Factor Structure of the Spanish Version of the Edinburgh Postnatal Depression Scale

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Introduction. The Edinburgh Postnatal Depression Scale (EPDS) is considered the gold standard in screening for postpartum depression. Although the Spanish version has been widely used, its factorial structure has not yet been studied .

Methods. A total of 1,204 women completed the EPDS 32 weeks after delivery. To avoid multiple testing, we split the sample into two halves, randomly drawing two subsamples of 602 participants each. We conducted exploratory factor analysis (EFA), followed by an oblimin rotation with the first sub-sample. Confirmatory factor analysis (CFA) was conducted using a Weighted Least Squares Means and Variance (WLSMV) estimation of the data. We explored different solutions between two and four factors. We compared the factors between two groups with depression and non-depression (evaluated with the Diagnostic Interview for Genetic Studies (DIGS) for the DSM-IV).

Results. The EFA indicated a three-factor model consisting of anxiety, depression and anhedonia. The results of the CFA confirmed the three-factor model ($\chi 2=99.203$, $p<0.001$; RMSEA=0.06, 90% CI=0.04/0.07, CFI=0.87 and TLI=0.82). Women with depression in the first 32 weeks obtained higher scores for anxiety, depression and anhedonia dimensions ($p<0.001$).

Conclusions. This is the first study of confirmatory analysis with the Spanish version of EPDS in a large sample of women without psychiatric care during pregnancy. A three-factor model consisting of anxiety, depression and anhedonia was used. Women with depression had a higher score in the three dimensions of the EPDS.

Keywords: Postpartum, Depression, Anhedonia, Anxiety, Factorial Analysis

Actas Esp Psiquiatr 2018;46(5):174-82

Estructura factorial de la versión española de la Escala de Depresión Posnatal de Edimburgo

Introducción. La Escala de Depresión Posnatal de Edimburgo (EPDS) es considerada el *gold standard* para el cribado de depresión postparto. Aunque la versión española ha sido ampliamente utilizada, su estructura factorial no ha sido todavía analizada.

Metodología. Un total de 1.204 mujeres completaron la EPDS a las 32 semanas del parto. Para evitar pruebas múltiples dividimos la muestra en dos mitades de 602 participantes. Se realizó un análisis factorial exploratorio (AFE) con rotación oblimin con la primera sub-muestra. Posteriormente, con la segunda de las muestras se realizó un análisis factorial confirmatorio (AFC) mediante la estimación *Weighted Least Squares Means and Variance* (WLSMV). Se exploraron diferentes soluciones entre dos y cuatro factores. Comparamos los factores en dos grupos de participantes con depresión y sin depresión (evaluados con la Entrevista Diagnóstica para Estudios Genéticos (DIGS) para el DSM-IV).

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Resultados. El AFE mostró un modelo de tres factores compuesto por ansiedad, depresión y anhedonia. Los resultados del AFC confirmaron el modelo de tres factores ($\chi 2$=99,203, p<0,001; RMSEA=0,06, 90% CI=0,04/0.07, CFI=0,87 y TLI=0,82). Mujeres con depresión a las 32 semanas tuvieron puntuaciones más elevadas en ansiedad, depresión y anhedonia (p<0,001).

Conclusiones. Primer estudio de análisis confirmatorio de la versión española de la EPDS, en una amplia muestra de mujeres sin tratamiento psiquiátrico durante el embarazo. Un modelo de tres factores compuesto por ansiedad, depresión y anhedonia ha sido obtenido. Mujeres con depresión tuvieron una mayor puntuación en las tres dimensiones de la EPDS.

Palabras clave: Postparto, Depresión, Anhedonia, Ansiedad, Análisis Factorial

INTRODUCTION

The transition to motherhood can result in some mothers feeling insecure and showing symptoms of stress and anxiety. It is believed that the percentage of mothers with emotional stress or postpartum depression ranges between 10 and 15%[1–3]. In our setting, a multicenter study conducted in Spain shows that the prevalence of significant symptoms of depression was 15.5% at 8 weeks after delivery and 12.7% at 32 weeks after delivery[4].

