Interactive Effects of Infant Gestational Age and Infant Fussiness on the Risk of Maternal Depressive Symptoms in a Nationally Representative Sample

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Abstract

Objective: To examine the interactive effects of gestational age and infant fussiness on the risk of maternal depressive symptoms in a nationally representative sample.

Methods: Our sample included 8200 children from the Early Childhood Longitudinal Study, Birth Cohort. Gestational age categories were very preterm (VPT, 24−31 weeks), moderate/late preterm (MLPT, 32−36 weeks) and full term (FT, 37−41 weeks). Maternal depressive symptoms (categorized as nondepressed/mild/moderate-severe), from the modified Center for Epidemiological Studies Depression Questionnaire, and infant fussiness (categorized as fussy/not fussy) were assessed at 9 months from parent-report questionnaires. We examined the interactive effects of infant fussiness and gestational age categories and estimated adjusted odds ratios (aOR) and 95% confidence intervals (CI) of maternal depressive symptoms using multinomial logistic regression.

Results: Infant fussiness interacted with gestational age categories in predicting maternal depressive symptoms ($P = .04$), with severity varying by gestational age and infant fussiness. Compared with mothers of VPT infants without fussiness, mothers of VPT infants with fussiness had greater odds of mild depressive symptoms (aOR, 2.32; 95% CI, 1.19−4.53). Similarly, compared with mothers of MLPT and FT infants without fussiness, mothers of fussy MLPT and FT infants had greater odds of moderate-severe symptoms (aOR, 2.30; 95% CI, 1.40−3.80, and aOR, 1.74; 95% CI, 1.40−2.16, respectively).

Conclusions: Mothers of MLPT and FT infants with fussiness had increased odds of moderate-severe depressive symptoms, and mothers of VPT infants with fussiness had increased risk of mild symptoms. Early screening for infant fussiness in preterm and FT may help identify mothers with depressive symptoms in need of support.

Keywords: ECLS-B (Early Childhood Longitudinal Survey-Birth Cohort); infant fussiness; maternal depressive symptoms; moderate/late preterm

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What's New

In a nationally representative sample, maternal depression risk varied by gestational age and infant fussiness. Mothers of VPT infants with fussiness had greater mild depressive symptoms, whereas mothers of fussy MLPT or FT infants had greater moderate-severe depressive symptoms.

Preterm birth, characterized by birth before 37 weeks' gestation, has an estimated prevalence rate of 11% in the United States.[1] Preterm birth is a non-normative transition to parenthood associated with feelings of grief, depression, and psychological distress,[2-4] with depressive symptoms often persisting for weeks or months after a child's discharge from the neonatal intensive care unit.[2,3] Maternal depressive symptoms are associated with suboptimal developmental and behavioral outcomes in preterm infants,[5,6] with worse outcomes associated with greater chronicity of symptoms.[7]

Most studies of maternal depression in preterm infants have focused on infants born very preterm (VPT, <32 weeks' gestation),[2-4] although VPT infants account for only 17% of all preterm infants.[1] Moderate (gestational age 32−33 weeks) and late preterm infants (gestational age 34−36 weeks) account for 83% of preterm infants,[1] yet as a population, they are relatively understudied. Because the morbidities associated with moderate preterm birth are similar to late preterms,[8] outcomes of moderate and late preterm infants often are examined together.[9,10] Recent research has examined the association between moderate/late preterm (MLPT) and maternal depressive symptoms, with some inconsistent findings.[6,11-14] Whereas 2 studies found no association between MLPT birth and maternal depressive

symptoms,[6,11] other studies have found a positive association between MLPT birth and maternal depression.[12-14] One reason for the lack of association may be related to the high cut points for depressive symptoms used in previous studies that identified individuals with moderate depressive symptoms[6,11] but that may have underidentified individuals with milder symptoms. Because mild (ie, subclinical) depressive symptoms are likely to persist[15] and are associated with risks to the early parent−infant relationship,[16] it is necessary to identify mothers with mild depressive symptoms to initiate appropriate interventions. Because MLPT infants do not receive any specialized developmental follow-up care, the risk for maternal depressive symptoms (especially mild symptoms) may go undetected, resulting in missed opportunities to initiate early interventions.[17]

