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ORIGINAL RESEARCH

Depressive symptoms in pregnant women with high trait and state anxiety during pregnancy and postpartum

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Background: Depression and anxiety are frequent during pregnancy, and epidemiological studies demonstrate high rates of co-morbidity.

Aims: To evaluate the association between the trait and state anxiety and depressive symptoms in women during the perinatal period.

Method: A transversal study was conducted at the National Institute of Perinatology (INPer, Mexico City) from 2012 and 2015. Pregnant women diagnosed with Major Depressive Disorder (MDD) were included (N=128). Depressive and anxiety symptoms were evaluated using CES-D and STAI, respectively. Patients were sub-classified according to percentile 75 for Low and High Trait Anxiety (LTA, HTA) and Low and High State Anxiety (LSA, HSA); depressive symptoms were compared between pregnant women and women in the postpartum, by state and trait levels.

Results: CES-D scores differed according to state and trait anxiety levels: while we observed that depressive scores (CES-D) were higher in HTA patients compared to LTA prenatally (35.9±9,5 vs 21.2±10,8 respectively; p=0.001), this finding was not observed in the postpartum period. In the case of state anxiety depressive scores were elevated among HSA versus LSA groups before delivery (33.0±11.3 vs 14.0±6.7 respectively; p=0.008) and after partum (35.1±8.06 vs 10.0±6.0; p=0.005).

Conclusions: Patients showed higher scores of depressive symptoms when high trait or state anxiety comorbidity is present during the perinatal period. In the postpartum period, even low trait anxiety scores were associated with high depressive scores.

Keywords: perinatal depression, perinatal anxiety, women, major depressive disorder

Introduction

Depression and anxiety are mental health disorders characterized by emotional lability, hopelessness, difficulty concentrating, low level of energy, alterations in the pattern of food and sleep, and irritability.[2] Feelings of sadness and anhedonia characterize depression; anxiety follows excessive worry and restlessness. Both conditions can occur in the perinatal period (up to one year after delivery).[2] According to the World Health Organization (WHO), globally maternal mental health problems are considered a significant public health challenge. International studies have reported a perinatal depression prevalence between 2 and 21%[4,16] increasing to 31% with self-report scales.[16] In the Mexican population, prenatal depression prevalence was reported in 9%[24] and 12% in the postpartum period.[31] Thus, perinatal depression is a crucial issue in obstetrics and mental health, not only

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for its prevalence but also for the associated risks for both mother and infant's health and well-being, respectively.[4] The impact of depressive and anxiety symptoms during the perinatal period are widely studied and includes obstetric adverse outcomes,[3,7] consequences in the family dynamic[25,32] and medical complications,[1,5] among others.[10,12,30]

In the case of prenatal anxiety, international prevalence was reported to be between 15.8% and 25%[13,21] and from 13 to 31.7% in the postpartum period.[6] In Mexico, prenatal anxiety has been reported from 10.6% to 14.8% and 9% in the postpartum period.[28] It is important to mention that there have not been many studies evaluating comorbid depressive and anxiety symptoms in the perinatal period.

Epidemiological studies consistently demonstrate high rates of co-morbidity between anxiety and depression; recent studies have established 9.5% during pregnancy, as well as 7.6% in postpartum.[9] Anxiety is an insufficiently studied mental health condition compared to depression; however, the importance of prompt identification has been described, because it acts as a possible predictor of depressive symptomatology in the postpartum period.[28] Britton reports a 50% increase in maternal anxiety during the first month postpartum, mainly in women at high risk of anxiety and previous depressive symptoms.[6] The present study aims to evaluate the association between depressive and anxiety symptoms during pregnancy and postpartum. Unlike previous studies, anxiety was taken into account as a trait and state according to a high or low level and the association shown with depressive symptomatology.

Material and methods

A cross-sectional study comprising 128 women in the perinatal period exhibiting Major Depressive Disorder (MDD) were evaluated during the pregnancy or postpartum. The study was conducted at the National Institute of Perinatology (INPer, Mexico City) from March 2012 to December 2015. The present study was approved by the ethical institutional committee (National Institute of Perinatology/HGM D1/14/112/04/072); this study was conducted in accordance with the Declaration of Helsinki, and all participants signed an informed consent form.

