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REGULAR ARTICLE

Infantile colic, prolonged crying and maternal postnatal depression

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Abstract

Aim: To study if infant crying is associated with maternal postnatal depression.

Methods: Data from 1015 mothers and their children participating in a prospective European multicentre study were analysed. Infantile colic and prolonged crying were defined as excessive crying as reported by the mothers 2 and 6 months after delivery, and at the same time the mothers completed the Edinburgh Postnatal Depression Scale (EPDS).

Results: In cross-sectional analyses, infant crying was associated with high EPDS scores both 2 (OR: 4.4; 95% CI: 2.4–8.2) and 6 months postpartum (OR: 10.8; 95% CI: 4.3–26.9). More than one-third of the others of infants with prolonged crying had high EPDS scores 6 months postpartum. Longitudinal analyses showed that mothers of infants with colic had increased odds of having high EPDS scores 6 months after delivery even if crying had resolved (OR: 3.7; 95% CI: 1.4–10.1).

Conclusion: Both infantile colic and prolonged crying were associated with high maternal depression scores. Most noteworthy, infantile colic at 2 months of age was associated with high maternal depression scores 4 months later.

INTRODUCTION

Approximately 10% of women suffer from depression in the first few months after birth (1,2). Risk factors include stressful life events, marital conflict and lack of social support. Other risk factors include low income, low education, previous history of depression and the presence of physical symptoms (1–3).

One significant and independent risk factor for maternal postnatal depression is infantile colic (1,3), usually described as unexplained and uncontrolled excessive crying in an otherwise healthy baby (4,5). Symptoms typically start around the second week of life, peak around 3–6 weeks and resolve by 3 months (4,6–8). The prognosis is in general considered to be good (6,8), although infantile colic might be the early expression of some of the more common disorders in childhood (9). The cause is not completely understood (7,8).

When an infant cries excessively after 3 months of age, this phenomenon may be called prolonged crying, and has, in contrast to infantile colic, been associated with increased risk of hyperactivity and of having lower intelligence scores later in life (6,10,11). Prolonged crying is much less common and is likely to have a different aetiology than classical infantile colic.

Abbreviations
EPDS, Edinburgh Postnatal Depression Scale; OR, odds ratio; SD, standard deviation; CI, confidence intervals.

Although a number of cross-sectional studies have found that infantile colic may be stressful to the family and may be associated with depressive symptoms in the mother in the first few months after birth (3,12–17), the literature is conflicting regarding long-term effects on maternal mental health, when the colic has resolved. While two studies reported that mothers of infants with colic felt less competent, tended to have more separation anxiety and that they reported more stress, compared with mothers of non-colic infants (18,19), two other studies did not find an increased risk of later depression once colic had resolved (17,20).

In this study, we therefore wanted to test the hypotheses that (a) mothers of infants with excessive crying have high depression symptom scores both 2 and 6 months after birth (cross-sectional), and specifically whether (b) infantile colic is a risk factor for high maternal depression score 6 months after delivery, even if the colic has resolved (longitudinal).

MATERIALS AND METHODS

Design

This study uses data from a randomized controlled multicentre study assessing the effect of high- or low-protein formula on overweight later in childhood (21). Participants were recruited at 11 study sites in five countries (Belgium; Germany; Italy; Poland; Spain). Eligible for study participation were healthy, singleton and term infants born between October 1, 2002 and July 31, 2004. Infants were enrolled

during the first 8 weeks of life and were either randomized to a high- or low-protein formula group, or were included in an observational group of breastfed infants. Details of the study have been published (21). In this study, data from children in the interventional group and the observational group were combined.

At study visits 2 and 6 months after birth, the mothers were asked to complete the Edinburgh Postnatal Depression Scale (EPDS) (22) and to answer a number of questions regarding their child's behaviour, including unexplained crying. At the examination 2 months after birth, it was emphasized that we were asking for the child's behaviour during the preceding 4 weeks, while at 6 months we were asking for the behaviour during the preceding 2 months. Data on the course of pregnancy, medical history, lifestyle, behaviour and maternal education were recorded at the first visit.

Study population

A total of 1678 mothers were enrolled in the main study, and for 1198 of their infants follow-up data were recorded 6 months after birth. Complete information of EPDS and infant crying was available for 1015 mothers and infants.

Main outcome measure

The EPDS is a 10-item self-report instrument (22). Each item is scored from 0 to 3, and the total score equals the sum of the 10 items. Scores higher than 12 are used to identify mothers at risk of being depressed (22). The instrument has been validated in German, Italian, Spanish and French (23–26), and has also been applied in Poland (27).

Main exposure

At each study visit, mothers were asked if their infant cried at least 3 h per day on at least 3 days per week (4). Such excessive crying was defined as infantile colic if recorded 2 months after birth, and as prolonged crying if it was present 6 months after birth.