An additional explanation for the lack of association between MLPT birth and maternal depressive symptoms is that symptoms may be related to a combination of gestational age (ie, degree of prematurity) and other infant risks. One infant risk that might confer an added risk for maternal depression is infant negative emotionality, characterized specifically by infant fussiness and difficulty.[18] Infant negative emotionality/fussiness has been associated with poorer infant sleep,[19] later child behavior problems,[20] and maternal depressive symptoms.[21] Negative emotionality has been examined in VPT,[22,23] but we have identified only 1 study examining negative emotionality in MLPT infants,[14] which suggests a need for additional research. Cumulative risk models suggest that combinations of risks increase the odds of poorer outcomes for children and families,[24] yet it is unclear whether infant negative emotionality in combination with preterm birth confers an added risk for maternal depression. Establishing such a link could inform anticipatory guidance provided to parents of preterm infants.

Given these factors, the objectives of this study were to examine the association between the degree of prematurity (VPT, MLPT, FT) and severity of maternal depressive symptoms (mild, moderate-severe) at 9 months and to test whether gestational age and infant negative emotionality (characterized by infant fussiness) have interactive effects in predicting the risk of maternal depressive symptoms. We hypothesized that the combination of risks (eg, infant fussiness combined with VPT or MLPT birth) would relate to greater odds of mild or moderate-severe maternal depressive symptoms, consistent with a cumulative risk model.

METHODS

STUDY DESIGN AND SAMPLE

Data were drawn from the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B), a nationally representative, population-based longitudinal study of children born in the United States in 2001. Data were collected from >10,000 children and their parents at 9 months, with subsequent assessments at 24 months, preschool, and kindergarten timepoints. Data collection consisted of home visits with parent interviews and direct child assessments and included information on children's development across multiple settings.[25]

From the original sample of 10,700, this analytical sample excluded children who had chromosomal abnormalities (n = 100) and included participants whose gestational ages were 24 to 41 weeks (additional 900 excluded). Participants also were excluded if they were missing maternal depression data (n = 1150), or other missing data (eg, 9-month development T-scores [n = 250], and breastfeeding [n = 100]). This resulted in the final sample size of 8200. Our study used data from 2 timepoints (birth, 9 months) and was considered exempt by the institutional review board because the research involved the use of a publicly available dataset, in which the participants were deidentified, and data could not be linked to the participants.

MEASURES

OUTCOMES

Maternal Depressive Symptoms. Maternal depressive symptoms were assessed via parent self-report questionnaire at the 9-month visit using a modified version of the Center for Epidemiological Studies-Depression Scale (CES-D).[26] The modified CES-D is a 12-item, self-administered scale that assesses the frequency of depressive symptoms experienced in the previous week. The modified CES-D has been validated in other large, national datasets, with internal consistency for the 12-item CES-D previously reported as $\alpha = 0.85$.[27] We calculated a measure of internal consistency for the modified CES-D used in our analytic sample ($\alpha = 0.88$), which was similar to reliability reported for the full 20-item CES-D ($\alpha = 0.89$).[27]

Items originally were scored on a 4-point Likert scale: 1 = never to 4 = often. Following scoring guidelines suggested in the 9-month ECLS-B user's manual, items were recoded to 0 = never to 3 = often, and responses were summed, with potential scores ranging from 0 to 36, with greater scores indicating more depressive symptoms.[25] Cut points for categories of depressive symptoms were defined by the ECLS-B as nondepressed (CES-D = 0−4); mild depression (CES-D = 5−9); moderate depression (CES-D = 10), and severe depression (CES-D >10).[25] Similar to previous research,[27,28] we examined maternal depressive symptoms as a 3-category variable: nondepressed (CES-D = 0−4); mild depression (CES-D = 5−9); moderate-severe depression (CES-D ≥10).