Patients attending the outpatient obstetric unit were invited to participate in the present study. Inclusion criteria were as the following: women in the perinatal period (all patients with a confirmed pregnancy by ultrasound or those who had their first visit to the outpatient service after partum), under 42 years age, able to complete all the instruments. We excluded patients with medical comorbidities, patients with psychiatric disease comorbidity or neurological condition, drug or substance abuse and dependence. Patients who had pregnancy loss were also excluded from the study because we consider that all of them have high levels of anxiety and/or depressive symptoms. In the case of incomplete data of some patients, we excluded them to the analysis. Data collection of the patients meeting all inclusion criteria and without exclusion criteria initiated in this first evaluation.

After the first evaluation, a clinical interview in the Psychiatry Department was conducted by an experimented Psychiatrist who diagnosed Major Depressive Disorder according to the Diagnostic and Statistical Manual of Mental Disorders, fourth version, reviewed text (DSM-IV-TR). In the same interview other psychiatric disorders were explored and patients with comorbidity were excluded from the study. After this interview, patients were asked to fulfill the standardized instruments for depressive and anxiety symptoms.

Instruments

Depressive symptoms were assessed by the Center for Epidemiologic Studies- Depression Scale (CES-D), a 20-item questionnaire that rates the frequency during the previous week of symptoms associated with depression. Each item is scored 0, 1, 2 or 3 depending on the frequency of symptoms (rarely, some time, occasionally or all of the time); higher scores imply more depressive symptoms and the total score could range from 0 to 60 points. The CES-D has been traduced to Spanish and validated for its use in Mexican population showing adequate clinimetric properties.[15,26,27] The CES-D has been widely used in México to screen perinatal depression.[29]

The State-Trait Anxiety Inventory (State-Trait Anxiety Inventory (STAI), was used to assess anxiety symptoms in all participants. The STAI is a self-report of anxiety symptoms. It is composed of two subscales: State Anxiety and Trait Anxiety, 20 items each, based on a 4-point Likert scale. The State Anxiety Scale evaluates the current state of anxiety, which is questioned as "at this moment" while the Trait Scale Anxiety evaluates the "anxiety proneness" or the longstanding quality of trait anxiety, which is interrogated as "in general".[20] The range of scores for each subtest is 20–80, the higher score indicating greater anxiety. The STAI has been translated and adapted in Spanish for its use to the Mexican population.[17,35]

Statistical analysis

All data are expressed as mean ± (Standard error of the mean) SEM. Demographic and clinical variables were compared with chi-square tests for categorical variables and independent sample two-tailed *t*-testfor continuous variables contrasts. The two-tailed *t*-test was used to compare state and trait anxiety scores between pregnant patients and patients at the postpartum. One-way ANOVA assessed comparisons between evaluation time according to gestation weeks groups with Tukey post hoc analysis. We grouped patients in high or low levels of anxiety using the 75 percentiles for both trait and state anxiety scores. Comparisons between High state anxiety (HSA) levels and Low state anxiety levels (LSA), as well as comparisons between high trait anxiety (HTA) levels and low trait anxiety (LTA) levels, were conducted using ANOVA test. For all statistics, a $p<0.05$ was considered significant. Statistical analysis used the SPSS software v24 (IBM® SPSS®, USA).

Results

One hundred twenty-eight patients were included in the study, 101 were pregnant participants and 27 were in the postpartum period. The population average age was 25±7 years. The demographic characteristics of the population are summarized in Table 1. No differences on demographic and general clinical characteristics were observed when we compared pregnant patients and patients at postpartum.

Anxiety symptoms

The trait-anxiety and state-anxiety scores, pre-and post-delivery are shown in Figure 1. No statistically significant difference was observed in the STAI total scores in prepartum and postpartum evaluations. Trait anxiety total scores were 27.14 and 28.69 in the pregnancy and the postpartum period, respectively (t=−0.26, p=0.85), in the case of State anxiety total scores at pregnancy and the postpartum period were 28.69 and 27.21, respectively (t=−0.27; p=0.66). However, some specific items were more intense in the prepartum compared to the postpartum evaluations. State-Anxiety presented differences on those questions about comfort such as "I feel upset". Trait-Anxiety indicated differences on worries and feeling overwhelmed; such as "I feel nervous", "I feel that difficulties are piling up so that I cannot overcome them", and "I worry too much over something that really doesn´t matter". To compare symptoms through time the patients were sub-divided according to the gestational week or elapsed time after childbirth (Figure 2). Groups were catalogued as follow: EV1 (n=37), before 22 gestational weeks (gw); EV2 (n=63), between 23 gw and birth, EV3 (n=18) during the first 6 months postpartum; and EV4 (n=8), after 6 months postpartum (see Figure 2). The only 3 items in the State-anxiety scores that were significantly different between those 4 groups were: "I fell satisfied with myself," "I feel that difficulties are piling up so that I cannot overcome them," and "I worry too much over something that really doesn´t matter."