Anxiety disorders, with or without depression, are common in the postpartum period[5–7]. Depression and anxiety in pregnancy represent two of the most important risk factors for postpartum depression[8–11], with a more likely manifestation of anxiety traits in postpartum depression than when a woman suffers from depression at other times of her life[12]. On the other hand, in a large sample composed of 8,323 women, 18.4% of the participants with anxiety disorder were also diagnosed with depressive disorder, and 33.9% of the women suffering from depression had an anxiety disorder[13]. Another study found that between the sixth and ninth months after childbirth, 8.5% of women showed, occasionally or often, intense anxiety or panic attacks[14]. In this regard, several studies suggest that anxiety disorders are at least as disruptive as depression and may be more prevalent[5,6,8,9,15]. Recently, the contribution of anxiety in depressive symptoms after childbirth, when assessed with the Edinburgh Postnatal Depression Scale (EPDS), has been demonstrated using a structural equation model in a sample of women in Spain[16].

Several risk factors have been studied in the development of postpartum depression. Thus, the influence of biological variables such as reproductive hormones[17] or genetic alterations[18] has been recorded. A significant history of psychiatric illness in the family[19] as well as previous psychiatric history[1,10,11,19], neuroticism[20], cognitive attribution style[21], stressful life events[1,22], perceived vital stress[10], limited social support[23,24], coping strategies[4,16] or low self-esteem[24] in the mother are considered social and psychological risk factors. In this sense, from a biopsychosocial model, it has been found that the association between biological risk factors and depression would be partially mediated by the relationship between depression and anxiety[25].

Some authors believe that anxiety disorders are usually included in the diagnosis of postpartum depression[5,26], so anxiety and depression should be assessed during the perinatal period[27]. In this sense, the term "postnatal mood disorder" has been proposed instead of postpartum depression[5]. Previous findings suggest the need to distinguish between depression and postpartum anxiety.

At present, the EPDS[28] is considered the gold standard for the detection of depressive symptoms in the postpartum period. The factorial analysis of the EPDS items carried out in a large variety of samples and in different countries and cultures has shown several factorial solutions[6,29–44]. Several studies have obtained a solution of three factors: depressive or non-specific depressive symptoms (items 7, 8, 9 and 10), anhedonia factor (items 1 and 2) and anxiety symptoms (items 3, 4 and 5)[36,43]. These results imply that obtaining an anxiety dimension using items from a scale designed to assess depressive symptoms poses construct validity problems for the EPDS. The use of EPS as a gold standard of postpartum depression may minimize the importance of postpartum anxiety symptoms. Several studies[32,35] have found that the sub-scale or anxiety factor of the EPDS is robust and correlated with other measures of anxiety, such as the Anxiety Inventory State Trait[45]. In fact, items 3, 4 and 5 of the EPDS, which have been frequently replicated in an anxiety factor and constitute a scale called EPDS-3, can be used for screening anxiety through a cut-off point of 6 or higher[37]. Another study has concluded that the sub-scale of anxiety of the EPDS could be a reliable and valid tool for the screening of anxiety in a large sample of women in the antenatal period, with cut-off point of 4 or higher[42]. This cutoff point of the anxiety scale has been obtained to identify women with anxiety disorders (comorbid with depression or when anxiety manifests without another disorder)[39].

To date, the analysis of the factorial structure of the Spanish version of the Edinburgh Postnatal Depression Scale has not been carried out. Determining the dimensions of the EPDS will help researchers better understand depressive symptomatology after delivery, allowing more specific scores of other dimensions, such as anxiety.

Therefore, this study has three objectives: 1) to examine the factorial structure of the Spanish version of the EPDS

through an exploratory factorial analysis (AFE); 2) to test the adequacy of the solution identified using a confirmatory factor analysis (CFA) and analyze the reliability values of the factors; and 3) obtain the descriptive statistics and analyze the differences in the scores of the EPDS factors between the group with depression and the group without depression at 32 weeks of delivery.