PREDICTORS

Gestational age. Gestational age was ascertained from birth certificate data from the ECLS-B restricted use data set. We created a 3-group gestational age category variable, with infants characterized as being VPT (<32 weeks), MLPT (32−36 weeks), and full term (FT, 37−41weeks), following gestational age categories defined by clinical convention.[1,8]

Infant Negative Emotionality/Fussiness. Infant fussiness was assessed via parent self-report questionnaire at the 9-month visit using a modified version of the Infant/Toddler Symptom Checklist.[29] The Modified Infant/Toddler

Symptom Checklist (M-ITSC) is a 7-item self-report questionnaire designed to identify children with self-regulatory disorders. Items were scored on a 4-point Likert scale: 0 = never; 1= used to be; 2 = sometimes; 3 = most times. Sample items include, "My child is fussy or irritable;" "my child cries for food or toys."[25] The measure of internal consistency for the M-ITC for our analytic sample was low ($\alpha = 0.57$), suggesting that these 7 items demonstrated poor reliability as a single construct. Because we were interested in the dimension of infant negative emotionality described by infant fussiness/irritable distress,[18] we chose one question from the M-ITSC "my child is fussy or irritable" as our variable of interest. Because there were few infants identified for some of the categories (eg, "most times fussy"), we had an insufficient sample size to identify meaningful group differences using 3- and 4-group categorizations. As a result, we elected to use a 2-group categorization of infant fussiness. Because parents' perceptions of infant behavior are formed early and can persist,[30] we considered that any experience of infant fussiness may contribute to persistent maternal perceptions of infant fussiness. As such, we dichotomized infant fussiness with scores = 0 ("never fussy") recoded as 0 = "not fussy," and scores greater than 0 recoded as 1= "fussy."

COVARIATES

Maternal and infant characteristics associated with prematurity or maternal depression were chosen a priori as covariates after a review of the literature. The following maternal characteristics were ascertained from the restricted ECLS-B birth certificate data: maternal age, race/ethnicity, marital status (married/ unmarried), history of prenatal smoking, history of breastfeeding (any breastfeeding, no breast feeding), and plurality (singleton, twin or multiple gestation). Also included were measures of maternal education (less than high school; high school graduate; more than high school) and poverty (<185% federal poverty line; ≥185% federal poverty line) which were incorporated into a single composite measure of household socioeconomic status (SES) created by ECLS-B at 9 months ($\alpha = 0.85$).[25]

Because the ECLS-B did not contain a composite measure of neonatal morbidity, we included the following neonatal risks ascertained from birth certificate data: birth weight, fetal growth characterized as small for gestational age (<10%); and 5-minute Apgar scores (dichotomized as >7 vs ≤7). Because frequent infant nocturnal waking may be associated with maternal affective symptoms,[31] we included infant nocturnal waking at 9 months (awakens ≥3 times/ night [yes/no]) as a potential confounder. In addition, because developmental delay may be associated with prematurity and maternal depression,[6] we included a measure of infant development as a potential confounder. Infant cognitive development was assessed at 9 months using the Bayley Short Form Research Edition, which was formulated from the Bayley Scales of Infant Development, Second Edition. The Bayley Short Form Research Edition Mental T-Scores were norm-referenced by age to the ECLS-B population, adjusted for prematurity, and were scaled to have a mean = 50, standard deviation = 10.[25] We also included infant sex and receipt of early intervention services at 9 months as covariates.

