Personality, depressive symptoms during pregnancy and their influence on postnatal depression in Spanish pregnant Spanish women

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Título: Personalidad, síntomas depresivos en el embarazo y su influencia en la depresión postparto en gestantes españolas.
Resumen: El objetivo del presente estudio es analizar la influencia de los factores de personalidad y los síntomas depresivos antenatales en la depresión puerperal. Se elaboró un diseño ex post facto prospectivo, con una asignación voluntaria de los sujetos. La muestra se compuso de 116 mujeres, captándose en el primer trimestre de embarazo y terminando el estudio a los cuatro meses postparto. Los instrumentos de medición empleados fueron la escala Edinburg Postnatal Depression Scale (EPDS) para evaluar la depresión postparto, el NEO-Five Factor Inventory (NEO-FFI) para analizar la personalidad y la subescala de depresión del Symptoms Check List 90-R (SCL 90-R) para valorar la depresión en el embarazo. Se tuvieron en cuenta variables sociodemográficas (edad, paridad, nivel de estudios, situación laboral, y planificación de embarazo) y clínicas (Apgar neonatal y tipo de parto). Se encontró una relación positiva entre la depresión postparto y los síntomas depresivos durante la gestación, sin embargo tras realizar un análisis de regresión se vio que el neuroticismo era el único factor que predecía los síntomas depresivos postparto, explicando un 24.8% de la varianza. El neuroticismo influye considerablemente en la salud psicológica ante acontecimientos vitales como es la maternidad. Debido a su condición estable, la personalidad podría evaluarse desde el inicio del embarazo, incidiendo en la atención de aquellas mujeres con un rasgo predominante de neuroticismo para prevenir, detectar y tratar precozmente la depresión puerperal.
Palabras clave: personalidad; embarazo; depresión postparto; mujer.

Abstract: The aim of this study was to analyse the influence of personality factors and antenatal depressive symptomatology in postnatal depression. A prospective ex post facto design was carried out. The sample consisted of 116 women, recruited in their first trimester of pregnancy and followed up until four months postpartum. The measurement instruments used were the Edinburg Postnatal Depression Scale (EPDS) to assess postpartum depression, the NEO-Five Factor Inventory (NEO-FFI) to analyse personality traits and the depression subscale of the Symptoms Check List 90 (SCL-90-R) to assess depressive symptomatology in the first half of pregnancy. Socio-demographic variables (age, parity, educational level, employment status, and planned pregnancy) and clinical variables (neonatal Apgar score and mode of delivery) were also taken into account. A positive correlation was found between postpartum depression and depressive symptomatology in the first trimester; however after the regression analysis neuroticism was the only factor that predicted postpartum depressive symptoms, explaining 24.8% of the variance. Neuroticism significantly influences psychological health during life events such as motherhood. Due to its stable condition, personality could be assessed from the beginning of pregnancy, contributing to the care of pregnant women with high scores in neuroticism, to prevent, detect and treat early postnatal depression.
Key words: personality; pregnancy; postpartum depression; woman.

Introduction

The birth of a new child doesn't always represent a satisfactory emotional event for the mother. There is a large amount of research that has suggested that in the puerperal phase there is a risk of appearance of postnatal depression. Its incidence, depending on the different reviews, ranges between 10-15% (Dennis and Hodnett, 2007), although there seems to be a great amount of variability based on socio-cultural factors (Halbreich y Karkun, 2006).

Personality and psychological health

Out of the large amount of personality theories the Big Five theory, presented by Costa and McCrae (Costa and McCrae, 1992; McCrae and Costa, 1987) stands out as an explicative model of personality. This theory establishes the existence of five independent traits: neuroticism (which identifies people with a tendency to suffer from psychological stress and with ineffective coping strategies), extraversion (which refers to the amount and intensity of interpersonal relationships, activity, need for stimulation and ability for en-

joyment), openness to experience (receptiveness to new situations) agreeableness (tendency to be empathic, worries about social harmony, optimistic views and tendency to control negative emotional expressions) and conscientiousness (degree of organization, persistence, control and motivation) (Boyle, Matthews, and Saklofske, 2008).