METHODOLOGY

Procedure

The sample is part of a multi-center study conducted in seven hospitals in Spain[18]. All participants were evaluated three times in the context of a larger study. The first assessment was made 2-3 days after the birth of the baby. The other evaluations were made 8 and 32 weeks after delivery. Recruitment was performed through consecutive sampling in obstetrics departments when the participants were admitted for the birth of their child. All women were evaluated on all occasions "face to face" by mental health specialists (psychiatrist or psychologist), with prior training in the scales to ensure the proper application of the instruments and consensus among groups. Given that our study assesses postpartum depression, several exclusion criteria were considered to avoid the inclusion of women with a psychiatric disorder during pregnancy that could bias the registry of depressive symptomatology that originated in the postpartum period. Specifically, women with psychiatric care during pregnancy were excluded. In the same way, women whose babies died after childbirth were excluded from the study given the traumatic condition of this circumstance. Likewise, women with language difficulties or cultural illiteracy who were not able to answer the questionnaires or refused to complete the follow-up visits were excluded. Being underage was the only exclusion criterion for age. All the participants were Spanish and of Caucasian origin. The study project received bioethical approval in all the participating institutions, and all the women signed an informed consent form. Thus, all procedures complied with the Declaration of Helsinki.

In the first visit, sociodemographic (age, marital and economic status and employment status) and obstetrics variables were collected, as well as other variables related to personality. The symptomatology of the participants' mood was recorded during the three visits. In the present work, we analyzed the responses of the EPDS 32 weeks after delivery. The criterion of detection of postpartum depressive symptomatology differs between studies or even between categories of diagnostic criteria. The time frame most commonly used by research studies to specify the onset of symptoms ranges from 3 months[46] to 12 months after delivery[47], although other studies report depressive symptoms even before three months[48,49]. The decision to schedule the three visits was arranged to include a time frame covering the earliest and latest onset of depressive episodes. In this sense, for the present study, we opted to analyze the data with the scores at 32 weeks since, given that more time had passed since delivery, this estimate would better reflect the probable presence of depressive symptomatology.

To ensure an accurate diagnosis, we used two evaluation procedures, one for screening and the other for diagnosis of depression. For the assessment of depressive symptomatology, we used the Edinburgh scale, which allows us to obtain a dimensional score of depressive symptomatology. Subsequently, women who obtained a score of 9 or higher were interviewed to determine whether they met the criteria for depression for the DSM-IV through the Spanish version of the Diagnostic Interview for Genetic Studies (DIGS)[50]. Subsequently, and once the factors of the EPDS were determined, we compared whether there were differences in the dimensions between the group with depression and the group without depression.

Participants

In this study, 1,204 women completed the EPDS at 32 weeks. The sample had an average age of 32.12 years (SD=4.4). Most women (97.1%) were married or had a stable partner; 94,2% were living with their families. More than two-thirds of the sample (69%) were employed at the time of the evaluation, and 47.6% were primiparous. Regarding education, 26.4% of the participants had a primary education, 42.8% a secondary education and 30.6% a university education. Additionally, 18.8% had experienced medical problem during pregnancy, and 34.1% suffered complications. The average EPDS score was 4.3 (SD=4.6) at 32 weeks of delivery.

Clinical assessment

1) Edinburgh Postpartum Depression Scale (EPDS)[28], Spanish version[51]. This scale evaluates depressive symptoms, is self-administered and consists of 10 items with four possible answers and a total score range of 0 to 30.

2) Diagnostic Interview for Genetic Studies (DIGS) for the DSM-IV[50], adapted for postpartum depression to obtain a clinical diagnosis of major depression. This is a structured interview for psychiatric disorders developed in 1994 by the National Institute of Mental Health (NIMH) for genetic studies. Its polydiagnostic capacity allows the detailed evaluation of the course of the disease, the chronology and the comorbidity.