STATISTICAL ANALYSIS

Maternal and child characteristics were examined using descriptive statistics. Multivariate, multinomial logistic regression using the SURVEYLOGISTIC procedure in SAS was used to examine the association between gestational age categories and infant fussiness with the outcome of maternal depressive categories. We controlled for variables that were related to gestational age and maternal depressive categories to adjust for potential confounding. We also examined whether the association between gestational age categories and severity of maternal depressive symptoms (mild or moderate-severe) was moderated by infant fussiness. Adjusted post-hoc tests examined pairwise differences between preterm categories stratified by infant fussiness and the odds of maternal depressive symptoms at a significance level of $P < .05$. All analyses were conducted using SAS 9.4 (SAS Institute Inc, Cary, NC). Because of the complex sample design, sample weights and the Jackknife method[32] were used to account for stratification, clustering, and unit nonresponse, thereby allowing the weighted results to be generalized to the population of US children born in 2001. In accord with the NCES requirements for ECLS-B data usage, reported numbers were rounded to the nearest 50.[33]

RESULTS

SAMPLE CHARACTERISTICS

Our final sample of 8200 infants born between 24 and 41 weeks included 800 VPT (<32 weeks), 1500 MPLT (32−36 weeks), and 5900 term infants (37−41 weeks). Gestational age groups differed by select maternal (Table 1) and infant characteristics (Table 2). Compared with infants born FT, infants born VPT and MLPT were more likely to have mothers who were unmarried, have less than a high school education, have income <185% below the poverty line, and were less likely to have breastfed. They were also more likely to be of black/non-Hispanic race/ethnicity and were more likely to be the product of a twin or multiple gestation. VPT and MLPT infants also were more likely to have lower birth weights and 5-minute Apgar scores compared with infants born FT. Gestational age groups did not differ by maternal age ($P = .95$), prevalence of maternal depressive symptoms ($P = .08$), or percentage of infants rated as being "fussy" ($P = .79$)

TEST OF CUMULATIVE RISK HYPOTHESIS

After adjusting for covariates, there was no main effect of gestational age category on the odds of maternal depressive symptoms, but we found evidence of interactive effects between infant fussiness and gestational age categories on the odds of maternal depressive symptoms ($P = .04$). In adjusted models stratified by infant fussiness,

Table 1. Maternal Characteristics for Weighted Sample

	Mean, SD or Weighted (%)				
	Total Sample	Very Preterm	Moderate/Late Preterm	Full Term	*P* Value
Unweighted N	8200	800	1500	5900	
Age, y	27.4, 3.5	27.3, 9.8	27.4, 9.6	27.4, 3.8	.95
Depressive symptoms					.08
No depressive symptoms	59.2%	55.1%	55.8%	59.7%	
Mild depressive symptoms	24.2%	23.5%	27.0%	23.9%	
Moderate-severe depressive symptoms	16.5%	21.4%	17.2%	16.4%	
Race/ethnicity					< .001
White/non-Hispanic	60.2%	50.6%	52.3%	61.3%	
Black/non-Hispanic	13.9%	26.1%	19.5%	13.0%	
Hispanic	20.3%	20.2%	22.2%	20.0%	
Asian	3.2%	2.1%	2.8%	3.2%	
Other	2.5%	0.9%	3.1%	2.4%	
Marital status					< .001
Married	68.0%	61.2%	61.2%	68.9%	
Unmarried	32.0%	38.8%	38.8%	31.1%	
History of prenatal smoking					.59
No	89.0%	87.0%	88.2%	89.1%	
Yes	11.0%	13.0%	11.8%	10.9%	
Plurality					< .001
Singleton	96.7%	79.4%	84.5%	98.5%	
Twin or greater	3.3%	20.6%	15.5%	1.5%	
Ever breastfed					< .001
No	30.6%	44.8%	38.6%	29.4%	
Yes	69.4%	55.2%	61.4%	70.6%	
Socioeconomic indicators calculated from measures of education and income at 9 mo					
Maternal education					.01
Less than high school	17.3%	21.4%	20.7%	16.8%	
High school graduate	28.3%	28.1%	29.1%	28.2%	
More than high school	54.4%	50.5%	50.2%	55.0%	
Below poverty threshold					< .001
(<185% federal poverty line)	46.0%	55.4%	53.4%	44.9%	
At or above poverty threshold					
(≥185% federal poverty line)	54.0%	44.6%	46.6%	55.1%	

SD indicates standard deviation.