Gender differences have been found in respect to personality traits, some studies show that higher scores are more frequent in women for all five traits (Goodwin and Gotlib, 2004), others have found that these differences are only to be found for conscientiousness and agreeableness (Griens, Jonker, Spinhoven, and Blom, 2002), whilst others have suggested that women scored higher on neuroticism, extraversion, agreeableness and conscientiousness in different countries, although these differences can become less salient when affected by adverse socio-economic situations (Schmitt, Realo, Voracek, and Allik, 2008).

There has been a lot of research focused on the relationship between personality and different psychological disorders. It has been shown that neuroticism has a positive relation with generalized anxiety disorder (Bienvenu et al., 2001), whilst extraversion is negatively associated to these disorders (Gomez and Francis, 2003). Openness to experience and conscientiousness associate negatively to obsessive compulsive disorder and agreeableness associates to post-traumatic disorder (Chung, Berger, Jones, and Rudd, 2006).

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As for depressive symptoms, neuroticism has been considered to influence the onset of depressive disorder (Goodwin and Gotlib, 2004; Peñate, Perestelo, Bethencourt, and Ramírez, 2009). It has also been shown that when somebody is suffering from a depressive disorder scores for neuroticism and extraversion are influenced by the depressive state, these scores will again change once the depressive symptoms recede, whilst the other three traits remain stable (Griens et al., 2002). In samples of children it has also been shown that there is a positive association between depression and neuroticism, as well as a negative association between depression and conscientiousness, extraversion, openness and agreeableness (Carrasco and del Barrio, 2007). It has also been found that higher scores on neuroticism are associated with a higher recurrence of depressive episodes in older adults (Steunenberg, Braam, Beekman, Deeg, and Kerkhof, 2009).

Socio-demographic and clinical variables and postnatal depression

Low socio-economic and educational status (Buist et al., 2008; Mayberry, Horowitz, and Declercq, 2007; Ritter, Hobfoll, Lavin, Cameron, and Hulsizer, 2000) as well as unemployment (Rubertsson, Wickberg, Gustavsson, and Radestad, 2005) have a negative influence on postnatal depression. Adolescence is a critical period that makes women more vulnerable to depression when facing childbirth and care taking of the infant. Different studies have shown that there is an increase in the risk of puerperal depression in young women (Mayberry et al., 2007), with an incidence rate that can even be as high as 40% (Logsdon, 2004; Schmidt, Wiemann, Rickert, and Smith, 2006). Non-planned pregnancies also increase the risk of developing depressive symptoms in the puerperal stage (Barbadoro et al., 2012; Karacam, Onel, and Gercek, 2011).

Certain variables have been associated to alterations of the mother's mood, it has been suggested that high risk pregnancies, obstetric complications or prematureness all contribute to the development of depressive symptoms (Agoub, Moussaoui, and Battas, 2005; Davis, Edwards, Mohay, and Wollin, 2003; Korja et al., 2008; Piyasil and Pichaiyut, 2011; Verdoux, Sutter, Glatigny-Dallay, and Minisini, 2002; Verkerk, Pop, Van Son, and Van Heck, 2003; Vigod, Villegas, Dennis, and Ross, 2010). In births that produce neonatal complications (foetal suffering or hospitalization of the new-born) there is an increase of depressive symptoms (Blom et al., 2010). Other variables, such as multiple births don't seem to have such a clear influence, as some researchers have found that there is an increase in the risk of depression (Mayberry et al., 2007) whilst others have found the contrary (Barbadoro et al., 2012). As for breast-feeding, this factor seems to have a protective effect (Akman et al., 2008; Hatton et al., 2005; Sibolboro Mezzacappa and Endicott, 2007).

