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Neonatal behavior of babies exposed to maternal depressive and anxiety disorders during perinatal period

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Abstract

Perinatal depression and perinatal anxiety can affect up to 20% of women during pregnancy and postpartum. Babies exposed to these pathologies suffer consequences in their development at a cognitive, motor, emotional and social level. Some of these can be observed since birth. In addition, adverse effects have been described in the behavior of the newborn exposed to psychopharmacotherapy during pregnancy. The aims of the study were to observe the neonatal behavior of babies exposed to perinatal depression or anxiety and to compare it between both diagnostic groups of mothers. The cohort included 86 newborns, from 2 to 67 days of chronological age (29 ± 13.4, 48% females), exposed to maternal depression ($n = 27$) or anxiety ($n = 59$). The *Neonatal Behavior Assessment Scale, 4th edition*, (Brazelton and Nugent, 2011) was administered at a maternal mental health unit to register the neonatal behavior. Chi-square and Student t-test analyses were calculated to compare item scores and percentages of suboptimal responses between both groups; Pearson correlations were calculated to analyze the relation of obstetric and psychiatric variables of mothers and the behavior of newborns. Significant differences between groups were found only regarding the change in skin color, with higher percentages of suboptimal responses in the group exposed to anxiety than to depression (24% versus 4%, $Chi^2 = 3.89$; $p < .05$). Correlation analyses show that, although the birth weight is positively related to the interactive social orientation (tracing face and voice: $r = .28$, $p = .02$), the last was affected negatively by the dose of antidepressants during the third trimester of pregnancy (tracing face and voice: $r = -.31$, $p = 0.03$), indicating that higher doses of antidepressant was related with lower interactive social orientation. Our findings emphasize the need to detect depression and anxiety in women during the perinatal period in order to intervene at a multidisciplinary level in both, mother and baby, and the relation.

Keywords: Perinatal mental health; depression; anxiety; assessment; neonatal behavior.

Resumen

Conducta neonatal en bebés expuestos a trastornos de depresión y de ansiedad maternos durante el período perinatal. La depresión y la ansiedad perinatales afectan hasta el 20% de las mujeres durante embarazo y postparto. Los bebés expuestos a ellas sufren consecuencias en su desarrollo a nivel cognitivo, motor y socioemocional, y pueden observarse desde el nacimiento. Además, se han descrito efectos adversos en la conducta del neonato expuesto a psicofármacos durante la gestación. Los objetivos de este estudio fueron observar la conducta neonatal de bebés expuestos a depresión y ansiedad perinatal y compararla entre ambos grupos de diagnóstico materno. La cohorte incluyó 86 neonatos, entre 2 y 67 días de edad cronológica (29 ± 13.4, 48% mujeres), expuestos a depresión ($n = 27$) o ansiedad ($n = 59$) materna. La *Escala de Evaluación de la Conducta Neonatal, 4ª edición*, (Brazelton y Nugent, 2011) fue administrada en una unidad de salud mental perinatal para registrar la conducta neonatal. Se realizaron análisis de Chi-cuadrado y t de Student para comparar las puntuaciones en los ítems y los porcentajes de respuestas subóptimas entre ambos grupos; se calcularon índices de correlación de Pearson para analizar la relación entre variables obstétricas y psiquiátricas de las madres y la conducta de los bebés. Únicamente se encontraron diferencias significativas entre los grupos diagnósticos respecto al cambio del color de la piel, con porcentajes mayores de respuesta subóptima en el grupo expuesto a ansiedad que a depresión (24% versus 4%, $Chi^2 = 3.89$; $p < .05$). Los análisis de correlación muestran que, aunque el mayor peso al nacer se relaciona positivamente con la respuesta social-interactiva (orientación a cara y voz: $r = .28$, $p = .02$), ésta se ve afectada negativamente por el uso de antidepresivos durante el tercer trimestre de gestación (orientación a cara y voz: $r = -.31$, $p = .03$), indicando que a mayores dosis, peor orientación social-interactiva. Nuestros hallazgos enfatizan la necesidad de detectar la depresión y la ansiedad en las mujeres durante el período perinatal para intervenir a nivel multidisciplinar sobre ambos, madre y bebé, y sobre la relación.

Palabras clave: salud mental perinatal; depresión; ansiedad; evaluación; conducta neonatal.