Statistical analysis

An exploratory factor analysis (AFE) and, subsequently, a confirmatory factorial analysis (CFA) were carried out. To avoid multiple tests, we divided the sample into two halves, randomizing 602 participants in each sub-sample. We perform an AFE with a subsequent oblimin rotation to the first sample. Based on previous research, we explore different solutions between two and four factors. AFE was performed in the R 3.3.0 and psych package. AFC was performed using the Weighted Least Squares Means and Variance (WLSMV) estimation for data via R 3.3.0 and lavaan package. The goodness of fit was assessed with the usual indexes[52]: $\chi 2$, comparative fit index (CFI), Tucker and Lewis index (TLI), root mean squared error of approximation (RMSEA), residual root mean square (RMSR), and Bayesian information criteria (BIC) using conventional critical levels[53]. For identification purposes, the latent factor variances were set at 1. For the univariate analyses, the data were analyzed using the Student's t-test to compare factors between groups (women with and without postpartum depression evaluated with the DIGS) and $\chi 2$ to compare the groups in the demographic variables. The level of significance was established at $p<0.05$.

RESULTS

The prevalence of depressive symptoms according to the EPDS was 12.5% at 32 weeks of delivery. The prevalence of major depression according to the DIGS interview was 8.6% at 32 weeks.

In terms of factor analysis, we explored the different solutions between two and four factors. Based on the interpretation of the factors and the different indices, a structure of three factors best replicated the data (Table 1). BIC was the lowest for a three-factor solution (BIC= -59.36), while RMSEA and RMSR were adequate (0.06 and 0.03). TLI showed excellent adjustment (0.96). The sedimentation graph indicated a three-factor solution delimiting 55% of the variance. The first factor explained 19% of the total variance, including items 7, 8 and 9 (Table 2). A second factor with items 3, 4, 5 and 6 explained 18%. The third factor explained 18% of the variance with items 1, 2 and 10. Except for item 10, with a correlation with its factor of 0.27, all the items had a correlation coefficient higher than 0.40. To replicate the factor structure of the AFE, we tested the adjustment of a three-factor model using AFC. The chi-square value for the model was 99,203, with 32 degrees of freedom ($p<0.001$). RMSEA was 0.06 (90% CI=0.04/0.07). CFI and TLI were 0.87 and 0.82, respectively. All indices indicated a fair relative fit. Figure 1 shows the factorial weights standardized in each factor. The correlation between the anxiety and depression factors was 0.76; the correlation between depression and anhedonia was 0.87, and the correlation between anhedonia and anxiety was 0.69. Cronbach's alpha for the 10 items on the EPDS scale was 0.86. The reliability for items 7, 8 and 9 was 0.84; for items 1, 2 and 10, the reliability was 0.72; and for items 3, 4, 5 and 6, the reliability was 0.77.

When we divided the sample into two groups according to the results of the DIGS interview, women with major depression had a mean (±SD) age of 31.98 (±5.03) years, while women without depression had a mean of 32.14 (±4.38) years. The two groups were similar in terms of age, educational level, type of coexistence and presence of complica-

Table 1 Goodness of fit for the EPDS models

	RMSEA	RMSR	TLI	BIC
Two-factor	0.108	0.04	0.876	38.7
Three-factor	0.06	0.03	0.962	-59.36
Four-factor	0.033	0.01	0.989	-52.47

Table 2 Factor analysis of the Spanish version of the Postnatal Depression Scale of Edinburgh (EPDS)

	F I	F II	F III
1. I have been able to laugh and see the funny side of things	-0.03	0.01	**0.88**
2. I have looked forward with enjoyment to things	0.06	0.00	**0.80**
3. I have blamed myself unnecessarily when things went wrong	0.04	**0.58**	0.09
4. I have been anxious or worried for no good reason	-0.03	**0.79**	-0.05
5. I have felt scared or panicky for no very good reason	0.02	**0.71**	-0.01
6. Things have been getting on top of me	0.09	**0.43**	0.19
7. I have been so unhappy that I have had difficulty sleeping	**0.54**	0.05	0.10
8. I have felt sad or miserable	**0.75**	0.02	0.12
9. I have been so unhappy that I have been crying	**0.92**	-0.01	-0.07
10. The thought of harming myself has occurred to me	0.16	0.11	**0.27**