Table 2. Infant Characteristics for Weighted Sample

	Mean, SD or Weighted (%)				
	Total Sample	Very Preterm	Moderate/Late Preterm	Full Term	*P* Value
Unweighted N	8200	800	1500	5900	
Gestational age, wk	38.5, 2.5	28.8, 3.1	35.0, 1.7	39.1, 1.6	< .001
Infant fussiness/difficulty					.79
Fussy	63.5%	65.5%	64.2%	63.3%	
Not fussy	36.5%	34.5%	35.8%	36.7%	
Sex					.60
Male	51.2%	49.8%	52.6%	51.0%	
Female	48.8%	50.2%	47.4%	49.0%	
Birth weight, g	3320.0, 408.4	1719.2, 2131.7	2806.1, 1005.0	3412.6, 392.8	< .001
Fetal growth					.03
Small for gestational age (<10%)	9.9%	6.6%	9.1%	10.1%	
5-min Apgar					< .001
>7	97.1%	71.0%	92.6%	98.2%	
≤ 7	2.9%	29.0%	7.4%	1.8%	
9-mo Bayley Mental T-score	50.1, 23.3	44.9, 22.5	46.8, 20.4	50.6, 19.5	< .001
Child awakens ≥3 times nightly					.04
No	85.9%	89.2%	83.3%	86.1%	
Yes	14.1%	10.8%	16.7%	13.9%	

SD indicates standard deviation.

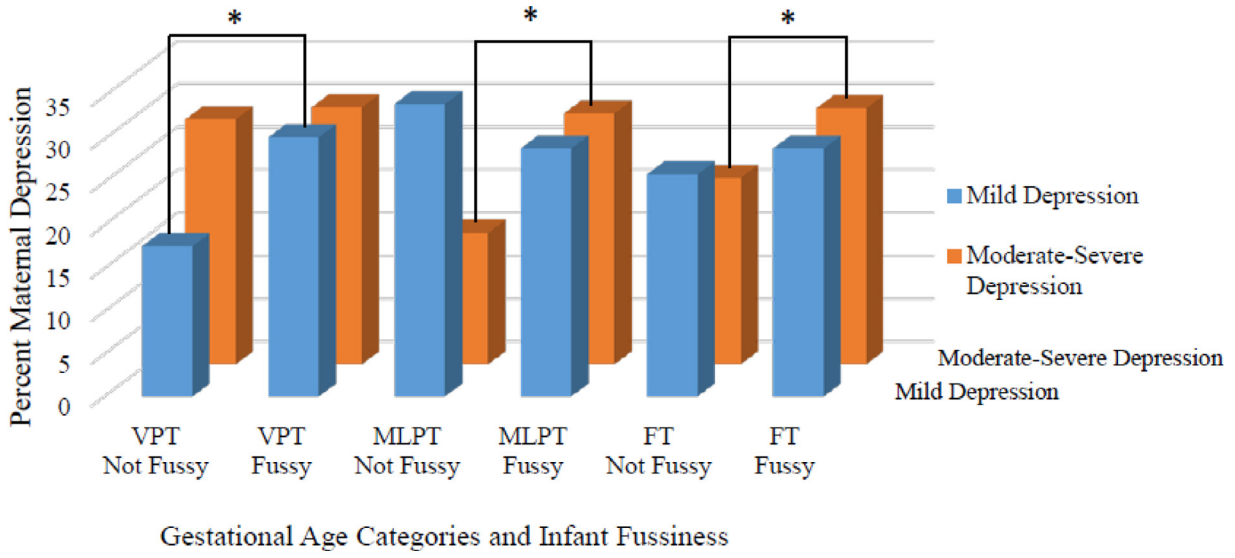

Figure. *Interactive effects of gestational age categories and infant fussiness on the severity of maternal depressive symptoms. *Significant pairwise differences at a level of* P < *.05.*

the prevalence and severity of maternal depressive symptoms varied by the degree of prematurity (Figure).