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Introduction

During pregnancy, childbirth and postpartum, women are at high risk of developing a mental disorder. This period, called "perinatal period" begins in gestation and ends in the first year of the baby's life. It is common that levels of anxiety and depression increase during this period, like other mental health problems. It is crucial to focus on these, due to the consequences for the mother and her child.

Pregnancy impacts woman on a biological, psychological and social level. At a biological level, involves hormones (such as estrogens, progesterone, glucocorticoids, prolactin and oxytocin) that can modify structures in the mother's brain, in order to adapt her to the future needs of motherhood (Pasqualini & Chetrite, 2016). These changes will later affect the mother's responses to the newborn's attachment behaviors. Once the baby is born, the mother again experiences hormonal changes, such as the suppression of estradiol and progesterone levels, the suppression of the hypothalamic-pituitary-adrenal axis or the attenuation of serotonergic activity, which leads the mothers to a greater vulnerability to emotional disturbances (Newman et al., 2016). Other psychological and social factors could also trigger emotional alterations, due to changes in family and personal relationships, in her body, in diet, in daily activities, but also due to the experience of complicated previous gestations grieving processes and even traumatic childbirths (Gómez, 2007; Lera Miguel & Andrés Perpiñá, 2019).

The World Health Organization states that 15% of women worldwide suffers from a mental health problem during the perinatal period (WHO, 2020). Only about 5.5% of them receives some kind of treatment (Andersson et al., 2003).

Perinatal Depression

Depression during pregnancy or prenatal depression, has an incidence range between 6% and 38% (Field, 2011). García Esteve and Valdés (2016) stated that, among alterations in perinatal mental health, the major depressive episode occurs in 8% of pregnant women, while the diagnosis of dysthymia occurs in 1%. Depression in pregnancy is associated with an increased risk of obstetric and neonatal complications in the mother and the baby and alterations in short- and long-term development.

Postpartum depression is characterized by the frequency of occurrence, as well as the intensity of the depressed mood regarding other periods of life. Mendoza and Saldivia (2015) stated that the period of higher risk or greatest vulnerability for postpartum depression are the first three months after delivery. Prevalence rates of postpartum depression around the world are in a range from 10 to 20% of mothers, increasing up to 26-38% if mothers were adolescent of low socioeconomic levels (Mendoza & Saldivia, 2015).

Perinatal anxiety

Recently, maternal stress and clinical anxiety have been recognized as important as depressive states. These disorders describe the mother's concerns about her physical appearance, her financial situation, or intense fears about childbirth and some type of child disability. The prevalence of anxiety disorders during pregnancy is around 10% in developed countries and around 25% in developing countries (Shahhosseini, et al., 2015). Approximately 8% of women in this period are diagnosed with generalized anxiety disorder (GAD) and 3% with panic disorder. A meta-analysis by Goodman, Watson and Stubbs (2016) concluded that 9% of women experienced one or more postpartum anxiety disorders. In fact, some authors point out that perinatal anxiety is more prevalent than depression: 54% of women experienced increased anxiety at some point in pregnancy, while 37% met criteria for depression (Lee et al., 2007).

Effects of perinatal depression and anxiety over the fetus and newborn

As mentioned, mental health disorders have an impact in women, but also in the fetal and newborn development at a physiological, cognitive, motor and emotional level (Field, 2011). Both prenatal depression and anxiety were associated with an increased risk for prematurity and low birth weight. Higher levels of hormones associated with stress, such as cortisol and norepinephrine, and lower levels of dopamine and serotonin were found among the newborns of women with these diagnoses (Field et al., 2011). In addition, a poor reactivity response to the Brazelton Neonatal Behavior Assessment Scale (NBAS) was observed in infants exposed to prenatal maternal depression, manifested in a deficit of social interactive orientation to the human face and voice (Field, 1998, 2011). Instead, high levels of prenatal anxiety were related to a poor performance in the NBAS domains of motor system and stability of the autonomic nervous system added to the same low orientation to social interaction (Vázquez, et al., 2005). Both disorders have been associated with difficult temperament of the baby and with sleep disturbances (Britton, 2011; Field, 2011; McGrath et al., 2008).

Pharmacological treatment of prenatal depression and anxiety

Some studies have shown that the use of psychopharmacs during pregnancy was related with congenital malformations (40% have an unknown origin and 2-3% of these are due to drugs), obstetric complications, spontanous abortion or miscarriage, gestational diabetes, poor neonatal adaptation syndrome (PNAS), and child long-term developmental adverse effects. The decision for drug therapy during pregnancy should be weighed in a conscious and informed way according to the benefits that long-term medication means for both, mother and baby (Bellantuono, et al., 2012; García-Esteve & Valdés, 2016).

