

Maternal anxiety disorders predict excessive infant crying: a prospective longitudinal study

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ABSTRACT

Purpose To prospectively examine relations between maternal DSM-IV-TR anxiety and depressive disorders and excessive infant crying.

Methods Based on the prospective longitudinal Maternal Anxiety in Relation to Infant Development Study, n=306 expectant mothers were enrolled during early pregnancy and repeatedly interviewed until 16 months post partum. Lifetime and prospective information on maternal anxiety and depressive disorders was assessed via standardised diagnostic interviews (Composite International Diagnostic Interview for Women). Excessive crying (crying for ≥3 h per day on ≥3 days per week for ≥3 weeks) was assessed via Baby-DIPS. During the first 16 months after delivery, n=286 mother-infant dyads were available and included in the analyses.

Results Excessive crying was reported by n=29 mothers (10.1%). Infants of mothers with anxiety disorders prior to pregnancy were at higher risk for excessive crying than infants of mothers without any anxiety disorder prior to pregnancy (OR=2.54, 95% CI 1.11 to 5.78, p=0.027). Risk was even increased when considering additionally incident anxiety disorders until delivery (OR=3.02, 95% CI 1.25 to 7.32, p=0.014) and until 16 months post partum (OR=2.87, 95% CI 1.13 to 7.28, p=0.027). Associations remained stable when adjusting for sociodemographic and perinatal covariates. Maternal depressive disorders prior to pregnancy were not significantly associated with excessive crying in this sample.

Implications Maternal lifetime and incident anxiety disorders revealed to be a robust predictor for excessive crying. Thus, early identification and monitoring of women with anxiety disorders is important to identify mother-infant dyads at risk for excessive crying.

What is already known on this topic?

- Excessive infant crying is common in infancy, but aetiological conditions are poorly understood and mainly studied retrospectively in clinical samples during the post partum period.
- The relation of excessive infant crying to maternal depressive disorders is well examined; the relation to maternal anxiety disorders has been widely neglected.
- Excessive infant crying is one of the most frequent reasons for paediatric consultation, but parents typically search for help after crying behaviour has already escalated.

What this study adds?

- Infants of mothers with anxiety disorders (but not with depressive disorders) prior to pregnancy are at higher risk for excessive infant crying.
- The association even increases, when considering incident anxiety disorders during pregnancy and the post partum period.
- The relation between maternal anxiety disorders and excessive infant crying cannot be explained by sociodemographic and perinatal confounders.

BACKGROUND

Excessive infant crying occurs with a prevalence of 3–40%[1] and is one of the most frequent reasons for parents to consult a paediatrician.[2] Unfortunately, most mothers search for professional help after infant crying behaviour has already escalated.[3] Thus, correlates of excessive crying are typically investigated in clinical samples and rarely examined in prospective longitudinal studies.[4–8]

Due to the close relation between infant and mother as primary caregiver, excessive crying seems to emerge in a dynamic interplay that can exacerbate to a vicious circle[9 10] and maternal psychopathology has been investigated as one potential vulnerability or risk factor. While the relation between maternal depression and excessive crying has gained a lot of attention,[6 11–14] maternal anxiety has been widely neglected. The few available studies suggest that maternal trait anxiety/psychological distress and manifest anxiety disorders during pregnancy are associated with excessive crying[15–18] or emotional problems later in childhood.[19] Yet, evidence based on prospective longitudinal examinations of the relation between maternal anxiety and depressive disorders (as well as their combination) is still lacking.

To summarise, previous studies used predominantly dimensional self-report questionnaires, often neglected prepregnancy status of the mother and mainly focused on depression whereas anxiety was typically not examined in detail. With respect to this gap of knowledge, the present study aims to investigate prospective longitudinal associations between lifetime and peripartum maternal DSM-IV-TR anxiety and depressive disorders and excessive crying based on two research questions:

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1. Are maternal anxiety and/or depressive disorders (and their severity) prior to pregnancy associated with an increased risk for excessive crying?
2. Does incident maternal anxiety or depressive disorder during pregnancy and post partum predict an increased or attenuated risk for excessive crying?