In bold, the highest factorial loadings of each item in the factor

tions or medical problems during pregnancy. There were differences between the groups regarding the employment situation during pregnancy (with a percentage of 71.1% active, 10.8% unemployed, 8.2% student / home and 9.9% maternity leave in the group of women without depression compared to 55.4%, 14.4%, 9.4% and 20.9%, respectively, in the depression group) and the marital status of the women (97.8% married, 1.7% living together and 0.5% other in the non-depressed group) compared to 93.6%, 4.3% and 2.1%, respectively, in the depression group). The results of the univariate analysis showed that women with depression during the first 32 weeks obtained a significantly higher score in the three factors of the EPDS (p<0.001) (Table 3).

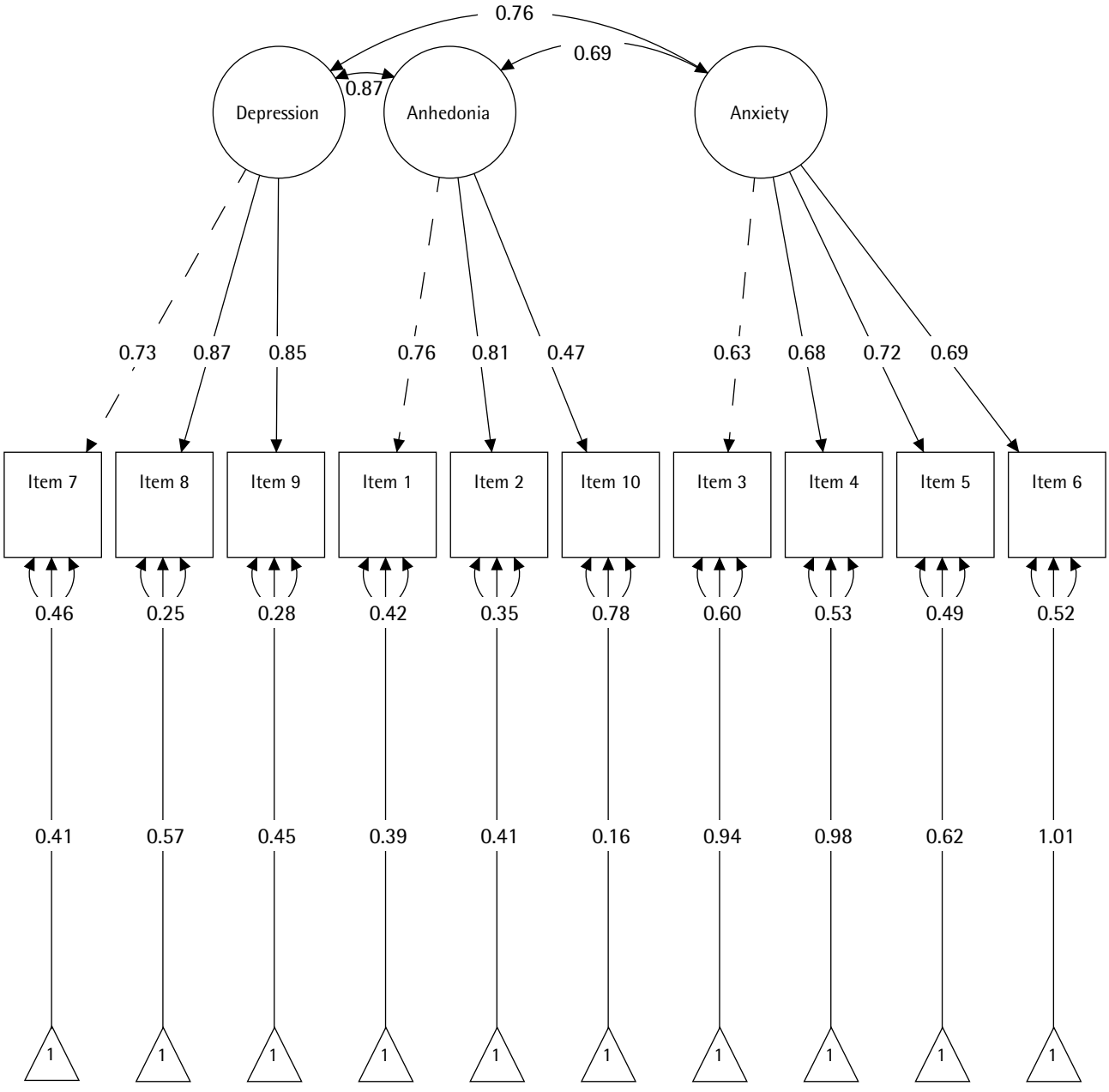

Figure 1 | *Three dimensional model of EPDS scale with standardized factorial loadings in each factor*

DISCUSSION

This is the first study that analyzes the factorial structure of the Spanish version of the EPDS. We created a three-factor model with a large sample of women evaluated in the postpartum period. By dividing the sample into two halves, we have shown with AFE and AFC that a three-factor model best fits our data. The three factors are grouped around items 1, 2 and 10 (anhedonia), items 3, 4, 5 and 6 (anxiety) and questions 7, 8 and 9 (depression). Although with some variation, a three-factor solution similar to that obtained in our study has been found in other countries[43,44]. Excluding item 10, a composite factor of items 1 and 2 has been obtained with several versions of the EPDS[33,38,41], which is usually considered an anhedonia factor. A factor called "depression" composed of items 7, 8 and 9 similar to ours was obtained with the Japanese version of the EPDS[44]. A composite dimension with items 3, 4 and 5, understood as an anxiety factor, has been delimited in other studies[6,30,32,35,39,40,43].