Interestingly, for analyzed items anxiety levels were lower in patients evaluated during the postpartum, particularly EV4 group compared to EV1 and EV2 groups. There were no differences in demographic or general clinical characteristics between these groups, data not shown.

Table 1 Clinical and sociodemographic characteristics of the patients

	Mean (SD)	
Age (years)	(25±7.08)	
Pregestational weight (Kg)	(65.9±12.0)	
		n (%)
Socioeconomic level	1	26 (20.3)
	2	81 (63.3)
	3	18 (14.1)
	4	3 (2.3)
Marital status	Single	60 (46.9)
	Married	63 (49.2)
	Divorced/separated	4 (3.1)
Educational level	Elementary school	4 (3.1)
	Incomplete junior high school	9 (7)
	Junior high school	21 (16.4)
	Incomplete senior high school	27 (21.1)
	Senior high school	27 (21.1)
	College studies	11 (8.6)
	Graduated college degree	16 (12.5)
	Post-graduated studies	3 (2.3)
	Technician	9 (7)
	Illiterate	1 (0.8)
Religion	Catholic	104 (83.2)
	Another	14 (11.2)
	Non-religion	7 (5.6)
Ethnics	Mexican	123 (96.1)
	Latin (other)	2 (1.6)
	Caucasian	2 (1.6)

Notes: Socioeconomic level =1 represents the poorer condition and 4 represents the best economic situation. Frequencies and percentages are shown.
Abbreviation: SD, standard deviation.