Since maternal anxiety and depressive disorders may be interrelated,[20–22] we consider anxiety and depressive disorders alone and in combination as well as independently from their comorbid presentation. As former studies showed associations of sociodemographic features (eg, lower maternal age and educational level) and perinatal factors (eg, primiparity, caesarean-section, breastfeeding) with excessive crying[1 5 15] these potential confounders will be considered as covariates.

METHODS

Procedure

In the prospective longitudinal Maternal Anxiety in Relation to Infant Development Study[23] n=306 women were investigated from early pregnancy until 4 months post partum at approximately 2-month intervals (T1:10–12 weeks of gestation; T2:22–24 weeks of gestation; T3:35–37 weeks of gestation; T4:10 days post partum; T5:2 months post partum; T6:4 months post partum) and additionally 1 year later (T7:16 months post partum). Participants were assessed via standardised interviews, questionnaires and observations.

All participants provided written informed consent after the study aims and procedures were fully explained.[23] The study has been approved by the Ethics Committee of the Medical Faculty of the TU Dresden (No: EK 94042007). Further information on the procedure is published elsewhere.[23]

Participants

A total of n=533 pregnant women were recruited in gynaecological outpatient settings (January 2009–June 2010) in the area of Dresden (Germany) and screened for inclusion and exclusion criteria. Fifty women met exclusion criteria (gestational age>12 weeks: n=8, younger than 18 years or older than 40 years: n=8, multiple pregnancy: n=2, history of more than three spontaneous abortions/(induced) terminations of pregnancy/stillbirths or infant impairment: n=2, invasive fertility treatment: n=9, severe physical disease/microsomia/skeletal malformation: n=6, substance abuse or heroin substitution during the past 6 months: n=0, severe psychiatric illness: n=2, expectation to leave the area of Dresden: n=6, insufficient mastery of German language: n=7).[23] Additionally, n=9 women did not participate due to spontaneous abortion before T1, n=10 due to lacking consent of partner, n=154 due to lacking time and n=4 due to unknown reasons.[23]

Overall, n=306 women were eligible for the Maternal Anxiety in Relation to Infant Development Study. Until 2 months post partum n=286 mothers could be retained (retention rate: 93.5%). Due to spontaneous abortion and termination of pregnancy (after detection of fetal malformation during gynaecological screening) the participation of n=8 women ended after T1. Until T5, n=2 women moved away from Dresden, n=3 women could not be reached anymore by phone, postal or personal contact and n=7 women reported lack of time or interest.[23]

Baseline sample (n=306) and retained sample (n=286) are comparable regarding their sociodemographic features: In this sample, mean maternal age was 28.1 years (SD=4.4) and 69.2% of the mothers reported high education (at least 10th grade; n=198). The majority of mothers was unmarried (n=180, 62.9%) and primiparous (n=168, 58.7%). Most infants were born via vaginal delivery (n=271, 94.8%), at term (≥37 completed weeks of gestation; n=275, 96.2%) and with an average birth weight of 3441.8 grams (SD=457.4). Infant sex ratio was almost equal (n=147 boys, n=139 girls).

Maternal diagnostic information

Maternal DSM-IV-TR anxiety and depressive disorders were assessed with the Composite International Diagnostic Interview for Women,[24] a modified version of the WHO-Composite International Diagnostic Interview[25] that comprises very good psychometric properties.[26 27]

To receive valid prospective information participants were carefully instructed to report the particular symptoms for each assessment period irrespective of the information they gave in interviews before. Most mothers were repeatedly assessed by the same investigator to encourage further study participation. Thus, interviewers were aware of previously reported symptoms, but not informed about the resulting diagnoses.

Lifetime diagnostic information: Based on lifetime diagnostic information all participants were assigned to one of the following initial diagnostic groups[23]:

Table 1 Description of maternal diagnostic status during the study (n=286)

	Lifetime until conception (Initial diagnostic groups)		Lifetime until delivery (T3)		Lifetime until 16 months (T7)	
	n	%	n	%	n	%
No AD (Reference)	100	35.0	91	31.8	83	29.0
Pure D	46	16.1	42	14.7	33	11.5
Pure A	79	27.6	84	29.4	84	29.4
Comorbid AD	61	21.3	69	24.1	86	30.1
No anxiety disorder (no AD, pure D) (Reference)	146	51.0	133	46.5	116	40.6
Any anxiety disorder (pure A, comorbid AD)	140	49.0	153	53.5	170	59.4
No depressive disorder (no AD, pure A) (Reference)	179	62.6	175	61.2	167	58.4
Any depressive disorder (pure D, comorbid AD)	107	37.4	111	38.8	119	41.6