It has been described how, in adults, the abruptly discontinuation of the treatment with antidepressants, antipsychotics, and benzodiazepines can cause withdrawal symptoms. As known, psychopharmacs cross through the placenta to the baby; therefore, an abrupt cessation at birth can lead the baby to the same withdrawal symptoms, some of them observed until 8 hours after the birth. These symptoms are characterized by feeding difficulties, increased irritability and tremors (Kievit, et al., 2013). The use of Selective Serotonin Reuptake Inhibitors (SSRIs) during pregnancy has increased in recent years; about 2-3% of pregnant women use them. Kievit et al. (2013) concluded in a revision that 30% of babies exposed to SSRIs showed symptoms of PNAS.

In summary, not treating perinatal mental disorders can lead to several medical complications in the baby which are a high risk for prematurity and for low birth weight, due to the high transfer of cortisol levels from mother to fetus, but also to psychological disturbances, such as irritability and agitation, poor alert responses and facial expression. Finally, the mother's symptoms and the baby temperament could affect the bond between them, which also would affect his/her behavior in the future.

The main objective of this study was to describe the neonatal behavior, measured with the NBAS, 4th edition, (Brazelton & Nugent, 2011), of babies exposed to perinatal depression and anxiety of mothers attended in a maternal mental health unit. The secondary objec-

tives were to compare the neonatal behavior of the children of mothers diagnosed with depression and those who were exposed to anxiety.

Taking into account these objectives, it is expected to find that 1) The babies of mothers with a diagnosis of depression will show similar response of interactive social orientation than the babies of the anxiety group; 2) Newborns of mothers with a diagnosis of anxiety will show poorer range of the emotional state, indicated by higher irritability and instability of autonomic nervous system, and 3) Babies exposed prenatally to antidepressants will show higher emotional instability and lower alertness than babies not exposed.

Method

Participants

A sample of 191 neonates have been evaluated with the NBAS, 4th edition (Brazelton & Nugent, 2011) in our clinical setting, in the period 2014-2019. For this study, newborns whose mothers had been diagnosed during pregnancy with any of the following disorders were selected and were grouped as follows: 1) Depression: single episode or recurrent major depression, dysthymia, postpartum depression, psychotic depression or 2) Anxiety: panic disorder with or without agoraphobia, unspecified anxiety disorder, generalized anxiety disorder, obsessive-compulsive disorder. From the whole sample, 96 babies were exposed to maternal depression or anxiety disorders; those babies born preterm (<37 weeks) were removed from the analyses. The final sample included 86 newborns.

Instruments

The *Neonatal Behavior Assessment Scale, 4th edition (NBAS*; Brazelton & Nugent, 2011) is used to observe the behavioral organization and the skills to respond to external stress and extra-uterine environment, but mainly to return feedback to parents about how their child is and how can they adapt better to satisfy the baby needs. It can be administered to healthy or to at-risk newborns up to 60 days of life. The NBAS is based on the observation of the baby's behavior when presenting stimuli to him or her. It consists of 35 behavioral items grouped into 6 domains or factors, in addition to 18 reflexes. For this study, all the behavioral items were taken into account (without reflexes), most of which were scored on a scale of 0 to 9 points, and some of which in scales 0 to 6 or 0 to 5, where 0 describes the absence of response or the worst response and 9/6/5 represents the optimal response. The six domains of the behavioral items are described below:

- *Habituation* (four items): how the baby is able to inhibit itself from repetitive and disturbing stimuli while sleeping (light, rattle, bell and tactile stimulation).
- *Social interactive orientation* (seven items): the ability to fixate and follow visual and auditory stimuli, human and non-human, which will be the basis of communicative competence.
- *Motor system* (five items): volume of motor activity, quality of movements and muscle tone.
- *Range of the state* (four items): emotional stability-instability in response to external stimuli, and the intensity, volume, speed of reaction and duration.
- *State regulation* (four items): newborn's resources to console himself and regain stability in coping stimuli.
- *Autonomic nervous system lability* (three items): frequency of tremors, changes in skin color, and startles.