Emotional elements, personality and postnatal depression

There is a large body of research about analyzing the influence of different factors during pregnancy on postnatal depression. Dysfunctional beliefs and self-esteem (Jones et al., 2010), as well as quality of the relationship as a couple (Zelkowitz et al., 2008), and life events (Rubertsson et al., 2005) can all increase the risk of developing postnatal depression.

There are numerous studies which specifically analyse the effect that anxiety and depressive disorders during pregnancy have on postnatal depression. The presence of depressive symptoms during pregnancy has been associated with the onset of depression after childbirth (Chaudron et al., 2001; Milgrom et al., 2008; Saisto, Salmela-Aro, Nurmi, and Halmesmaki, 2001). Some studies have focused on how antenatal depression is a factor that, independently from other variables, can predict the appearance of postnatal depressive symptoms (Kim, Hur, Kim, Oh, and Shin, 2008; Verkerk et al., 2003).

Several authors have demonstrated that there is an influence of the mother's depressive history before pregnancy, finding a positive association between the existence of depressive episodes before pregnancy and the later development of postnatal depression (Henshaw, 2003; McCoy et al., 2008; Milgrom et al., 2008).

Other studies have focused on analysing the influence of anxiety on postnatal depression, identifying a positive association between it and antenatal anxious symptoms (Milgrom et al., 2008), therefore suggesting that the onset of these symptoms a strong independent predictor (Austin, Tully, and Parker, 2007).

Nevertheless, there aren't that many studies which have analysed the influence of personality on postnatal depression. Amongst the personality factors studied, the one that has shown as most consistent role in the development of depression has been neuroticism, which associates positively with depressive symptoms in puerperal phases (Henshaw, 2003; Jones et al., 2010; Lee, Yip, Leung, and Chung, 2000; Podolska et al., 2010; Saisto et al., 2001; Verkerk, Denollet, Van Heck, Van Son, and Pop, 2005).

This current study aims to assess the influence of personality on puerperal depression, controlling for other socio-demographic and clinical variables which have been studied in the literature as possible risk factors. Likewise, due to the relevance that antenatal depression has shown, we will be analysing its possible role in postnatal depression.

Our working hypotheses are:

H1: Personality traits influence postnatal depression, in such a way as that a high score in neuroticism and low scores on extraversion, agreeableness, openness and conscientiousness will play an important role in predicting depressive symptoms. Of all personality traits, neuroticism is expected to have the highest predictive value.

H2: Depressive symptoms during pregnancy influence the onset of postnatal depression, without eliminating the effect of neuroticism.

Method

Participants

Participants of the current study are part of a wider observational-longitudinal study, aimed at analysing the influence of different psychological factors in the course of pregnancy, childbirth and puerperal phases. Our temporal measures for the current study were obtained during the first half of pregnancy and in the puerperal phase, four months after childbirth.

The sample was composed of pregnant women from Health Area 9 of the Community of Madrid. Inclusion criteria were being over 18 years of age, appropriate understanding of Spanish, and not having been diagnosed previously or during the pregnancy with a psychiatric disorder, as well as having no medical alterations of the mother or foetus that could put the pregnancy at a significant risk. Exclusion criteria were miscarriage and neonatal alterations diagnosed at birth.

A total of 290 questionnaires were obtained through mail during the first trimester, out of which 5 were excluded due to late miscarriages, thus making a final sample of 285 women. They were all re-contacted over the phone after childbirth, out of these 116 questionnaires were returned 4 months after childbirth.

The women that composed our sample received obstetric attention at the Hospital Universitario de Fuenlabrada (HUF), which is a public hospital in the south of Madrid, it caption area is of 216803 people, and attends around 3000 obstetric patients a year. The average age of our sample was 31.31 years old (30.46 – 31.65), 82.8% of the pregnancies were planned, 50.5% of the women were multiparous. 27.5% had attended primary school, 45.4% had attained secondary education and 27.1% had university education, 65.1% were working when they got pregnant.