Our results have shown that all the items correlated with their factor with values from 0.43, except for item 10 in the anhedonia factor with a low saturation of 0.27. In several studies in which a two-factor solution was obtained, item 10 appears in the same factor as items 1 and 2, among other items[30,37,39,40]. Other studies that obtained a bi-factorial solution for the EPDS show a composite factor of items 1, 2, 8 and 10[34]. Likewise, a factor composed only of item 10 has been found in other studies[6,32,35,41]. Although our results show that item 10 is related to the anhedonia factor, in other studies, this item is associated with the depression content of the EPDS[30,33,37–41,43]. Therefore, since it implies suicidal ideation (The thought of harming myself has occurred to me), this item indicates the severity of the depression. The low correlation of item 10 in our study, together with the results obtained previously, suppose that within the general construct of postpartum depression, this EPDS criterion is unstable. However, a recent work that collects the results of a meta-analysis conducted with studies published from 1965 to 2016 shows that there is a robust association between anhedonia and suicidal ideation and that this is independent of depressive symptomatology[54]. The association between anhedonia and suicidal ideation can be explained from a psychological perspective. In this sense, ideas of suicide have been considered part of dysfunctional strategies of experiential avoidance (tendency to avoid unwanted psychological experiences)[55,56]. On the other hand, from a neurobiological approach, both the motivational anhedonia and the risk of suicide have been linked to a decrease in the release of dopamine in the striated circuit[57], which would lead to an alteration in decision making and in the processing of the reward[58].