Sociodemographic and clinical variables were registered from the medical history which included: *age of the mother at delivery, age of the baby, duration of gestation in weeks, type of delivery, presence and type of obstetric risk, principal psychiatric diagnosis before pregnancy* and *current perinatal psychiatric diagnosis* (according to the criteria of the Diagnostic and Statistical Manual for Psychiatric Disorders, 5th edition (DSM-5, APA, 2013) and, in case of antidepressant treatment, *dosage* (times of minimal therapeutic dose).

Procedure

The clinical guidelines of our maternal mental health unit include the assessment of the babies in different time points along the first year of life. Two certified evaluators (SAP, SLM) administered the NBAS, according to the standardized conditions of the scale. Each caregiver receives necessary feedback on the baby's performance by making some suggestions and recommendations. Data of the NBAS were registered in direct scores and also dichotomized into optimal or suboptimal response after being anonymized. For items scored on a scale up to 9, the scores were dichotomized as optimal if they were between 7 and 9, for items with scores up to 6, the optimal ones were between 5 and 6, and for items scored up to 5, the optimal ones were between 4 and 5.

Ethical Review Board of our institution approved this study.

Statistical analysis

Means (*M*), standard deviations (*SD*) and frequencies (*n*) have been extracted for the sociodemographic and clinical variables of mothers and babies. In addition, contingency tables and *chi-square* analyses have been extracted to compare the percentages in each domain of suboptimal responses. Student's t-tests (*t*) have been calculated to compare the responses of the babies exposed to prenatal depression or to anxiety. Pearson correlation indexes (*r*) were also calculated to analyze possible relationships between the antidepressant dose, birth weight, length of gestation, and chronological and postmenstrual age of the baby. The analyses were done with the statistical program SPSS 25.0.

Results

Sociodemographic and clinical data of mothers and babies

Table 1 reflects sociodemographic, clinical and obstetric data for each subgroup of newborns. Mothers of the babies in this study, had an age between 22 and 51 years of age (M = 36.33, SD = 4.39), with a mean of 36 years old. The gestation period in weeks of our sample was between 37 and 42 weeks (M = 39.09, SD = 1.27 weeks). Forty-nine percent of newborns were girls and 51%, boys. Regarding the type of delivery, cesarean was performed in 39% of deliveries and another 39% were eutocic, 13% were induced and 8%, instrumentalized. Fifty-eight percent of the sample had an obstetric problem, being gestational diabetes (8%) and preeclampsia (7%) the most registered. Babies were assessed with the NBAS in a range between 2 and 67 days of chronological age (M = 29.03, SD = 13.4) and between 39 and 47 weeks (M = 43.32, SD = 2.10) of postmenstrual age (time between conception and moment of the evaluation). Eighty-four percent of the depressed or anxious mothers of our sample had been previously diagnosed with a mental disorder before the perinatal period, being panic disorders with/without agoraphobia (16%), recurrent depressive disorder (12%), obsessive-compulsive disorder (11%) and unspecified anxi-

ety disorders (7%) the most common. Only a 1% of the mothers had been diagnosed as postpartum depression in previous pregnancies. The most diagnosed disorders during the index perinatal period were unspecified anxiety disorder (33%) followed by panic disorder with/without agoraphobia (17%), recurrent depressive disorder (13%) and obsessive-compulsive disorder (13%). Only the 4% of the women in the current sample were diagnosed as postpartum depression. Thus, diagnostic subgroups were formed by 31% of newborns from mothers with depressive disorder (n = 27) and 69% of newborns from mothers with anxiety disorders (n = 59).

Table 1. Demographic, obstetric and clinical data of mothers and babies (means and standard deviations or percentages)