Average gestational age for the women when they completed the first trimester questionnaires was of 14.41 weeks (14.10 – 14.90). The puerperal questionnaires were completed on average 16.90 weeks after childbirth (16.26 – 17.53).

Assessment instruments

Neo Five Factor Inventory (NEO-FFI) (Costa and Mc Crae, 1999). This is a reduced version of the Neo Personality Inventory (NEO-PI-R). For the current study, we used the Spanish version (Seisdedos, 1999). It is composed by 60 items that assess all five personality factors (neuroticism, extraversion, openness to experience, conscientiousness and agreeableness), on a Likert type scale that ranges from 0 (*completely disagree*) to 4 (*completely agree*). Each dimension is composed by 12 items, and can have a theoretical range of a

minimum of 0 to a maximum of 48. Its factorial structure has been confirmed through an exploratory and confirmatory analysis (Ludtke, Trautwein, Nagy, y Koller, 2004). The expected factor structure of the five traits has been replicated with a moderate correlation between the scales ($r < .37$). Cronbach's alpha for each variable in this study ranged between .70 and .86.

Edinburg Postnatal Depression Scale (EPDS). Designed by Cox, Holden and Sagovsky (1987), and adapted for Spanish population by García-Esteve, Ascaso, Ojuel and Navarro (2003). The scale is composed by 10 multiple-answer items, with four possible alternatives each; we established a 10/11 point cut-off for diagnosis of major depression with a sensitivity of 100% and a specificity of 92%, and a positive predictive value of 28.8%. In the study by Cox et al. (1987) they obtained a Cronbach's alpha coefficient of 0.87, sensitivity of 85%, a specificity of 77%, and a positive predictive value of 83%. Cox and Holden (2003) suggest that failure to detect depression in women could be reduced by 10% if a lower cut-off were used, of 9/10, therefore identifying almost all cases of depression with very few false negatives and thus recommending this cut-off point in studies in which EPDS is the only scale used. In the current study Cronbach's alpha coefficient was of .88.

Symptoms Check List 90-R (SCL 90-R). Designed originally by Derogatis (*Derogatis, 1977*) and adapted to Spanish population by De las Cuevas et al. (1991). It is composed of 90 items with a Likert type response scale ranging from 0 (*not at all*) to 4 (*extremely*), it assesses 9 dimensions: somatisation, obsession compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism. For the current study we used the depression subscale to assess depressive symptoms in the first half of pregnancy. This subscale has shown adequate convergent validity with other assessment instrument for depression such as Beck's Depression Inventory or Hamilton's Depression Scale (Aben, Verhey, Lousberg, Lodder, and Honig, 2002). In general, the SCL-90-R has shown adequate reliability for all dimensions, with a Cronbach's alpha coefficient for the current study of .85 for the depression subscale.

All other variables referring to socio-demographics such as age, parity, educational level, working status and pregnancy planning were collected using a questionnaire created by the research team. All clinical data, such as Apgar score and type of birth, as well as essential data to determine inclusion/exclusion from the study were assesses using clinical history case notes.

Procedure

Recruitment of the sample was completed between October 2007 and December 2008. The participants were recruited over the phone after having previously checked their results of the first trimester ultrasound in their clinical records. Once the participants had been informed and after accepting to volunteer to be included in the study we posted

the questionnaires along with a pre-paid envelope for them to be returned to the Obstetrics Department at the hospital. Four months after childbirth, we contacted the participants again and sent out new questionnaires, including the EPDS scale, which were to be returned to the hospital once they were completed.

The study obtained ethical approval from the hospital's ethics committee. The participants signed informed consent forms once they had accepted to participate

Design

We used a prospective ex post facto design for the study, with volunteer allocation of participants to the study sample.

Statistical analysis

Several analyses were performed. First, we performed a descriptive analysis of the data. Afterwards we compared mean scores on depression in the first trimester and on the EPDS scale, for the groups of socio-demographic and categorical clinical variables we used Student's *t*-test, Snedecor's *F* test and Mann-Whitney's *U* test, as well as Pearson's correlation for age. We performed correlation analyses between

the different variables (personality, antenatal depression and postnatal depression) using Pearson's correlation.