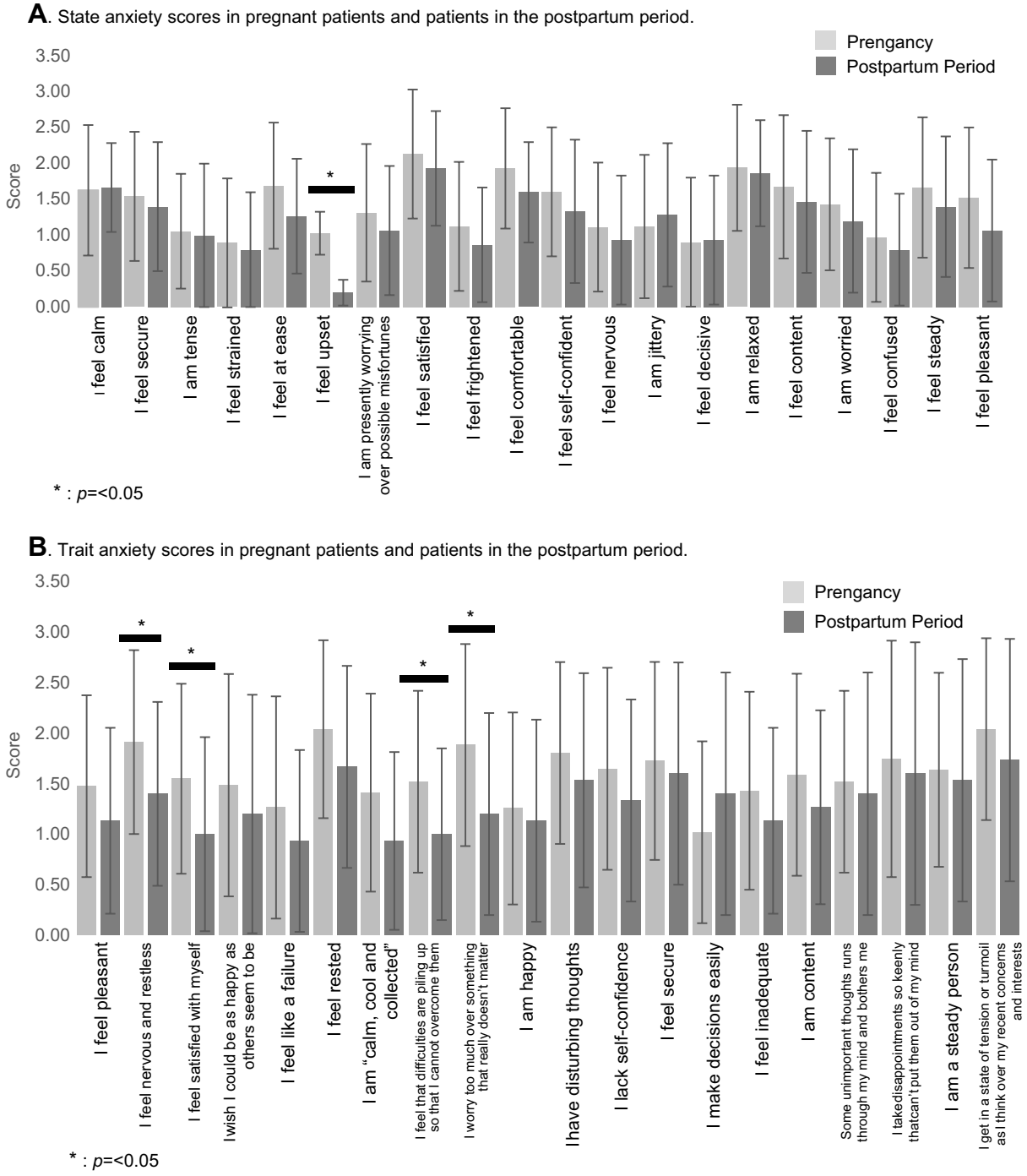

Figure 1 Comparison of state and trait anxiety scores between pregnant patients and patients in the postpartum. (**A**) State anxiety scores in pregnant patients and patients in the postpartum. (**B**) Trait anxiety scores in pregnant patients and patients in the postpartum.

Depressive symptoms

In the case of depressive symptoms, postpartum CES-D scores were higher than prepartum CES-D score, but this difference did not reach statistical significance (33.3±10.94 vs 24.8±14.0; p=0.053) (Figure 3). We also analyzed item by item in the prepartum and postpartum evaluations and no differences were observed.

Depressive symptoms on high anxiety levels in pregnant patients

Trait anxiety levels were sub-classified according to percentile 75 for Low and High Trait anxiety (HTA). Depressive symptomatology was compared between these groups before and after delivery (Table 2). Results indicated that depression levels in

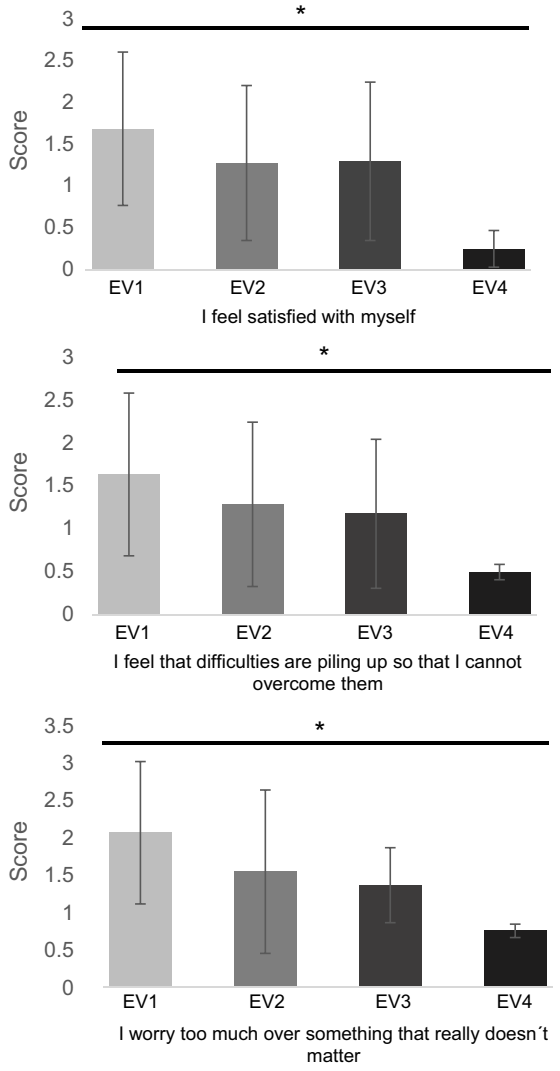

Figure 2 State-Anxiety scores in pregnant patients and patients in the post-partum period. EV1 patients evaluated before 22 gw; EV2 23 gw to birth; EV3 delivery to 6 months post-partum; and EV4 after 6 months post-partum. *Significant difference between EV1 and EV4, $p<0.05$.