	Depression N = 27 *Mean± sd*	Anxiety N = 59 *Mean± sd*	*t-test*
Mother age at delivery	36.2 ± 5.8	36.4 ± 3.4	-.20
Gestation period (weeks)	38.8 ± 1.02	39.2 ± 1.4	-1.3
Baby chronological age (days)	30 ± 11.7	29 ± 14.1	.42
Baby postmenstrual age (weeks)	43.1 ± 2	43.4 ± 2.2	-.74
Birth weight (grams)	3227 ± 488.7	3183 ± 529.5	.35
	Percentage	Percentage	*Chi2*
Sex (female)	48%	47.5%	2.257
Obstetric risk (yes)	70%	41%	2.624
Type of delivery:			1.282
Eutocic	43%	37.5%	
Induced	15.4%	13.4%	
Instrumental	11.5%	7%	
Cesarean	31%	43%	
Previous principal diagnosis:			
Major depression:			
Single episodi	5.8%		
Recurrent	11.6%		
Post-partum	1.2%		
Dysthymia	1.2%		
Panic disorder /Agoraphobia		16.3%	
Generalized anxiety disorder		3.5%	
Non-specified anxiety		7%	
Obsessive-compulsive disorder		10.5%	
Perinatal principal diagnosis:			
Major depression:			
Single episodi	11.6%		
Recurrent	12.8%		
With psychotic symptoms	1.2%		
Post-partum	3.5%		
Dysthymia	2.3%		
Panic disorder /Agoraphobia		17.4%	
Generalized anxiety disorder		5.8%	
Non-specified anxiety		32.6%	
Obsessive-Compulsive disorder		12.8%	
Use of psychopharmacs during 2nd-3rd trimester	77.8%	86.4%	1.020

*Significant p-values are stated at .05; *p<.05; **p<.01.*

Eighty-four percent of the sample received drug treatment during second and third trimester of pregnancy. Considering the women taking antidepressants as the principal psychopharmacological class (74% of total sample), 17% received fluoxetine (n = 15), 16% escitalopram (n = 14) and 13% sertraline (n = 11). Almost 26% of our sample received only the benzodiacepine lorazepam during this period. Two women received the atypical antipsychotic aripiprazole and two received the anticonvulsivant lamotrigine as a principal treatment.

Neonatal response of newborns to NBAS domains

More than two thirds of newborns showed optimal habituation to external stimuli presented during the sleep (72% to light, 87% to rattle, 70% to bell, 74% to tactile stimulus). However, little more than a half of newborns oriented optimally to the animated and unanimated visual, visual-auditory and auditory stimuli of the social interactive domain (61% to face, 52% to face-voice, 46% to ball, 51% to rattle; 78% to voice, 59% to rattle), with low quality of alertness (55%). Most of the babies manifested an optimal muscular tone (82%) and motor activity (89%) and maturity (71%), but, contrary, the response to seat incorporation was suboptimal (only 25% was optimal). Most of the newborns had a quick response to irritability (only 24%, optimal), although not to many stimuli (78%, optimal response) and not for long (81%, optimal response in excitement); high change between psychophysiological states was observed in almost 40% of the newborns. Regarding the regulation skills, 68% had an optimal response to the cuddle but almost all presented suboptimal response to consolation skills (only 18%, optimal) and did not manifest own skills to search self-comfort (10%). A 31-38% reacted with frequent startles and tremors.

Differences between babies exposed to depression and anxiety

There are no differences between the means of two groups for mother age at delivery, duration of pregnancy, baby chronological and postmenstrual ages and birth weight. Percentages of type of delivery, presence of obstetric risk, sex of babies or exposition to psychopharmacological treatment were similarly distributed between groups (p > .05). Table 2 shows the scores to NBAS items and the percentages of suboptimal response in each diagnostic group.

Taking into account the scores in each item, the neonatal behavior of babies exposed to perinatal depression did not significantly differ from babies exposed to perinatal anxiety disorders in any direct score on the NBAS scale; a trend to statistical significance is observed in motor maturity (t = -1.79; p = .077), indicating a worse response among the babies exposed to maternal depression. Related to percentages of suboptimal responses, greater percentage of babies exposed to perinatal anxiety (24%) showed suboptimal stability of the autonomic nervous system (ANS), specifically in change on skin color, in front of the 4% of suboptimal responses in babies exposed to depression (*chi-square* = 3.89; p = .048). No other significant differences were found between diagnostic groups.

Correlations between obstetric variables and baby's responses in NBAS

In order to control other variables which could affect the behavior of the baby, it was found that the length of gestation is positively correlated with the quality of the alert (r = .24, p = .038). The mother's age did not correlate with any score on the NBAS scale. The birth weight correlated positively with social interactive orientation (tracing face: r = .31, p = .012; tracing face and voice: r = .28, p = .022; alertness: r = .26, p = .027) and negatively with range of state (maximum volume of excitement: r = -.23, p= .043), indicating that more mature babies showed better orientation to social interactions, but also, more emotional instability.