(No AD) no anxiety nor depressive disorder prior to pregnancy, (Pure D) pure depressive disorder(s) prior to pregnancy, (Pure A) pure anxiety disorder(s) prior to pregnancy, (Comorbid AD) comorbid anxiety and depressive disorders prior to pregnancy, (n) number, (%) percentage. Please note that all participants of the initial diagnostic groups were reallocated if they reported incident anxiety and/or depressive disorders. For example, a woman with an incident anxiety disorder during pregnancy who was initially classified as no AD prior to pregnancy was then classified as pure A until delivery.

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Table 2 Description and crude logistic regression of maternal diagnostic status prior to pregnancy (lifetime until conception) and excessive infant crying (n=286)

	Excessive crying (n=286)							
	No (n=257)		Yes (n=29)					
Lifetime until conception: Diagnostic groups	**n**	**%**	**n**	**%**	**OR**	**95% CI**		**p Value**
No AD (Reference) (n=100)	92	92.0	8	8.0	–	–	–	–
Pure D (n=46)	45	97.8	1	2.2	0.26	0.03	2.11	0.205
Pure A (n=79)	67	84.8	12	15.2	2.06	0.80	5.32	0.135
Comorbid AD (n=61)	53	86.9	8	13.1	1.74	0.62	4.89	0.297
No anxiety disorder (no AD, pure D) (Reference) (n=146)	137	93.8	9	6.2	–	–	–	–
Any anxiety disorder (pure A, comorbid AD) (n=140)	120	85.7	20	14.3	**2.54**	**1.11**	**5.78**	**0.027**
No depressive disorder (no AD, pure A) (Reference) (n=179)	159	88.8	20	11.2	–	–	–	–
Any depressive disorder (pure D, comorbid AD) (n=107)	98	91.6	9	8.4	0.73	0.32	1.67	0.455
Lifetime until conception: Anxiety and depression liability	**mean**	**SD**	**mean**	**SD**	**OR**	**95%CI**		p Value
AL in total sample (n=286)	2.4	2.7	3.4	2.9	**1.14**	**1.00**	**1.29**	**0.048**
AL in women without anxiety disorders (no AD, pure D) (n=146)	0.4	0.7	0.2	0.4	0.64	0.17	2.47	0.521
AL in women with any anxiety disorder (pure A, comorbid AD) (n=140)	4.7	2.3	4.9	2.4	1.04	0.85	1.28	0.673
DL in total sample (n=286)	2.6	2.5	2.4	2.5	0.97	0.83	1.14	0.720
DL in women without depressive disorders (no AD, pure A) (n=179)	0.9	1.3	1.0	1.4	1.03	0.72	1.48	0.866
DL in women with any depressive disorder (pure D, comorbid AD) (n=107)	5.2	1.6	5.6	1.2	1.14	0.73	1.78	0.558

(No AD) no anxiety nor depressive disorder prior to pregnancy, (Pure D) pure depressive disorder prior to pregnancy, (Pure A) pure anxiety disorder prior to pregnancy, (Comorbid AD) comorbid anxiety and depressive disorder prior to pregnancy, (AL) anxiety liability index, (DL) depression liability index, (*n*) number, (%) percentage, excessive infant crying was defined as crying for ≥3 h per day ≥3 days per week for ≥3 weeks, bold characters display statistically significant associations on the 5% level.

- *no AD:* no anxiety nor depressive disorder prior to pregnancy
- *pure D:* pure depressive disorder(s) prior to pregnancy
- *pure A:* pure anxiety disorder(s) prior to pregnancy
- *comorbid AD:* comorbid anxiety and depressive disorders prior to pregnancy

To consider anxiety and depressive disorders independently from their comorbid presentation, women with any anxiety disorder prior to pregnancy (pure A, comorbid AD) were compared with women without anxiety disorders prior to pregnancy (no AD, pure D) and women with any depressive disorder prior to pregnancy (pure D, comorbid AD) were compared with women without depressive disorders prior to pregnancy (no AD, pure A).