VPT Infants

Mothers of VPT infants with fussiness were more likely to experience mild depressive symptoms, compared with mothers of VPT infants without fussiness (30% vs 17.6%, respectively). Mothers of VPT infants with fussiness had 2.3 greater odds of experiencing mild depressive symptoms compared with mothers of VPT infants without fussiness (adjusted odds ratio [aOR], 2.32; 95% confidence interval [CI], 1.19−4.53).

MLPT Infants

In contrast, among infants born MLPT, mothers of MLPT infants with fussiness were more likely to experience moderate-severe depressive symptoms, compared with mothers of MLPT infants without fussiness (29.2% vs 15.3%, respectively). Mothers of MLPT infants with fussiness had 2.3 greater odds of experiencing moderate-severe depressive symptoms compared with mothers of MLPT infants without fussiness (aOR, 2.30; 95% CI, 1.40−3.80).

FT Infants

For FT infants, mothers of FT infants with fussiness were also more likely to experience moderate-severe depressive symptoms, compared with mothers of FT infants without fussiness (29.8% vs 21.7%, respectively). Similar to mothers of MLPT infants, mothers of FT infants with fussiness had a 1.7-greater odds of experiencing moderate-severe depressive symptoms compared with mothers of FT infants without fussiness (aOR, 1.74; 95% CI, 1.40−2.16) (Table 3).

Maternal and Infant Characteristics Associated With Mild and Moderate Maternal Depressive Symptoms

Several maternal and infant characteristics also were associated with greater mild and moderate-severe maternal depressive symptoms, including a history of prenatal smoking and being unmarried. Lower odds of mild and moderate-severe maternal depressive symptoms were associated with older maternal age and greater SES. Asian and black race, history of frequent nocturnal waking and having twin or multiple gestation were associated with greater odds of moderate-severe depressive symptoms (Table 4).

Discussion

This is the first study to examine the interactive effects of the degree of prematurity (VPT, MLPT, FT) and infant fussiness (fussy vs not fussy) on the severity of maternal depressive symptoms in a nationally representative sample. Our study is also unique in its focus on predictors

Table 3. Gestational Age Categories, Infant Fussiness, and Adjusted Odds of Mild and Moderate-Severe Maternal Depressive Symptoms*

Level of Depressive Symptoms	VPT With Fussiness vs VPT Without Fussiness, aOR [95% CI]	MLPT With Fussiness vs MLPT Fussiness, aOR [95% CI]	FT With Fussiness vs FT Without Fussiness, aOR [95% CI]
Mild depressive symptoms	2.32 [1.19−4.53]	1.02 [0.69−1.51]	1.41 [1.21−1.65]
Moderate-severe depressive symptoms	1.42 [0.80−2.52]	2.30 [1.40−3.80]	1.74 [1.40−2.16]

aOR indicates adjusted odds ratio; VPT, very preterm; MLPT, moderate/late preterm; and FT, full term.

*Analyses included the following covariates: smoking, maternal race, plurality, marital status, infant nocturnal awakening, breastfeeding, socioeconomic status, maternal age, and Bayley 9-month T-scores; W1R0 weight applied to analyses.