Following this we created a predictive regression model to explain the influence of the different personality factors and depressive symptoms in the first trimester on postnatal depression. Diagnostic criteria for the model were carried out according to Fox (1991), to verify the assumptions of the model (linearity, homocestacity), independence according to the Durbin-Watson statistic and normality using the Kolmorogov-Smirnov test for normality of distribution. The study of the influential values was conducted using Cook's distance, according to the criteria set by Cook and Weisberg (1982), without taking into account abnormalities.

Results

Higher scores in the NEO-FFI show were found for extraversion, agreeableness and conscientiousness, whilst neuroticism showed the lowest scores. Mean scores for women on the SCL-90-R depression scale was de 0.73 (*IC* 95% 0.67-0.79), which is low in comparison to the theoretical range (0-4) (Table 1).

Table 1. Pearson Correlation Between Personality Factors, Antenatal Depression, Post-partum Depression and Maternal Age (*N* = 116).

	M (CI 95%)	1	2	3	4	5	6	7
1. EPDS global score	5.60 (4.74 – 6.46)	-						
2. Neuroticism	18.05 (17.20 – 18.90)	.494*	-					
3. Extraversion	31.52 (30.81 – 32.23)	-.307*	-.347*	-				
4. Openness	26.01 (25.31 – 26.72)	-.077	.055	.240*	-			
5. Agreeableness	30.79 (30.12 – 31.45)	-.097	-.320*	.185*	.303*	-		
6. Conscientiusness	31.81 (31.14 – 32.48)	-.307*	-.369*	-.380*	-.004	-.065	-	
7. 1st trimester depression	6.16 (5.25 – 7.06)	.396*	.658*	-.197*	.043	-.191*	-.181*	-
8. Maternal age	31.05 (30.46 – 31.65)	-.0034	.016	-.002	.082	-.030	.026	-.055

Note. * *p* < .01; *CI* – confidence interval.

Scores on the EPDS varied on a wider range, with scores between 0 and 22 (Mean: 5.60; *IC* 95% 4.74 – 6.46) (Table 1). A total of 19.2% of women scored above 9 on the scale. We found no significant differences for socio-demographic or clinical variables on EPDS scores when comparing the groups; significant differences were found for depressive symptoms in the first trimester amongst women who had planned their pregnancies compared to those who hadn't (*t*(59.35) = 3.77; *p* < .01; *d* = .65) (Table 2). No significant correlations were found between EPDS scores or depression in the first trimester and age (Table 1).

We compared mean scores on the variables between women who completed their participation in the study and those who only participated in the first half. We found no significant differences either in the socio-demographic or clinical variables, or in personality traits. Nevertheless, we did find significant differences on their depression scores in the first trimester, finding higher scores amongst the women who dropped out of the study (*t*(285) = 2.419; *p* = .016; *d* = .293).

A significant positive correlation was found between scores on EPDS scores and neuroticism (*r* = .494; *p* < .001) and depressive symptoms in the first trimester (*r* = .396; *p* < .001); a significant negative correlation was found between EPDS scores and extraversion (*r* = -.307; *p* < .001) and conscientiousness (*r* = -.307; *p* < .001).

We designed a regression model with a predictive purpose, which included neuroticism, extroversion and conscientiousness to examine their effects on depressive symptoms after childbirth. In this model we later introduced depressive symptoms in the first trimester, as we had found a strong correlation with postnatal depression. Sociodemographic and clinical variables were not included in the model, as there was not a significant influence of these variables on EPDS scores these were not included. The final model showed that the only trait that had predictive capacity was neuroticism, which explained 24.8% of the variance on puerperal depressive symptoms, which is a moderate effect (Table 3).

Table 2. First Trimester Depression Scores and Postpartum Depression Scores With Relation to Sociodemographical Variables.