To investigate whether the severity of the disorder was associated with excessive crying, the dimensional anxiety liability index (AL) and depression liability index (DL) were applied.[23] Each subject was assigned a score that considered type and severity of the symptoms reported: AL considers ten diagnostic features (eg, occurrence of panic attacks, early onset, comorbidity) and DL nine diagnostic features (eg, number of depressive episodes and symptoms, interference with daily life) reflecting the severity of anxiety and depressive symptomatology present at baseline or before.

Incident diagnostic information: To consider incident anxiety and depressive disorders, participants of the initial diagnostic groups were reallocated to the appropriate group, whenever they reported incident anxiety and/or depressive disorders during pregnancy (incorporates prior lifetime diagnostic status and incident diagnoses until delivery) and post partum (incorporates prior lifetime diagnostic status and incident diagnoses up to 16 months post partum) (see table 1). For example, a woman with an incident anxiety disorder during pregnancy who was initially allocated to no AD prior to pregnancy was then assigned to pure A until delivery. Overall, n=30 incident anxiety and n=12 incident depressive disorders were reported until T7. Rates of maternal depressive disorders were consistently lower than rates of maternal anxiety disorders over the course of the study.

Excessive crying

Excessive crying was assessed via maternal information obtained at T5, T6 (questionnaire format) and T7 (interview format; Baby-DIPS).[28] The Baby-DIPS is a structured diagnostic interview that measures behavioral problems in infants and toddlers between 0–3 years with moderate to excellent inter-rater agreement.[29] Excessive crying was determined as crying for ≥3 h per day on ≥3 days per week for ≥3 weeks (rule of three),[30] since this is a common definition that has been shown to be selective and valid in research and clinical practice.[1 4] Overall, n=286 provided information on excessive crying at least once after delivery (at T5, T6 and/or T7). Missing information at any assessment point (T5: n=5, T6: n=7, T7: n=22) was substituted as not present at this particular assessment point (conservative estimation).

Confounders

Sociodemographic and perinatal factors that were considered as potential confounders were based on maternal reports (maternal age, marital status, education, occupation and parity) and medical records[31] that were filled out by gynaecologists or midwives (infant prematurity, type of delivery, birth weight and sex).

Statistical analyses

STATA (V.12.1)[32] was used to compute descriptive statistics and prospective associations. Logistic regression models were fitted to calculate ORs for crude associations and associations adjusted for potential confounders. Two-sided statistical significance was evaluated at the 5% level.

RESULTS

Excessive crying was reported by n=29 mothers (10.1%) at least once after delivery (T5, T6 or T7); n=18 (6.3%) reported

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Table 3 Description and crude logistic regression of maternal diagnostic status lifetime until delivery and until 16 months post partum and excessive infant crying (n=286)

	Excessive crying (n=286)							
	No (n=257)		Yes (n=29)					
	n	%	n	%	OR	95% CI		p Value
Lifetime until delivery: Diagnostic groups								
No AD (Reference) (n=91)	85	93.4	6	6.6	–	–	–	–
Pure D (n=42)	41	97.6	1	2.4	0.35	0.04	2.96	0.333
Pure A (n=84)	70	83.3	14	16.7	**2.83**	**1.03**	**7.76**	**0.043**
Comorbid AD (n=69)	61	88.4	8	11.6	1.86	0.61	5.63	0.273
No anxiety disorder (no AD, pure D) (Reference) (n=133)	126	94.7	7	5.3	–	–	–	–
Any anxiety disorder (pure A, comorbid AD) (n=153)	131	85.6	22	14.4	**3.02**	**1.25**	**7.32**	**0.014**
No depressive disorder (no AD, pure A) (Reference) (n=175)	155	88.6	20	11.4	–	–	–	–
Any depressive disorder (pure D, comorbid AD) (n=111)	102	91.9	9	8.1	0.68	0.30	1.56	0.367
Lifetime until 16 months post partum: Diagnostic groups								
No AD (Reference) (n=83)	77	92.8	6	7.2	–	–	–	–
Pure D (omitted)* (n=33)	33	100.0	0	0.0	–	–	–	–
Pure A (n=84)	75	89.3	9	10.7	1.54	0.52	4.54	0.434
Comorbid AD (n=86)	72	83.7	14	16.3	2.50	0.91	6.84	0.076
No anxiety disorder (no AD, pure D) (Reference) (n=116)	110	94.8	6	5.2	–	–	–	–
Any anxiety disorder (pure A, comorbid AD) (n=170)	147	86.5	23	13.5	**2.87**	**1.13**	**7.28**	**0.027**
No depressive disorder (no AD, pure A) (Reference) (n=167)	152	91.0	15	9.0	–	–	–	–
Any depressive disorder (pure D, comorbid AD) (n=119)	105	88.2	14	11.8	1.35	0.63	2.92	0.443