Table 4. Maternal and Infant Characteristics Associated with Odds of Mild and Moderate-Severe Maternal Depressive Symptoms*

	Mild Depressive Symptoms, aOR [95% CI]	Moderate-Severe Depressive Symptoms, aOR [95% CI]
Gestational age × infant fussiness	Results in Table 3	Results in Table 3
Prenatal smoking (yes)	1.4 [1.1–1.8]	2.2 [1.7–2.7]
Ever breastfed (yes)	0.9 [0.8–1.1]	1.1 [0.9–1.3]
Maternal race/ethnicity		
Other	1.4 [0.97–2.1]	1.4 [0.95–2.0]
Asian	1.2 [0.99–1.5]	1.5 [1.1–2.0]
Hispanic	0.7 [0.6–0.9]	0.6 [0.5–0.8]
Black, non-Hispanic	1.2 [0.98–1.5]	1.5 [1.1–1.9]
White, non-Hispanic	REF	REF
Plurality (twin or multiple gestation)	1.1 [0.9–1.4]	1.3 [1.1–1.7]
Marital status (unmarried)	1.3 [1.1–1.5]	1.6 [1.4–2.0]
Maternal age	0.98 [0.97–0.99]	0.98 [0.97–0.99]
SES (9 months)	0.8 [0.7–0.9]	0.6 [0.57–0.7]
Infant nocturnal waking (yes)	1.1 [0.9–1.4]	1.7 [1.4–2.0]
Infant 9-month cognitive development	0.99 [0.99–1.00]	0.98 [0.98–1.00]

aOR indicates adjusted odds ratio; SES, socioeconomic status.
*W1R0 weight applied to analyses.

associated with both mild (ie, subclinical) depressive symptoms, as well as more commonly studied moderate-to-severe depressive symptoms. Although there is a paucity of research regarding child outcomes associated with mild depressive symptoms, there is increasing awareness that mild depressive symptoms are common, may progress into more severe depressive symptoms,[15] and are associated with risks to the early parent–infant relationship.[16] Given these factors, identifying mothers with subthreshold symptoms may help give professionals the opportunity to provide preventive support to mothers.

Similar to previous research using the ECLS-B,[6] our results suggest that the degree of prematurity is not an independent risk associated with maternal depression. However, we found that infant fussiness in combination with the infant gestational age categories was associated with varying severity of maternal depressive symptoms. Using a cumulative risk model,[24] we hypothesized that mothers of infants with more biological risk (ie, being born more preterm) combined with an additional vulnerability (ie, infant fussiness) would experience more elevated maternal depressive symptoms. Contrary to expectations, we found that infant fussiness was a potent vulnerability factor, especially for later-born infants. In other words, mothers of MLPT infants with infant fussiness experienced more severe maternal depressive symptoms, whereas mothers of VPT fussy infants experienced milder depressive symptoms. In addition, mothers of fussy FT infants also experienced moderate-severe depressive symptoms, contrary to a cumulative risk hypothesis.

Infant negative emotionality, especially the dimension of infant fussiness and irritability, is a well described challenge to the caregiving relationship. Mothers of fussier, less-soothable infants report significantly less confidence, lower efficacy, and more stress and depressive symptoms than mothers of less fussy, more-soothable infants.[34] Concerns about infant fussiness often present to the general pediatrician, and as such, the pediatric primary care visit is an ideal opportunity to assess infant negative emotionality and its influence on the early parent–child relationship. General pediatricians are uniquely poised to observe infant behavior and to inquire about infant fussiness, which may help identify mothers who may experience their infant as challenging, and who may benefit from additional supports or services.

More recently, a growing number of studies have examined early negative emotionality and infant difficulty as a susceptibility factor, rather than an independent risk factor for children. That is, infant negative emotionality may make an infant susceptible, or malleable, to both negative and positive experiences. A recent meta-analysis of 84 longitudinal studies[35] found that infants with who were rated by their parents as being more challenging were more vulnerable to negative parenting and also benefitted more from positive parenting, compared with children who were rated as being less challenging, supporting a differential susceptibility interpretation.[36] These findings are particularly important when one adds maternal depression into the mix because infants with negative emotionality (ie, "fussy" infants) who also experience maternal depression, and the negative parenting often accompanying elevated depressive symptoms, are more likely to develop social emotional problems.[37] Early screening and intervention for both concerns may prevent such problems from developing.