Table 3 Differences (means and standard deviation) between the groups with major depression and without major depression in EPDS factors

EPDS items	Depression (n=140)	No depression (n=1064)	p
3, 4, 5, 6 - Anxiety	4.92 (3.18)	2.69 (2.41)	<0.001
7, 8, 9 - Depression	2.88 (2.48)	0.72 (1.41)	<0.001
1, 2, 10 - Anhedonia	1.62 (2.01)	0.31 (0.83)	<0.001

Several authors have evaluated the construct of the anxiety scale of the EPDS[32,35,37,39,42,59]. For example, a study conducted in a sample of women from the general population found that a score of 6 or higher on the EPDS-A scale (items 3, 4 and 5) detected symptoms, according to the DSM-III-R criteria, in at least one anxiety disorder, including generalized anxiety disorder, panic disorder or obsessive-compulsive disorder[37]. However, other results from the anxiety scale and the total score of the EPDS found that the scales did not differentiate anxiety disorders from depression, nor were they associated with any diagnosis of a particular anxiety disorder[60]. Models of psychopathology have proposed that the comorbidity between anxiety and depression could be explained by the common negative emotionality, understood as the tendency to experience negative emotional states[61]. This model implies that the symptoms of depression and anxiety are not different constructs but rather a manifestation of emotional distress. To evaluate this postpartum distress construct, defined as symptoms of anxiety and depression, instruments such as the PDM (Postpartum Distress Measure) have been developed[62]. Therefore, in people with postpartum depression, more studies on anxious symptoms are necessary. Specifically, it is necessary through diagnostic interviews to incorporate a registry design of the categorial presence of anxiety disorders. This strategy would help to differentiate the presence of anxiety, as a clinical picture in itself, from the nonspecific emotional stress of the mother and, in turn, from the anxious symptoms associated with the diagnosis of depression.

When we divided our sample according to the categorical diagnosis of major depression of the DSM-IV according to the DIGS interview, women with postpartum depression at 32 weeks had a higher score in the three dimensions of anhedonia, anxiety and depression. The three scales, with reliability coefficients greater than 0.70 (0.72 to 0.84), are in the range of "moderate to excellent", which implies that the dimensions can be used independently as evaluation scales.

Our study has several strengths: 1) this is the first work that demonstrates the factorial structure of the Spanish version of the EPDS; 2) the results are based on a large sample of adequately characterized women; and 3) the sample comes from women without psychiatric care during pregnancy.

This study has several limitations. We have excluded women with psychiatric care during pregnancy. This exclusion criterion, motivated to guarantee that depressive symptoms after childbirth are not explained by another cause prior to delivery, constitutes a selection bias and conditions the generalization of the results to other populations. Another limitation is the derivative of the high frequency of anxiety disorders with and without postpartum depression and the presence of comorbidity between both disorders usually recorded in other postpartum studies. We have not registered the presence of anxiety disorders through the DIGS in those women with a score of 9 or higher in the EPDS. Including this evaluation of anxiety would allow greater clarity of the results in relation to the EPDS scale construct. At the methodological level, this aspect generates a confusion bias; thus, further studies should evaluate the presence of anxiety disorders in relation to the EPDS scale. Another aspect to consider is the recording of depressive symptoms. An evaluation with scales such as the Hamilton depression scale or Montgomery-Asberg (MADRS) scale, which are clinically validated and more widely used than DIGS, could increase the accuracy of the clinical diagnosis of depressive symptoms. Finally, in our study, some variables that could influence the presence of anxious / depressive symptoms, such as social dystocia, less access to resources or living in unstructured homes, have not been evaluated.

In conclusion, this study shows that the Spanish version of the Edinburgh Postnatal Depression Scale (EPDS) is composed of three factors or dimensions: anhedonia, depression and anxiety. The three factors differentiate women with depression from those without postpartum depression. The coefficients of reliability of the factors in the "moderate to excellent" range guarantee that the scale can be used in our environment to assess the different components of postpartum depression.

ACKNOWLEDGMENTS

This work was funded by the Instituto Carlos III (grants number PI041635, PI041783, PI041779, PI0411761, PI041791, PI041766 and PI041782), la red de Genotipación y Psiquiatría Genética (G03/184), RTA (RD06/001/1009) and the Generalitat de Catalunya (SGR2009/1435).

CONFLICT OF INTEREST

There is no conflict of interest on the part of the authors.

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