity and the specificity (Teissedre & Chabrol, 2004) of the Edinburgh Postnatal Depression Scale provides a cut-off score of 9 (Sensitivity: 0.88) (Specificity: 0.50) as predictive of postpartum depression. For this cut-off score, the type I error is low (5.8%) and the type II error is higher (18.9%).

PBQ

Maternal bonding was measured with the Postpartum Bonding Questionnaire. This Questionnaire was designed by Brockington et al (2001) and has since been frequently applied to assess early disturbances in maternal bonding towards infants and young children. It consists of 25 items and has proven good test–retest reliability. German version was created by translation and re-translation through officially licensed translators.

Potential covariates

Socioeconomic status was assessed in order to control the confounding effect of social adversity.

Data analysis

Sample size was determined by power calculation to be 100. In case of multiple variables, multivariate analysis was performed with assessment of partial correlations.

Results

Sample

The sample consisted of 101 mother–infant pairs born to a volunteer sample of healthy Caucasian mothers recruited through the four major local obstetric units. The women ($M = 33.3$ years) were between the ages of 25 and 45, did not smoke, and drank no more than an occasional glass of wine or beer during pregnancy, and had full term deliveries. Infants were above 2500 grams of weight in order to exclude SGA infants. Medium infant weight was 3497 grams ($SD = 3.8$). APGAR scores were above 7 and the third APGAR score had to be at least nine in order to exclude severe perinatal asphyxia. 45% of infants were girls. 81% of mothers in the study had a college degree and 19% had a high school degree. All mothers were in a partnership with the infant's father.

Covariates

Infant gender and maternal education were not significantly related to Postpartum Bonding (see Table 1).

Table 1. Mean and SD of bonding for sociodemographic variables

	Bonding		<i>n</i>	%	<i>p</i> ¹
	Mean	SD			
Gender					0.225
Male	9.68	5.6	56	55.4	
Female	9.43	6.3	45	44.6	
Maternal education					0.160
High school	9.71	7.6	25	24.6	
College	8.86	4.9	20	19.8	
University degree	9.76	5.5	56	55.6	

¹ *p*-value is the results of analysis of variance relating the bonding score as dependent variable with sociodemographic categories.

Table 2. Course of bonding over the first fourteen months of infant life

	M (SD)			
	2 weeks	4 weeks	4 months	14 months
Bonding	10.21 (6.14)	10.46 (7.43)	8.02 (4.67)	9.74 (5.12)

PBQ

The PBQ-total score showed good internal consistency of 0.797 (Cronbach's alpha). Maternal bonding showed moderate stability over time. The course of maternal bonding over the four time points is presented in Table 2. Only the eigenvalue of the first factor was above one, and the first factor explained 79% of the variance indicating a one-factor model. The internal consistency (Cronbach's alpha) was 0.79, showing again high reliability of this instrument.

EPDS

The hypothesis that maternal postnatal depression was related to maternal bonding was tested with a Pearson correlation of EPDS measures. EPDS scores at four months were correlated with Bonding at two weeks ($r = 0.28$), six weeks ($r = 0.39$), four months ($r = 0.35$) and fourteen months ($r = 0.28$). Mothers with postnatal depressive symptoms at 4 months postnatal age have more negative bonding patterns starting before 2 weeks postnatally and lasting at least until fourteen months postnatally.

SCL-90-R

To assess the course of maternal depressive symptoms during the first fourteen months of life on mother–infant bonding, Pearson correlations between maternal depres-

Table 3. Means and SD of maternal psychopathology and correlation with the bonding impairment

	2 weeks		6 weeks		4 months		14 months	
	M (SD)	r^1	M (SD)	r^1	M (SD)	r^1	M (SD)	r^1
SCL90-R-depression	0.42 (0.34)	0.29	0.33 (0.29)	0.41	0.31 (0.35)	0.18	0.29 (0.34)	0.12
GSI	0.30 (0.24)	0.23	0.22 (0.22)	0.49	0.22 (0.24)	0.17	0.24 (0.26)	0.11

¹ Partial correlation.

sive symptoms as assessed at two weeks, six weeks, 4 months and 14 months postnatal age by the Symptom Checklist and the PBQ-sum score at concurrent assessments were performed with multivariate analysis (see Table 3). Of the nine subscales only depression ($F(4.93) = 2.95, p = 0.02$) and the global severity index were analysed over the four time points. They were strongly associated with the child's bonding at each assessment, apart from the last (see Table 4). The impact of maternal depressive symptoms on bonding was most pronounced at six weeks ($r = 0.41$ for depression and 0.49 for the global severity index) indicating that bonding at six weeks is most sensitive to maternal depressive symptoms. These data confirm the findings obtained with the EPDS and described above, that bonding at six weeks is most severely impaired by maternal depressive symptoms as assessed by EPDS. There was no significant relationship between maternal depressive symptoms at fourteen months and bonding at the same time, precluding the explanation that bonding in maternal judgment is worse because of distorted perception due to maternal depressive symptoms.

Discussion

The data presented above indicate an association between maternal emotional state, especially postnatal depressive symptoms in the first year of life and mother infant bonding. This study adds to the existing knowledge about postnatal maternal mood and infant emotional development in so far as maternal mood was monitored at several time points during the first fourteen months. This close monitoring resulted in a better understanding of the relationship between the course of maternal depressive symptoms and development of bonding. The possibility that mothers with depressive symptoms reported their bonding in a more negative way does not seem to be a very likely explanation for this phenomenon, as there was no concurrent impact of maternal depressive symptoms on maternal bonding at fourteen months. Therefore, distorted maternal perception is not

likely to be a major mediator between maternal depressive symptoms and impaired bonding.