Table 2. Mean and Standard deviations

	Depression *Mean± sd*	Anxiety *Mean± sd*	*t-test*	Depression Sub-optimal response percentage	Anxiety Sub-optimal response percentage	*Chi-² (p)*
Habituation:						
Light	7.3 ± 1.83	6.9 ± 2.4	.36	37.5%	25.9%	.46
Rattle	8.8 ± .50	7.7 ± 1.6	1.32	0%	16%	.92
Bell	7.7 ± 1.53	7.2 ± 2.6	.33	33.3%	30%	.14
Pin-Prick	8.3 ± .58	7.1 ± 2.3	.93	0%	31.3%	1.3
Social-Interactive:						
Inanimated Visual (ball)	6.4 ± 2.7	5.7 ± 2.7	1.0	45%	58.7%	1.06
Inanimated Visual-Auditive (rattle)	6.4 ± 2.3	5.9 ± 2.7	.79	39.1%	54.2%	1.4
Animated Visual (face) 1.1						
Animated Visual-auditive (face-voice)	6.9 ± 2.1	6.4 ±2.4	.91	30.4%	42.6%	.96
Inanimated Auditive (rattle)	6.9 ± 1.7	6.7 ± 1.8	.63	41.7%	51%	.57
Animated Auditive (Voice)						
Alertness	5.9 ± 1.9	6.5 ± 1.9	-1.1	48%	37%	.818
	6.9 ± 1.9	7.4 ± 1.5	-1.2	22.7%	21.7%	.008
	6.1 ± 1.8	6.5 ± 1.9	-8.6	53.8%	40.4%	1.3
Motor:						
Maturity	6.8 ± .83	7.2 ± 1.0	-1.8	33.3%	26.8%	.38
Pull to sit	5.1 ± 2.1	5.1 ± 2.2	-.11	78.3%	73.6%	.18
Defense	6.3 ± 1.6	6.9 ± 1.4	-1.7	42.9%	29.2%	1.2
Tonus	5.5 ± .98	5.4 ± .88	.45	14.8%	19.3%	.25
Activity	4.4 ± .97	4.6 ± .65	-1.4	14.8%	8.9%	
Range of State:						
Rapidity of Build-up	3.4 ± 1.9	1.8 ± 1.6	1.5*	72%	77.2%	.25
Irritability	5.1 ± 1.5	4.9 ± 1.7	.34	13%	25.5%	1.5
Peak of Excitement	3.7 ± .9	3.9 ± 1.1	-.85	22.2%	16.9%	.34
Lability of State	3.5 ± 1.6	2.9 ± 1.7	1.3	37%	48.3%	.94
State Regulation:						
Cudliness	46.8 ± 1.8	6.8 ± 1.7	.27	29.6%	32.7%	.08
Consolability	4.2 ± 1.9	4.3 ± 1.9	-.22	94.4%	76.9%	2.6
Self quieting	2.6 ± 1.8	2.7 ± .20	-.10	100%	85%	3.0
Hand to mouth	3.0 ± 2.2	3.1 ± 2.4	-.066	96.3%	91.1%	.74
Lability of ANS:						
Tremolousness	7.1 ± 2.6	6.8 ± 2.7	.483	37%	38%	.02
Lability of Skin Color	4.4 ± .51	4.3 ± .97	1,1**	3.8%	20.7%	3.9
Startles	7.4 ± 2.5	6.9 ± 2.4	.72	25.9%	32.8%	.41

*ANS: Autonomous Nervious System. Significant p-values are stated at .05; *p<.05; **p<.01.*

Finally, it was found that the higher the antidepressant dose received, the worse the response to the social interactive orientation (tracing to face and voice: r = -.31, p = .032; alertness: r = -.33, p = .021). It is also related to a lower range of state (maximum volume of excitement: r = -.33, p = .011) and to a worse habituation during sleep to sound stimuli (bell: r = -.55, p = .033).

In summary, higher doses of antidepressant during 3rd trimester was related to worse social interactive orientation and to a lower stability of the psychophysiological states.

Discussion

The main aim of this study was to analyze the neonatal behavior of newborns exposed to prenatal depression and anxiety from a cohort of mothers with mental disorder treated in a specialized department of perinatal mental health.