In addition to the interactive effects of infant fussiness and gestational age, we found that maternal characteristics associated with prenatal stress and socioeconomic disadvantage (ie, lower SES, unmarried marital status, smoking) were associated with greater odds of both mild and moderate-severe maternal depressive symptoms. Similarly, experiences associated with challenges to caregiving (ie, history of multiple gestation and increased infant nocturnal waking) also were associated with greater odds of moderate-severe maternal depression. Interestingly, we found that Asian and black race were associated with a greater odds of moderate-severe depressive symptoms,

whereas Hispanic ethnicity was associated with a lower odds of maternal depression. This raises the question regarding the role of culture as a potential risk or protective factor in the development of maternal depression.

Multiple resources are available to support parents in the postnatal period. These resources include nursing home-visitation, early intervention, and infant mental health services.[38] Although these supports are typically offered to parents of VPT infants, parents of MLPT infants, as well as FT infants, are often not referred for such supports. Because our results suggests that infant fussiness occurs at a similar frequency in MLPT infants as VPT infants, and because mothers of fussy MLPT infants experience more severe depressive symptoms than their VPT counterparts, one implication of our study is to consider specialized supports for mothers endorsing infant fussiness (eg, the Fussy Baby Network, which offers telephone support for mothers of difficult infants).[39]

Although VPT infants have greater morbidity than MLPT infants, the perinatal care of infants VPT may actually help buffer against more severe maternal affective symptoms. VPT infants are often cared for in a neonatal intensive care unit setting, where part of the specialized care includes anticipatory guidance focused on the vulnerabilities associated with preterm birth. As the parents of VPT infants transition home, they often receive an enhanced level of postnatal support and developmental follow-up, including referrals to early intervention programs, home visiting, and subsequent care in neonatal follow-up clinics.[38] These postnatal supports and services provided to parents of VPT infants may help prepare them for the potential challenges associated with caring for a preterm infant and may help mitigate the risk for maternal depressive symptoms. In contrast, infants born MLPT often have a shorter duration of hospitalization,[40] receive no specialized neonatal follow-up care, and are less likely to qualify for early intervention services compared with infants born VPT.[41] There is an emerging literature indicating that mothers of late preterm infants are more likely to perceive their infant as being demanding and difficult[14] and rate late preterm infants as having more behavior problems than infants born more preterm.[40] In the absence of the psychosocial supports and anticipatory guidance provided to mothers of VPT infants, mothers of MLPT infants may feel more challenged by MLPT behavior, contributing to more severe maternal depressive symptoms in the context of infant fussiness.

This study had several strengths and limitations. Notable strengths include the use of a large, nationally representative sample that included infants across the full spectrum of gestational age and use of a well-validated measure for maternal depressive symptoms. One limitation is that our study used parental reports of both maternal depressive symptoms and infant fussiness and thus, reporter bias and shared method variance are considerations, as mothers with depressive symptoms are more likely to perceive their children as being more difficult.[42] Another limitation was that our measure of infant fussiness was based on one question item from a larger questionnaire. Our study design did not permit us to examine causality of maternal depressive symptoms or infant fussiness, and because depressive symptoms were assessed at 9 months, it was not possible to determine whether the depressive symptoms were present before, or emerged after the birth of the infant. In addition, while the ECLS-B is a rich dataset and among the only longitudinal cohorts from the United States, the data are old, which is an additional limitation. Despite these limitations, our results demonstrated that the risk for maternal depressive symptoms varied by a dimension of infant temperament and degree of prematurity, which has implications for pediatric primary care.

CONCLUSIONS

Mothers of VPT with infant fussiness experienced increased odds of mild depressive symptoms whereas mothers of "fussy" MLPT and FT infants had increased odds of moderate-severe depressive symptoms, suggesting a potential need for closer surveillance and supports for these mothers. Pediatric providers can query mothers about their experiences of infant fussiness, which can help identify which mothers would benefit from additional depression screening, and referrals for additional services (eg, preventative programs targeting maternal emotional well-being),[16] thus improving the postnatal care of dyads at risk.

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