Covariates

At the first study visit, the mother's and the father's level of education was recorded as well as the number of previous pregnancies, pregnancy complications, stress, including causes for the stress, such as occupational strain, financial problems, lack of support, health problems or other causes, and whether the current pregnancy had been planned. The five answer options on the stress question were reduced to three categories: (1) 'not at all' and 'rarely', (2) 'sometimes' and (3) 'frequently' and 'all the time'. Answer options to the question on planned pregnancy were (1) the pregnancy was planned (2) the pregnancy was not planned, though the parents wanted to have a child at some time, and (3) the pregnancy was not planned and the parents did not want a child at this time. If the mother answered 'yes' on pregnancy complication, she was asked to specify the complication. Education was dichotomized in those who had only completed secondary school and those who had more than secondary school education.

Ethics

The main study was approved by the ethics committees of all study centres. Written informed consent was obtained from the mothers on behalf of themselves, and from the parents on behalf of the child.

Statistical analyses

Data were analysed both cross-sectional and longitudinal. First, the cross-sectional association between high EPDS scores and excessive crying was studied at 2 and 6 months postpartum (hypothesis a). We then in longitudinal analyses tested if infantile colic was a risk factor for high EPDS scores 6 months after birth even if colic had resolved (hypothesis b).

The test was used to analyse differences in proportions between groups. Comparisons of mean values were done using the *t*-test for independent samples.

Logistic regression analyses were used to calculate OR with 95% CI adjusted for covariates. The effect of covariates were analysed separately for potential confounders, and their combined effects were analysed in a stepwise procedure. Population attributable fraction was calculated according to the formula (Ip−Iu)/Ip, where Ip is the incidence rate (proportion) in the total population and Iu is the incidence rate (proportion) among the unexposed.

All data were analysed using SPSS 14.0 for Windows (Copyright © SPSS Inc., 1989–2005).

RESULTS

Table S1 shows the prevalence of high EPDS scores 2 and 6 months postpartum and its relation to some covariates. Twenty mothers had high EPDS scores both at 2 and at 6 months after delivery. Mothers with high EPDS scores (mean age: 29.1; SD: 5.4) 2 months after birth were on average 1.5 (95% CI: 0.30–2.67) years younger than mothers with normal scores (mean age: 30.6; SD: 5.0; $p < 0.05$). Six months after delivery, there was no difference in maternal age between mothers with high (mean: 30.3 years; SD: 5.8) and normal (mean: 30.5 years; SD: 5.0; $p = 0.8$) EPDS scores.

Table S2 shows the prevalence of infantile colic and prolonged crying and the relation to some covariates. Mean maternal age did not differ between mothers of children with or without infantile colic, or between mothers of children with or without prolonged crying (data not shown).

Excessive crying and postnatal depression

Table 1 shows the results of the cross-sectional analyses. Two months after birth, mothers of infants with colic had increased odds of having high EPDS scores compared with mothers of children without colic. The OR was slightly attenuated when adjusted for possible confounders. Six months after birth, 8 (36.4%) of the 22 mothers of infants with prolonged crying had high EPDS scores (OR: 10.8; 95% CI: 4.3–26.9), and the association persisted when we adjusted for possible confounders.

Table 1 Cross sectional analyses of the association between infant crying and high maternal score on the Edinburgh Postnatal Depression Scale (EDPS) at 2 and 6 months after delivery, respectively

	EPDS score				
Two months after delivery	≤12	>12	Crude OR (95% CI)	Adj. OR (95% CI)	Adj. OR (95% CI)
Infantile colic	N	N			
No	886	59	1	1	1
Yes	54	16	4.4 (2.4–8.2)	3.9 (2.0–7.7)[a]	N.A.
Six months after delivery	≤12	>12			
Prolonged crying	N	N			
No	943	50	1	1	1
Yes	14	8	10.8 (4.3–26.9)	9.8 (3.6–26.9)[b]	6.4 (1.9–21.4)[c]

[a]Adjusted for country, maternal age, parity, stress during pregnancy and unplanned pregnancy.
[b]Adjusted for country, stress, unplanned pregnancy, pregnancy complication, parity and maternal age.
[c]Adjusted for all in b + colic and high EPDS score 2 months postpartum.

Table 2 Longitudinal analyses of the association between infantile colic at 2 months of age and high maternal score on the Edinburgh Postnatal Depression Scale (EDPS) 6 months after delivery

	EPDS score 6 months after delivery			
	≤12	12	Crude OR (95% CI)	Adj. OR (95% CI)[a]
Infant colic	N	N		
No	899	46	1.0	
Yes	58	12	4.0 (2.0–8.1)	3.8 (1.8–8.2)

[a]Adjusted for country, stress, unplanned pregnancy, pregnancy complication, parity and maternal age.

Table 2 shows the results of the longitudinal analysis. Mothers of infants with colic had increased odds of having high EPDS scores 6 months postpartum (OR: 4.0; 95% CI: 2.0–8.1). The association was nearly unchanged when adjusted for possible confounders.