(No AD) no anxiety nor depressive disorder prior to pregnancy, (Pure D) pure depressive disorder(s) prior to pregnancy, (Pure A) pure anxiety disorder(s) prior to pregnancy, (Comorbid AD) comorbid anxiety and depressive disorders, (*n*) number, (%) percentage, excessive infant crying was defined as crying for ≥3 h per day ≥3 days per week for ≥3 weeks, bold characters display statistically significant associations on the 5% level.
*Analysis was omitted due to a lack of participants with pure D until 16 months post partum in the group with excessive crying.

excessive crying at one, n=10 (3.5%) at two and n=1 (0.3%) at all three assessment points.

Maternal anxiety and depressive disorders prior to pregnancy and excessive crying

As shown in table 2 infants of mothers with pure A and comorbid AD had remarkably higher rates of excessive crying (15.2% and 13.1%) as compared with women with no AD (8.0%), but the crude ORs between maternal initial diagnostic status and excessive crying were not statistically significant. Infants of mothers with pure D appear to have a lower risk for excessive crying in this sample (OR=0.26), but the broad CI (0.03 to 2.11) does not allow for a robust conclusion.

However, analyses considering anxiety and depressive disorders in separate models revealed that infants of mothers with any anxiety disorder prior to pregnancy were at higher risk for excessive crying than infants of mothers without any lifetime anxiety disorder (OR=2.54, 95% CI 1.11 to 5.78, p=0.027). Any maternal depressive disorder prior to pregnancy was not significantly associated with excessive crying.

In the dimensional analyses using the liability scores, maternal AL—but not DL—predicted an increased risk for excessive crying (OR=1.14, 95% CI 1.00 to 1.29, p=0.048).

The statistically significant relation (point estimate) between maternal anxiety disorders prior to pregnancy and excessive crying increased when adjusting for maternal depressive disorders prior to pregnancy (OR_{adj}=2.68, 95% CI 1.17 to 6.15, p=0.020). Similarly, the statistically significant relation between maternal AL and excessive crying increased when adjusting for maternal DL (OR_{adj}=1.18, 95% CI 1.02 to 1.35, p=0.026).

Incident maternal anxiety and depressive disorders during peripartum and excessive crying

Considering incident disorders (table 3) during pregnancy revealed that infants of mothers with pure A until delivery were at higher risk for excessive crying than infants of mothers with no AD until delivery (OR=2.83, 95% CI 1.03 to 7.76, p=0.043). Similarly, infants of mothers with any anxiety disorder until delivery were at increased risk for excessive crying as compared with mothers without any anxiety disorder until delivery (OR=3.02, 95% CI 1.25 to 7.32, p=0.014). For any depressive disorder until delivery no statistically significant association was found.

After delivery, the OR in comorbid AD was highest, although not statistically significant (OR=2.50, 95% CI 0.91 to 6.84, p=0.076). Infants of mothers with any anxiety disorder until 16 months post partum were at significantly higher risk for excessive crying as compared with infants of mothers without any anxiety disorder until 16 months post partum (OR=2.87, 95% CI 1.13 to 7.28, p=0.027). Any incident depressive disorder until 16 months post partum was not associated with excessive crying.