patients with High Trait Anxiety (HTA) were increased compared to Low Trait Anxiety (LTA) before delivery (21.2±10.8 vs 35.9±9.5, respectively, $p=0.001$), this phenomenon was not replicated after delivery (29.6±9.9 vs 34.2±9.98, respectively, $p=0.463$).

State anxiety levels were also analyzed according to percentile 75. patients were sub-classified for Low (LSA) and High State anxiety (HSA), and depression levels were compared between these groups before and after delivery (Table 2). Results indicated that depression levels in patients with HSA are increased compared to LSA during pregnancy (33.0±11.39 vs 14.0±6, 72 respectively, $p=0.008$), as well as the scores after delivery (35.1±8.06 vs 10±6.00; $p=0.005$).

There were no differences between demographic or clinical characteristics between these groups.

Discussion

Several authors have reported a close relationship and high comorbidity between depression and anxiety.[18,22] Furthermore, pathophysiological mechanisms are shared between depression and anxiety disorders.[11] Patients exhibiting major depressive disorder (MDD), comorbid anxiety resulted in poorer outcomes, such as a decrease in antidepressant response rate and prolonged recovery from a depressive episode.[8] Interestingly, recent studies showed that significant risks reported during pregnancy included subjects exhibiting a psychiatric disorder, poor health behaviors, low birth weight, adverse perinatal outcomes, higher risk of suicide attempt, among others.[14] In a meta-analysis conducted by Lancaster,[23] it was shown that life stress and maternal anxiety were significantly associated with a higher probability to display prepartum depressive symptoms, with anxiety, being one of the strongest predictors of depression among studied variables. It is even proposed that anxiety symptoms during pregnancy are one of the strongest risk factors for postpartum depression.[34] In the present study, we found that women with high trait anxiety show significant higher depressive scores concerning women with low trait anxiety during pregnancy. Such relation was not detected in the postpartum, showing any differences among women exhibiting either high and low trait anxiety, respectively. Regarding the state anxiety, we found that women with high scores of state anxiety showed high depressive scores, during pregnancy and the postpartum, as well. These findings suggest that anxiety symptoms represent a risk factor for developing depressive disorder in the perinatal period; whereas anxiety features throughout life (trait anxiety) is more a condition that influences pregnancy but not the postpartum. Worth to note is that symptom analysis revealed that comfort and well-being displayed the highest scores during pregnancy, albeit that such symptoms are not exclusive of anxiety trait. Concerning the trait anxiety, symptoms that flecked higher scores were related to an emotional process, such as, feeling nervous and overwhelming feeling; indicating that state anxiety appears to be closely related to depression in pregnancy and the postpartum with respect to the anxiety trait. Although, we did not explore why our patients were anxious; recent studies showed a close relationship between anxiety and depression during pregnancy[36,38] suggesting that state anxiety might be more closely associated to depression than anxiety trait, as our results show herein.

