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Research report

Predictive validation study of the Edinburgh Postnatal Depression Scale in the first week after delivery and risk analysis for postnatal depression

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Abstract

Background: Postnatal depression is a major public health problem. The aim of this study is to validate the use of the Edinburgh Postnatal Depression Scale (EPDS) in the early postpartum, and to identify the markers for risk of postnatal depression.
Methods: 815 women filled out an EPDS and general information questionnaire between the third and the fifth day postpartum. The women with an EPDS score of >8 and a randomized control group from those with scores of <8 were contacted 8 weeks postpartum. 363 women therefore had a structured diagnostic interview by telephone at 8 weeks postpartum (MINI-DSM-IV), without knowledge of their EPDS scores, to screen for a major or minor depressive episode.
Results: The sensitivity of EPDS was measured as 0.82 [0.78–0.86], with a positivity threshold of 9.5/30. For an estimated prevalence for all depressive episodes of 16.1%, the positive predictive value of EPDS was measured as 42.8% [39.1–46.5%]. Multivariate risk analysis using logistical regression identified the following as risk markers for postnatal depression: previous history of depression (postnatal or other), unemployment, premature delivery or stopping breast-feeding in the first month for non-medical reasons.
Conclusion: The use of EPDS between the third and fifth day postpartum is valid. An EPDS score of >10 should be completed by a clinical assessment and suitable management. The risk markers identified here are clinical indices that can be used for first-line early screening by non-psychiatric health workers.

Keywords: Postnatal depression; EPDS; Postpartum; Predictive validity; MINI; Risk factor

1. Introduction

Postnatal depression (PND) is a frequent psychiatric disorder whose prevalence is evaluated as 12.8% (O'Hara and Swain, 1996). It is currently the most frequent complication following giving birth. The development of medicine during the 20th century has produced a large reduction in obstetrical morbidity and mortality, but the frequency of PND has remained stable over this period. PND has a three-fold impact (Cox and Holden, 2003): on the mother's health, on the couple and on the cognitive and psychoaffective development of the

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baby. Apart from its high prevalence, PND causes many residual symptoms in young mothers. In fact, 60% of women identified as being depressed at 4 months are still clinically depressed 1 year after delivery (MacMahon et al., 2005). The risk of depression is also increased in the partner (Lovestine and Kumar, 1993). Mother–baby interactions are less frequent, and their inter-dependence and reciprocity are less marked (Campbell et al., 1995). Babies of depressed mothers are also more likely to have insecure attachment styles (Murray et al., 1999) and a delay in cognitive development (Grace et al., 2003). These risks are increased if the father also has a psychopathological disorder (Marmorstein et al., 2004). In view of its epidemiological importance, it is therefore essential to develop strategies for early screening of PND.

Identification of at-risk women before delivery is an interesting topic for research (Austin and Lumley, 2003), but there is the risk that the most isolated women, who do not benefit from medical follow up, will be missed. Moreover, the peak prevalence of PND is between 4 and 10 weeks postpartum (Cooper and Murray, 1995), but many patients are lost to follow-up after leaving the maternity unit, this being compounded by the gradual reduction in the number of doctors in some parts of France. Assessment of the women after leaving the maternity unit, therefore, encounters the same difficulties as during the antenatal period. Immediate postpartum screening in the Maternity Unit allows the whole of the exposed population to be assessed.

The Edinburgh Postnatal Depression Scale (EPDS), a questionnaire with 10 items, filled out by the patient, was developed to help screen for PND at 6 weeks postpartum (Cox et al., 1987). EPDS has been translated and validated in several languages (see review, Jardri, 2004). Early use is possible, since EPDS measurement immediately postpartum has been shown to be independent of the diagnosis of uncomplicated postpartum baby blues (Sutter et al., 1997). Also, the accuracy over time (Hannah et al., 1992; Dennis, 2004; Teissedre and Chabrol, 2004), and the internal consistency of EPDS (Chabrol and Tesseidre, 2004), have already been evaluated using two measurements at 1 and 6 weeks postpartum. We believe that this psychometric tool fulfils the requirements for use as a test for early screening of PND in the maternity unit. However, the studies mentioned above did not use a standardized diagnostic interview.

We believe that a study is required to measure the predictability of a postnatal depressive episode by EPDS between the third and fifth days postpartum. The secondary objective would be to determine the medical, social and demographic markers, which are significantly associated with the risk of PND in the study population. This type of risk table for PND would be a useful complement for use alongside EPDS. We feel that risk mark ers specific to our population in the north of France should be identified, in view of its importance (1.4% of all births in France) and the large percentage of women coming from lower social groups.