The OR of any anxiety disorder until delivery increased when adjusting for any maternal depressive disorder until delivery (OR_{adj}=3.26, 95% CI 1.33 to 7.96, p=0.010). The association between any anxiety disorder until 16 months post partum also remained statistically significant when adjusting for any maternal depressive disorder until 16 months post partum (OR_{adj}=2.80, 95% CI 1.09 to 7.23, p=0.033), although it was slightly attenuated.

Sociodemographic and perinatal factors and excessive infant crying

As shown in table 4, only maternal age (OR=0.86 per year of age, 95% CI 0.78 to 0.95, p=0.004) and lower education

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(OR=2.31, 95% CI 1.06 to 5.02, p=0.035) were significant predictors of excessive crying. Adjusting for each potential confounder did neither increase nor attenuate the relations between maternal anxiety disorders and excessive crying (see table 5).

DISCUSSION

In this prospective longitudinal examination of maternal anxiety and depressive disorders and excessive crying we found:

1. In the categorical and the dimensional analyses, maternal anxiety prior to pregnancy was associated with an increased risk for excessive crying; even when adjusting for maternal depression.
2. The association of maternal anxiety disorders and excessive crying was increased when considering incident anxiety disorders during peripartum.
3. No statistically significant associations were found for maternal depression and excessive crying.

These findings were confirmed even when controlling for sociodemographic and perinatal confounders, although maternal age and educational level were significantly associated with the outcome. We found the strongest associations for the mere occurrence of maternal anxiety disorders independent of severity that is in line with Weinberg and colleagues.[18]

In contrast to the predominantly clinical view, that maternal depression is a major risk factor for excessive crying,[6 11 14] our results point to a greater importance of maternal anxiety disorders. When considering lifetime maternal anxiety disorders and the degree of maternal anxiety liability expressed prior to pregnancy we consistently found that maternal anxiety was a strong predictor of excessive crying up to 16 months after delivery.

We assume that this divergence of findings is due to several factors: First, former research[6 11 14] focused on the association between maternal post partum depression and excessive crying. Second, former studies failed to examine the role of maternal anxiety disorders in greater detail, and third, they did not take into account mothers' diagnostic status prior to pregnancy.

Why we find statistically significant associations for anxiety, but not for depression, remains unclear. It could be argued that the consistently lower rates of maternal depressive disorders reduced statistical power, so that potential associations were not observable in this sample. On the other hand, one might speculate, whether this points to the role of different parenting styles in mothers with anxiety versus depressive disorders. While maternal depression might lead to withdrawnness that potentially discourage infant crying, maternal anxiety might lead to intrusiveness that possibly intensifies infant crying. However, since respective empirical findings are incoherent and unsatisfying,[33] these mechanisms remain speculative and need further research attention.

Strengths and limitations

Major strengths are the prospective longitudinal design with multiple assessments, the application of well-defined categorical diagnoses (DSM-IV-TR) of maternal anxiety and depressive disorders prior to and during peripartum, the additional consideration of comorbidity and dimensional measures as well as the

Table 4 Sociodemographic and perinatal factors and excessive infant crying (n=286)

	Excessive crying (n=286)							
	No (n=257)		Yes (n=29)					
	n	%	n	%		OR	95% CI	p Value
Marital status prior to pregnancy								
Married	99	93.4	7	6.6	–	–	–	–
Not married	158	87.8	22	12.2	1.97	0.81	4.78	0.134
Level of maternal education								
High education (>10th grade)	183	92.4	15	7.6	–	–	–	–
Low education (10th grade)	74	84.1	14	15.9	**2.31**	**1.06**	**5.02**	**0.035**
Maternal occupation								
Employed	236	90.1	26	9.9	–	–	–	–
Not employed	21	87.5	3	12.5	1.30	0.36	4.64	0.690
Parity								
Multiparous	107	90.7	11	9.3	–	–	–	–
Primiparous	150	89.3	18	10.7	1.17	0.53	2.57	0.701
Prematurity								
>37 weeks gestational age	248	90.2	27	9.8	–	–	–	–
<37 weeks gestational age	9	81.8	2	18.2	2.04	0.42	9.94	0.377
Type of delivery								
Vaginal delivery	245	90.4	26	9.6	–	–	–	–
Caesarian section	12	80.0	3	20.0	2.36	0.62	8.89	0.206
Sex of infant								
Female	128	92.1	11	7.9	–	–	–	–
Male	129	87.8	18	12.2	1.62	0.74	3.57	0.229
	mean	SD	mean	SD	OR	95% CI		p Value
Maternal age	28.4	4.3	25.9	4.8	**0.86**	**0.78**	**0.95**	**0.004**
Birth weight	3450.9	461.2	3361.4	421.3	1.00	1.00	1.00	0.318

(n) number, (%) percentage, excessive infant crying was defined as crying for ≥3 h per day ≥3 days per week for ≥3 weeks, bold characters display statistically significant associations on the 5% level.