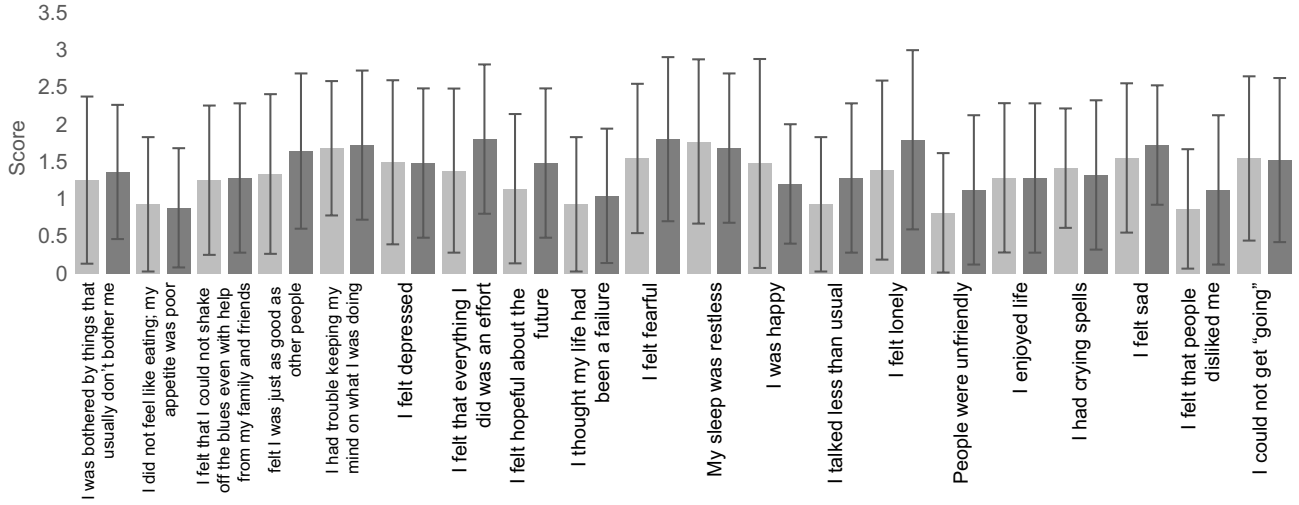

Figure 3 Depressive symptoms in pregnant patients and patients in the postpartum. No significant difference was observed between pregnant patients and patients at the postpartum when evaluated each CES-D item. $p<0.05$.

Despite that several factors might have influenced the anxiety scores during the evaluations, it is important to consider the interrelation between trait and state anxiety, as proposed by Huizink[19] describing that trait and anxiety may influence each other over time along pregnancy.

Furthermore, a prospective study in pregnant women showed that the prevalence of an increased depression during early pregnancy might predict an increase in anxiety and stress in late pregnancy,[33] data that may support the association between anxiety and depression during the perinatal period.

In this line, we consider that monitoring depressive and anxious symptoms along the perinatal period represents a crucial issue that might help in reducing and/or preventing the risks associated mood-related disorders, which may impinge on both mother and the offspring physical and mental health. Distinct validated instruments may be used for monitoring depression and anxiety in pregnant women, particularly short instruments that are rapid and easy to apply. Moreover, the identification of such symptoms during early pregnancy may be crucially important to assess specific treatments for such mood-related disorders, besides preventing the negative outcomes that result from depression and anxiety, as well.[37]

Nonetheless, certain limitations need to be highlighted in the present study; for instance, the cross-sectional evaluation and the small sample size. Additionally, a deeper search of stressful life events would have allowed factors and grounds leading to the anxiety state. Nevertheless, the depressed scores obtained in patients with HSA vs LSA showed significant differences, supporting that these issues should be considered in future studies.

A remarkable point of our study is the evaluation of anxiety as a state or as a trait and its relation to depressive symptoms. It contributes to elucidate the importance of "suffer a situation that generates stress" in the perinatal period or having an anxiety trait that could not be related to depressive symptoms increase at the postpartum period. Other conditions but not trait anxiety could predispose to depressive symptoms during the postpartum period, which should be the focus of study for later research in this field.

Conclusion

High levels of trait and state anxiety were found associated with high depressive scores in pregnant women. At the postpartum, high levels of state anxiety showed to be related to depressive symptomatology. In the case of trait anxiety, patients with low or high levels of had high CES-D scores in the postpartum. Patients with low trait anxiety levels were both prone to be depressed in the postpartum period. Our results support the importance of assessing anxiety symptoms during the perinatal period.

Disclosure

Dr Mónica Flores-Ramos has served as a speaker for Schwabe-Pharma. The authors reports no further conflicts of interest in this work.