		1T n = 285	PP n = 116	1T depression	EPDS
Education	Primary	77	27	0.70 (0.53)	6.11 (5.34)
	Secondary	129	57	0.77 (0.49)	6.35 (4.99)
	University	77	32	0.71 (0.53)	5.84 (4.53)
Working	Yes	185	78	0.82 (0.56)	5.74 (4.84)
	No	98	38	0.68 (0.47)	7.00 (5.01)
Previous abortions	Yes	78	27	0.72 (0.53)	6.85 (6.21)
	No	206	89	0.78 (0.46)	5.94 (4.47)
Previous deliveries	Yes	139	56	0.75 (0.52)	6.09 (4.97)
	No	143	59	0.72 (0.51)	6.22 (4.94)
Pregnancy planning	Yes	235	98	**0.67 (0.46)**	6.28 (4.94)
	No	49	18	**1.03 (0.63)**	5.50 (4.83)
Mode of delivery	Eutocic		60		5.42 (4.27)
	Non eutocic		39		5.72 (4.37)
Apgar score	< 7		2		8.00 (5.66)
	>=7		104		5.62 (4.58)

1T = first trimester of pregnancy; PP = postpartum.
All data are presented as mean (standard deviation). Statistically significant differences are presented in bold ($p < .01$).

Table 3. Regression Model for the Prediction of Postpartum Depression Symptoms.

	F	R^2	IncR^2	Beta	t	p
Step 1:	13.450*	0.267	0.247			
Neuroticism				**0.420**	**4.539**	**< .001**
Extraversion				-0.104	-1.111	.269
Conscientiusness				-0.086	-0.908	.366
Step 2:	10.399*	0.294	0.248			
1st trimester depression				0.134	1.087	.279

Note. Standardized regression coefficients (betas) are derived from the step in which they were added to the equation; *Tabla 1.

Discussion

In accordance with the aims we set at the beginning of our study, our results help to confirm the influence of personality traits on puerperal depression. It's interesting to highlight the negative association found between extraversion and conscientiousness and scores on EPDS, as the literature about these personality traits and postnatal depression is scarce. Extraversion could, therefore, be a protective element when facing important life events, the optimism found in extraverted people could diminish the risk of developing depressive symptoms during pregnancy. Conscientiousness, which is characterized by persistence, control and organization, could also be a protecting factor when facing a stressful situation such as motherhood, thus decreasing the presence of depressive symptoms. However, these variables don't have the same predictive influence as neuroticism on postnatal depression.

Our proposed model shows a significant influence of neuroticism on postnatal depressive symptoms, which is in accordance with previous literature (Henshaw, 2003; Jones et al., 2010; Lee, Yip, Chiu, y Chung, 2000; Saisto et al., 2001; Verkerk et al., 2005). Neuroticism is characterized by a tendency to suffer from psychological stress and the use of poor coping strategies, which could be leading mothers to face motherhood in a more dysfunctional way, increasing the risk of developing an emotional disorder.

However, if we analyse the predictive power of all five personality traits in the onset of depressive symptoms, in most studies, we can find a strong influence of neuroticism, but it is difficult to find a defined personality profile in which the other traits may have the same influence. Studies such as the one from Weiss et al. (2008), in an older age groups, have shown an effect of conscientiousness as well as neuroticism on the incidence of major depression, suggesting that the combination of extraversion, openness and conscientiousness influences the relationship of neuroticism with the onset of depression. Other studies which have focused on adult population have shown an association exclusively between neuroticism and depression, as well as with other psychological disturbances such as anxiety and obsessive thinking (Bienvenu et al., 2001, 2004).

Thus, it seems neuroticism may be the most important trait in association to emotional disturbances. Specifically when referring to motherhood, due to the significant change that childbirth generates, which could be interpreted as a stressful situation which requires an important effort to adapt, women with high neuroticism could be more susceptible to presenting depressive symptoms.