According to our diagnostic groups, perinatal anxiety disorders (69%) were more prevalent than depressive disorders (31%) in our sample of assessed newborns, which agreed with the observations of Lee et al. (2007). Nevertheless, the prevalence of defined anxiety and depression diagnoses in the wide original sample of 191 newborns assessed in the maternal mental health unit was different, with higher rates for panic disorders with/without agoraphobia (15%) and depressive episodes (11%) and lower rates for generalized anxiety disorder (less than 3%) in relation to previous studies (Garcia-Esteve & Valdés, 2016; Goodman et al., 2016), pointing out that women attended in our specialized setting suffered from more severe disorders. Although preterm newborns were removed from the analyses, the risk for prematurity is also increased in our specific sample of 96 mothers with prenatal depression and anxiety: 10% in front of the 6% rated for general population in our country (Idescat, 2019), reflecting the negative effect of maternal stress over pregnancy.

Babies of this current sample, exposed to depressive or anxious symptoms during pregnancy or first weeks of postpartum, were characterized by diminished social interactive behavior, reduced scope of arms movements and head firmness, fast irritation to stimulation, rather high variability of the emotional states and ineffective response to consolation. Previous studies and reviews have reflected poorer

social interactive orientation, suboptimal motor responses and instability of the ANS in newborns exposed to maternal stress (Field, 1998; Field et al., 2011; Vázquez et al., 2005) and other, more recently published, have found suboptimal performance in babies from mothers with prenatal depression also in the range and the regulation of the state, as it has been observed in our sample (Osborne et al., 2018).

The comparation between diagnostics showed significant differences between babies exposed to perinatal maternal depression or to anxiety in only one item (change of skin color); consequently, and contrary to our hypothesis, it is adequate to state that there were no differences in the affectation of these two groups of psychopathological symptoms over the neonatal behavior in our sample of babies from treated mothers. These findings were not agreeing with previous studies that observed worse social interactive orientation in babies exposed to depression compared to anxiety (Field, 2011) but converge with studies that found lower performance on ANS among those exposed to anxiety (Vázquez et al., 2005). This could be due to the fact that our mothers were receiving a multidisciplinary therapy program during pregnancy and postpartum that could have produced a reduction the experience of stress in both group of mothers, not based only in psychological and psychopharmacological treatment, but also in the intervention on the bond and parenting skills. The reduction of the obstetric risks associated to prenatal depression due to antidepressant treatment has received support in the literature (Jarde et al., 2016; Venkatesh et al., 2017) but there is no published research about multidisciplinary treatments.

Finally, the current study analyzed the effect of antidepressant dosage and found a relation of higher doses with a worse response in the social interactive items (face and voice), a longer response time, more volume of irritability-crying states and a worse habituation during sleep to sound stimulus. Kievit et al. (2013) observed withdrawal signs in the baby exposed to prenatal antidepressants, such as high irritability and difficulties in sleeping. Our findings could be aligned with the fact that the exposure to high doses of antidepressants was not the unique factor explaining these suboptimal responses to NBAS, but it produced additive effects over the injury due to the exposure to chronic and severe maternal states of stress and depression, given that higher doses of SSRI were administered to higher severity of symptoms (Andrade, 2017; Hermansen & Melinder, 2015). Further research has to been still considered to isolate both effects.

One of the limitations of the study is based on the fact that the syndromic groups have been cataloged according to DSM-5 clinical diagnoses; however, clinical questionnaires about anxiety and depression were not administered to all women of the sample and have not been considered in the current analyses. A second limitation was that the lack of a control group of mothers and babies of general population did not allow the analyses of significant deficits for the clinical sample. Having a larger subgroup of treated mothers without pharmacological treatment would be useful to know more robustly the additive effects of psychopharmacological treatment over the symptom's severity in the affectation of the neonatal behavior as well as to compare different kinds of treatment. The same would be useful regarding to control the additive effect of obstetric risks, such as gestational diabetes or pre-eclampsia in these mothers with depression and anxiety disorders. In addition, other variables such as the maternal substance use (nicotine, caffeine, alcohol, cannabis and others illicit drugs) have not been registered, neither the existence of previous children, which in some way could also affect the experience of anxiety during pregnancy.

As a final conclusion, we want to reinforce the importance of continuing to create specialized units in perinatal mental health to support mother-infant dyads and ensure their mental health and development. To continue the training and the research to observe the neonatal behavior, crucial in prevention and early intervention, contributes to strengthening the bond mother-child and the stimulation of the communication between the family and their baby. Longitudinal and prospective studies about the response to multidisciplinary treatments for mental disorders and maternal skills would be necessary to understand the child needs and to adapt to the temperamental traits.

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