Figure S1 shows the proportions of mothers with high and low EPDS scores 2 and 6 months postpartum and their relation to infantile colic. Among 58 mothers with high EPDS score 6 months after delivery, 20 mothers also had high EPDS scores 2 months postpartum (Figure S1). In addition, there were 14 infants who cried excessively both 2 and 6 months after birth. We therefore analysed the data restricted to mothers with normal EPDS scores 2 months after delivery, and whose children did not cry excessively 6 months after birth. In these analyses, the association between infantile colic and high EPDS score 4 months later persisted (OR: 3.7; 95% CI: 1.4–10.1), and was even strengthened when adjusted for country, stress, unplanned pregnancy, pregnancy complication, parity and maternal age (adjusted OR: 5.5 95% CI: 1.8–16.9).

However, the figure shows that 46 of 58 mothers with high EPDS score at 6 months did not have a child with colic, and among the remaining 12, 5 had high EPDS score at 2 months of age. Thus, the population attributable fraction of infantile colic as a possible cause for later high EPDS score was 0.13.

Finally, we re-analysed the data excluding data from Spain, since the proportion of infants with colic was significantly lower in this than in the other countries. However, the results were essentially unchanged (data not shown).

DISCUSSION

We found that infantile colic may be a risk factor for depressive symptoms 6 months after birth, even if symptoms of colic have resolved. Moreover, excessive crying both 2 and 6 months after birth are significant risk factors for maternal depression.

The main results are unlikely to be due to chance, as indicated by low p-values and the magnitude of the effects. Strengths of the present study are the prospective design, the high number of participants, neither participants nor examiners were aware of the hypotheses and the possibility of adjusting for a number of possible confounders. The proportion of women reporting high EPDS scores and the proportion of infants with colic are comparable with other prospective studies (2,28,29). However, some of the background data were collected retrospectively, and we cannot exclude that depressed mothers may have overemphasized problems both during pregnancy and during the postnatal period. On the other hand, the results were essentially the same when the analyses were restricted to the data where the recording of crying and depression were separated in time, and to mothers with early normal EPDS scores (infantile colic versus late depression). Thus, even if some bias cannot be excluded, information bias seems less likely to explain the main findings. Moreover, in the perspective that infantile colic may be a marker for maternal depression, the objective amount of crying may not be that essential.

Multivariable analyses adjusting for possible confounders suggested that the associations between crying and depression were robust. Moreover, when we analysed the association between infantile colic and high EPDS scores 6 months postpartum, we studied this association also by restricting the analyses to mothers without early postnatal depression and by excluding infants with prolonged crying. We

therefore consider confounding to be a less likely explanation of these results.

Our finding that infantile colic is associated with maternal depression is consistent with a number of other cross-sectional studies (3,12,14,15,17). However, we were not able to find studies addressing the association between prolonged crying and maternal depression. In the few published studies on the outcome of prolonged crying, support and counselling to parents of infants with prolonged crying has been recommended (10). Our finding that more than one-third of mothers of infants with prolonged crying had high EPDS scores lends further support to this recommendation.

The most noteworthy finding of this study may be that excessive crying 2 months after birth (infantile colic) was associated with high depression scores 4 months later, even when the excessive crying had resolved. Two recent studies with comparable prospective designs and applying EPDS to assess depression reported different results (17,20). A study from Australia found that only women whose children had three or more episodes of cry/fuss, but not after a 'single' episode had increased risk of high depression score 2 years later (17). Likewise, a study from Canada found no evidence for high depression scores once the colic had resolved (20). Our results may, however, be consistent with two long-term follow-up studies with somewhat different designs (18,19). Stifter et al. (18) examined mothers 18 months after birth and found that mothers of infants with colic felt less competent as mothers, and tended to have more separation anxiety than mothers of non-colic infants. Rautava et al. (19) reported 3 years after birth more family stress in families who had experienced colic compared with those without this experience. Thus, despite the good prognosis of infantile colic for the child (7,8), our results are in favour of studies suggesting long-term consequences for the mother and the family.

Nonetheless, despite infantile colic being a significant risk factor for later depression, our results suggest that only approximately 13% of the risk of new cases with high EPDS scores may be attributed to infantile colic, if a causal pathway may be assumed.

The opposite possibility that maternal depression may lead to excessive crying (30) could not be addressed in the present study.

Postpartum depression is frequently missed by primary care teams (1). The implication of the present study may therefore be that particular attention should be paid to mothers who report excessive crying of their infants, not only those with classical infantile colic but in particular mothers of infants with prolonged crying.

CONCLUSION

In this study, both infantile colic and prolonged crying were associated with high symptom scores of maternal depression. Particular attention should be paid to mothers of infants who cry excessively 6 months after birth, since more than a third of these mothers had high scores. Moreover, infantile colic was associated with increased risk for high depression score 6 months after birth, when crying had resolved.

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APPENDIX: THE EUROPEAN CHILDHOOD OBESITY TRIAL STUDY GROUP

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article.

Figure S1 Number infants with and without colic, their mothers EPDS scores 2 months after birth and the proportions of these mothers who had high EPDS scores 6 months after delivery.

Table S1 Background data of mothers with normal (≤12) or high (>12) scores on the Edinburgh Postnatal Depression Scale (EDPS) 2 and 6 months after delivery.

Table S2 Background data of infants with infantile colic and prolonged crying.

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