In addition to the life event that childbirth represents, we also have to take into account all the hormonal changes that occur immediately after delivery and that different studies have associated to depressive symptoms (Bloch et al., 2000). It is also important to highlight the relationship between neuroticism and the functional polymorphism of the seroto-

nin-transporter, as this gene has been associated to emotional disorders linked to the reproductive hormonal cycles and hormonal modifications that occur after childbirth (Gingnell, Comasco, Oreland, Fredrikson, and Sundstrom-Poromaa, 2010; Sanjuan et al., 2008), although there are no specific studies in the puerperal phase. It would be necessary to analyse depression, neuroticism and other psycho-physiological elements associated to changes in gonadotropins after childbirth.

Although mean scores on depressive symptoms during the first trimester were low, they were significantly higher in the group of women whose pregnancies were not planned, this is in accordance with similar findings in other studies (Yanikkerem, Ay, and Piro; 2013). Average scores for EPDS were lower than those found in other studies on Spanish population. The percentage of women with a score above 9 was also lower in our sample (19.2% of women) (Garcia-Esteve et al., 2003; Limlomwongse and Liabsuetrakul, 2006). As for the presence of depressive symptoms during pregnancy, although these are associated to depressive mood after childbirth, as other studies have also found (Chaudron et al., 2001; Milgrom et al., 2008; Saisto et al., 2001), they don't seem to have the strong influence on postnatal depression that neuroticism has or its ability to predict this disorder.

None of the socio-demographic or clinical variables showed a relevant role on the development of postnatal depression. There were no differences between women who had planned their pregnancies and those who had not, this could be due to the higher prevalence of non-planned pregnancies among younger women, and those who don't have a stable partner. In this situation, social support may not be appropriate to the mother's needs, which could thus increase the likelihood of developing emotional problems. In our sample the average age of the participants was 31.3 years old, and they all counted on social and/or family support (including those whose pregnancies had not been planned). As in other studies, we weren't able to find differences between the women based on their parity (Barbadoro et al., 2012); therefore new studies are needed to assess the influence of this variable, as having had other children previously could be a factor to take into account. Apgar scores, although they are an indicator of neonatal wellbeing, probably don't constitute an appropriate parameter to identify women at higher risk of presenting postnatal depression; therefore other better indicators should be used, such as the presence of complications in the new-born which may provoke a separation of mother and child and that may imply that there is a hospitalization of the child (Blom et al., 2010). Something similar should be considered regarding mode of delivery, as maybe the mother's experience of childbirth could be more important than the mode of delivery per se.

This study has some limitations that should be mentioned. In first place women that participated were recruited voluntarily in a single health centre, which could be limiting representativity, therefore generalization of the data to general pregnant population could be compromised. We also must take into account that our inclusion criteria made it necessary for the participant to have a high level of Spanish comprehension. This also influenced the way our sample was composed, as it excluded an important group of pregnant women from the area, as it includes a large proportion of immigrants who don't have a high level of understanding of the language. Another limitation is the reliability of the data obtained through self-informed measures. Specifically, when these instruments are used to assess negative variables (neuroticism, worries, psychological symptoms), participants are more likely to be biased in their responses.

It is important to highlight that women who dropped out of the study had higher scores on the SCL-R-90-R depression subscale. This could be creating a bias because we found significant positive correlations between antenatal depression and postnatal depression. The possible predictive role that antenatal depression has on postnatal depression would have been better represented if the entire simple had continued on to the end of the study. However, this limitation doesn't seem to have an influence on the predominant role that neuroticism has shown to have above all other variables.

In conclusion, amongst personality traits, neuroticism is a factor that has a considerable influence on psychological health when facing life events that require the use of coping strategies, such as motherhood. Because personality has traditionally been considered stable we are able to assess it at the beginning of pregnancy. Women who show neuroticism to be a predominant trait could benefit from individual psychological attention during pregnancy, to help them develop strategies aimed at coping with motherhood, as well as from close follow-ups after childbirth, so as to be able to detect mood symptoms as soon as possible which could be indicating the onset of a depressive disorder.

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