Bonding was moderately stable and mother–infant bonding seemed to be at its best with the lowest impairment score at four months infant age, a finding matched by intuition as usually maternal satisfaction might be highest with a no longer ‘colicky’ but not yet mobile infant.

The finding that depressive symptoms in the early postnatal period influence maternal bonding almost a year later contributes significantly to the understanding of developmental impairments seen up to 8 years after maternal depression. The data presented here emphasise that child abnormalities in later life might be caused by an impaired mother–child relationship in the maternal mind that outlasts the duration of maternal depressive symptoms. In order to accurately estimate the impact of maternal postnatal mood on mother–child relationship, this association has to be assessed in a more longitudinal design, as the effect might last even longer than fourteen months. The current findings are highly relevant, because impaired mother–infant bonding has been regarded as a risk factor for the whole spectrum of mother–child relationship disturbances including child abuse (Brockington et al, 2001). Therefore, these data give another reason for significant concern regarding ‘depressed’ mother–child dyads.

Furthermore, these results bring up a second important issue for child development: an issue of a ‘sensitive period’ and a ‘window of opportunity’ with regard to the mother–child relationship. As described above, depressive symptoms in the first 4 months of life were predictive of impaired bonding at 14 months and the most significant impact was found for depressive symptoms at six weeks. As depressive symptoms at 14 months itself did not have any influence on the concurrent mother–child relationship, these data emphasise the specific importance of maternal mental state in the first months of life for later mother–child relationship. This could be due to the fact that an already firmly established mother–child bond in the second year of life is much more resistant towards an influence of maternal mental state.

Therefore, the data presented here indicate the existence of a sensitive period for mother–infant bonding in the first months of life, with sensitivity increasing from 2 weeks and peaking at six weeks and decreasing again at four months. One reason for this phase of heightened vulnerability of mother–infant relationship might be the infant's extreme dependency on the mother and the fact that, in most cases, the mother constitutes the infant's primary environment in the first postnatal months.

This intriguing finding warrants further investigations as the early vulnerability of mother–child relationship identified here might not be limited to maternal postnatal depressive symptoms, but might constitute an additional risk through other factors possibly acting on the early mother–infant relationship such as mother–child separation during this period. These data also warrant studies that would include closer investigation of other conditions potentially affecting maternal bonding in an early stage for a prolonged period of time.

Frequency of true postnatal depression in our sample (about 8%) was low, as compared to other populations (see Teissedre & Chabrol, 2004). This might be due to the socioeconomic status of our sample that was typical of a small university town with a large academic population. However, socioeconomic status did not show any impact on mother–infant bonding, indicating that the effect of depressive symptoms on bonding is not mediated by adversity. None of the mothers in this study was clinically diagnosed or treated for depression. The impact of clinical maternal depression on child development has been frequently examined in clinical populations and found to be highly significant. But also, a recent non-clinical study has reported a linear relationship between maternal depressive symptoms and a child's emotional disturbance (Pauli-Pott et al, 2004). Therefore, it seems possible that even undiscovered maternal depression could, during a period of heightened cerebral plasticity in the first year of life, lead to long lasting alteration of a child's emotional development possibly mediated by alterations of mother–infant bonding.

The relationship between depressive symptoms and bonding impairments was linear. This discovery in a community based sample is highly relevant, since we found in our upper middle class sample that depression was never clinically noticed, but nevertheless posed an increased risk for child development. Since even unrecognized depressive reactions are associated with bonding impairments, efforts should be intensified to investigate the background of this potentially harmful

relationship between unrecognized maternal psychopathology and bonding disturbance.

The data also underline an immediate relevance of detection of undiscovered maternal postnatal depressive symptoms for child development.

One more intriguing question has been created but not answered by the data described above: is there a possibility that maternal bonding impairment is the factor that brings about an episode of postnatal depression in the first place? Our first assessment was at two weeks of infant's age and already at this point, maternal depression and bonding were correlated. In order to find out onset of which occurs first, prospective studies on the topic would have to start immediately at birth or even before.

Limitations

The sample was community based as it was designed to screen for an impact of maternal psychopathology in the first year of life on mother–infant bonding. It was not specifically set up for comparing infants of postnatally depressed mothers with infants of control mothers. It can be expected that the findings reported above would be much more pronounced in a control group design, including mothers with clinical levels of depression. However relationship between depressive symptoms and bonding impairments was linear and did not indicate a specific threshold effect for a specific group of mothers with clinical depression.

Nonetheless, clinical relevance of the postulated findings should give rise to further studies with a case control design. Also, it should be investigated whether early treatment of postnatal depression might alter the association between bonding impairment and maternal depression.

Clinical relevance

This study is highly relevant because of the following three aspects:

1. Data suggests a possible effect of a maternal mood in the first four postnatal months on the mother–child bonding that could potentially last for the first 14 months of an infant's life. This knowledge can be used to design preventive programs targeting maternal emotional well-being, especially in the first few months of a child's life in order to establish and preserve a better bonding between mother and child. Given the usual prevalence of about 15% of postpar-

tum depression, the findings reported here might be of great clinical relevance for prevention of childhood emotional disorders in at risk populations.

2. The results indicate that even an undiagnosed maternal depression can impact a mother–child relationship. The data can be used to develop and implement preventative programs targeting maternal emotional well being in the first postnatal year in the general as well as in clinical populations.
3. The existence of a vulnerable period for mother–infant relationship in the first few months of life, as suggested by our results, justifies an intensification of efforts protecting and supporting all mother–infant dyads in the first few postnatal months.

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