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Table 5 Relation between maternal anxiety status and excessive infant crying crude and adjusted for sociodemographic and perinatal factors (n=286)

	Any anxiety disorder prior to pregnancy				Any anxiety disorder until delivery				Any anxiety disorder until 16 months pp			
	OR	95% CI		p Value	OR	95% CI		p Value	OR	95% CI		p Value
Crude regression	2.54	1.11	5.78	0.027	3.02	1.25	7.32	0.014	2.89	1.13	7.28	0.027
Adjusted for												
Maternal age	2.55	1.10	5.89	0.028	2.99	1.22	7.32	0.017	2.66	1.04	6.83	0.042
Maternal marital status	2.54	1.11	5.80	0.027	3.06	1.26	7.43	0.014	2.86	1.12	7.29	0.027
Maternal education	2.34	1.02	5.39	0.045	2.80	1.15	6.83	0.024	2.59	1.01	6.65	0.047
Maternal occupation	2.53	1.11	5.78	0.027	3.04	1.25	7.36	0.014	2.85	1.12	7.25	0.027
Maternal parity	2.55	1.12	5.81	0.026	3.05	1.26	7.40	0.014	2.88	1.14	7.33	0.026
Infant preterm delivery	2.61	1.14	5.97	0.024	3.15	1.29	7.70	0.012	2.96	1.16	7.57	0.023
Infant type of delivery	2.49	1.09	5.69	0.031	2.99	1.23	7.27	0.015	2.88	1.13	7.33	0.026
Infant birth weight	2.61	1.14	5.96	0.023	3.10	1.27	7.52	0.013	2.99	1.17	7.62	0.022
Infant sex	2.51	1.10	5.74	0.029	3.03	1.25	7.36	0.014	2.85	1.12	7.25	0.028

(pp) post partum, excessive infant crying was defined as crying for ≥3 h per day ≥3 days per week for ≥3 weeks.

widely used definition of excessive crying.[1 4 30] Since we used an epidemiological sampling design and did not sample mothers in clinical-psychiatric settings, our results might be better generalisable to pregnant mothers living in the community. However, generalisability might be restricted by the initial response rate and our use of inclusion and exclusion criteria (eg, mothers younger than 18 years or older than 40 years or with insufficient mastery of German language were excluded).

As a potential limitation, one may argue that the assessment of excessive crying via maternal report was confounded by current maternal anxious or depressive state. As already discussed by others[4 7] this could lead to diagnostic error, for example anxious mothers might tend towards catastrophic misinterpretations.[34] Therefore anxious mothers may overvalue the amount of crying leading to overestimation of associations. Nevertheless, the prospective longitudinal approach provides the current gold standard to investigate prospective relations between maternal and infant factors. And still, maternal reports are the most common and feasible diagnostic approach to obtain detailed information about infant behaviour.[8 35]

CONCLUSION

Our results show a robust association from maternal prepregnancy and incident anxiety disorders during the peripartum period to excessive crying. Thus, a history of maternal anxiety disorders seems to be highly relevant for the development of excessive crying and should therefore be regarded as a risk factor. If this could be confirmed, early identification and monitoring of women with anxiety disorders prior to and during pregnancy might be helpful to identify mother-infant dyads at risk for excessive crying. This highlights the potential need for routine screening for maternal psychopathology in perinatal care.[36–38] Then, prevention programmes like parenting training could be offered particularly to women with a history of anxiety disorders to help them improve their knowledge and skills for future crying situations before they escalate. If infant crying behaviour has already become excessive, specific interventions are indicated for mother and infant (eg, developmental counselling, treatment in mother-infant units), to break the vicious circle of excessive crying.

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