Table 2 CES-D scores in pregnant patients and patients in the postpartum, according to with high state anxiety and high state anxiety classification

(A) **State anxiety scores by CES-D item in pregnant patients and patients in the postpartum.**				
	Pregnancy		**Post partum**	
CES-D Item	**Low state anxiety**	**High state anxiety**	**Low state anxiety**	**High state anxiety**
1	0.611±0.6	1.50±1.10*	0.67±0.56	1.71±0.75
2	0.50±0.78	1.11±1.10	0.67±0.57	1.43±1.25
3	0.56±0.50*	1.67±1.03	0.33±0.30	1.71±1.11
4	0.78±0.70	1.67±1.10	0.33±0.31	2.29±1.11
5	1.22±1.00	1.72±0.96	2.00±0.10	2.00±0.57
6	0.39±0.30*	2.17±0.99	0.67±0.57	2.14±1.07
7	1.33±1.28	1.59±1.17	1.58±1.17	2.33±1.15
8	0.78±0.70	1.50±0.78	1.00±0.90	1.71±0.76
9	0.33±0.31*	1.5±1.09	1.00±0.9	1.29±0.75
10	0.72±0.70*	2.33±0.76	1.33±1.30	1.71±0.95
11	1.44±1.19	2.27±0.89	0.66±1	2.29±0.76
12	0.61±0.60*	1.61±0.78	0.33±0.30	1.14±0.78
13	0.56±0.50	1.06±1.05	0.33±0.57	1.00±0.57
14	0.39±0.57*	2.00±1.14	0.33±0.57*	1.00±0.57
15	0.28±0.27*	1.22±1.06	1.09±1.07	1.57±0.98
16	0.83±1.04	1.61±0.98	0.33±0.30	1.29±1.11
17	0.76±0.66*	1.67±0.84	0.67±0.57	1.89±1.07
18	1.00±1.00*	2.00±0.68	0.67±0.57	1.87±0.89
19	0.50±0.49	1.00±0.90	1.05±1.11	1.29±0.76
20	0.78±0.70*	2.00±1.03	0.67±0.57	1.57±1.51
CES-D total score	14.05±6.72*	33.06±11.39	10±6.00*	35.17±8.06

(B) **Trait anxiety scores by CES-D item in pregnant patients and patients in the postpartum.**				
CES-D Item	**Pre partum**		**Post partum**	
	Low trait anxiety	**High trait anxiety**	**Low trait anxiety**	**High trait anxiety**
1	1.03±0.09	1.81±1.1*	1.14±1.02	1.63±0.74
2	0.70±0.93	1.6±1.1*	0.71±0.69	1.13±1.0
3	0.99±0.98	1.86±0.94*	1.00±0.99	1.88±0.99
4	1.25±1.1	1.59±0.85	1.57±0.01	1.88±1.1
5	1.58±1.05	2.00±1.02	1.43±0.85	2.13±0.99
6	1.17±1.1	2.32±0.84*	1.07±0.92	2.00±1.07
7	1.14±1.12	2.05±0.92*	1.64±0.93	1.88±1.2
8	0.97±0.95*	1.63±0.84*	1.29±1.1	1.50±1.1
9	0.65±0.6	1.64±1.04*	0.86±0.7	1.13±0.99
10	1.30±1.08	2.14±0.77*	1.79±1.1	1.75±1.28
11	1.57±1.1	2.32±0.78*	1.29±0.99	2.00±1.07
12	1.30±1.20	1.95±0.80	0.71±0.61	1.75±0.70
13	0.76±0.71	1.50±0.91*	1.21±1.05	1.50±0.93
14	1.06±1.16	2.23±0.87*	1.31±1.25	2.38±0.92
15	0.68±0.67	1.18±1.05	1.14±1.29	0.75±0.70
16	1.07±1.03	1.86±0.88*	0.71±0.70	1.88±0.83*
17	1.19±1.01	2.00±0.82*	1.07±0.83	1.75±1.28
18	1.30±1.05	2.13±0.77*	1.35±0.74	2.25±0.71

(*Continued*)

Table 2 (Continued).

(B) Trait anxiety scores by CES-D item in pregnant patients and patients in the postpartum.				
CES-D Item	**Pre partum**		**Post partum**	
	Low trait anxiety	**High trait anxiety**	**Low trait anxiety**	**High trait anxiety**
19	0.70±0.69	1.45±1.14*	0.86±0.84	1.25±1.03
20	1.38±1.14	2.00±0.93	1.07±0.99	2.00±1.3
CES-D total score	21.2±10.8	35.9±9.5*	29.60±9.9	34.29±9.98

Note: Low and high trait anxiety was classified considering percentile 75 of the total sample. *$p < 0.05$.

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