2. Methods

This naturalistic study (using standard clinical practice conditions) took place in the Jeanne de Flandre Maternity Unit (University Hospital Centre of Lille, France) during two periods of 2 months each, in order to correct for possible seasonal variations (Hiltunen et al., 2004): December 2003–January 2004 (minimal sun) and July–August 2004 (maximal sun).

2.1. Population

The inclusion criterion was that of giving birth in the Maternity Unit during the study period. All of the women concerned received an information and consent form on the second day of their long-stay in the Postnatal Department. The exclusion criteria were refusal to participate and illiteracy. A secondary exclusion criterion was schizophrenia, according to the DSM-IV diagnostic criteria (A.P.A., 1996), noted during a MINI test at 8 weeks postpartum. In fact, these schizophrenic patients generally already benefited from psychiatric treatment, but treatment for schizophrenia is different from what we offer to depressed patients, including those with other comorbidities.

2.2. Procedure

Between the third (D3) and fifth days (D5) postpartum, the patients included in the study filled out the EPDS and a general information questionnaire. The data were: age, parity, employment and social status, whether they had their own accommodation, their past medical history, a past history of PND, or of another depressive episode. The medical data were noted according to the International Classification of Diseases ICD-10 (W.H.O., 1992). A second series of data about how the pregnancy, delivery and postpartum had gone were collected, together with the patient's consent form from the computerized medical records. These data were checked against the paper medical records. These data included the presence of an antenatal complication, a complication during delivery or postpartum, the type of delivery, prematurity or the need for neonatal resuscitation, and the type of feeding.

The EPDS filled out between D3 and D5 was the French version, validated at 6 weeks postpartum, with a positivity threshold of 11.5/30 (Guedeney and Fermanian, 1998). The questionnaire was collected in a sealed envelope upon discharge from the department. All of the studies validating EPDS found in the literature (Jardri, 2004), found positivity thresholds of more than 8.5/30. Also, the preliminary studies of the use of EPDS in early postpartum recommended using a lower threshold of 9.5/30 (Hannah et al., 1992; Dennis, 2004). In view of these findings, two groups were made: the women with EPDS scores of >8 and a control group with the same number of patients, who were chosen randomly from all of the women with an EPDS score of <8. A score of 8 was used since the aim of our study was to find a threshold to predict possible depression, and this score gave us some leeway so that as few depressed women as possible would be missed. The women from these two groups were contacted 8 weeks postpartum. Two doctors (JR, PJ) telephoned the women from the two groups at their homes without knowledge of their EPDS scores.

The following general information was obtained at 8 weeks postpartum: the health status of the baby (as it was noted in the baby's healthcheck booklet by the paediatrician or the family doctor) and the mother, if breast-feeding had been stopped during the first month for non-medical reasons, or if anti-depressants were being taken for more than 3 weeks. A standardized diagnostic evaluation was made during this interview, using the French version of the Mini International Neuropsychiatric Interview (Sheehan et al., 1998) (MINI for DSM-IV v.5.0). We also noted the diagnosis of minor depression (Rapaport et al., 2002) which is a frequent form of postpartum depression, particularly with less-marked somatic symptoms (Paykel, 2002). From a "criteriological" point of view, these minor episodes were defined by the presence of between two and four criteria for a major depressive episode, lasting for more than 15 days (APA, 1996; Berle et al., 2003). The use of MINI-DSM-IV by telephone has been validated (Duburcq et al., 1999). The inter-judge fidelity coefficient for the two participating psychiatrists using this questionnaire was evaluated on a preliminary sample using Cohen's Kappa coefficient as 0.8.

The results of the diagnostic and therapeutic measurements performed in our department are briefly presently here. All of the women with an EPDS score of >8 were contacted by telephone and assessed using MINI-DSM-IV. The patients with a positive diagnosis of depression were given an appointment for a perinatal psychiatric consultation, as well as those who asked for a consultation during the telephone interview. We did not take account of any health problems that the baby may have had, but they were treated by the paediatrician and noted in the baby's healthcheck booklet.

2.3. Statistics

Statistical analysis was performed using the *Statistical Analysis System v.8* software. The follow-up and the representativity of the study sample were performed using the exact Fischer and Chi squared (χ^2) tests for the categorial variables, and the Student's *t*-test for the continuous variables, with a significance level of $p<0.05$ (two-tailed). Single-factor variance analysis (ANOVA) with an independent factor, the postpartum mood status of the patients (not depressed, mild depression, major depression), was performed using the EPDS scores. When significant differences were found between the patients in the different mood-status groups, contrast analysis was performed using Tukey's test. The threshold for positivity of EPDS, to allow the best balance between sensitivity and specificity, was calculated using Receiver Operation Characteristics analysis, a comparison being made with the reference test, MINI-DSM-IV. The accuracy of these measurements was assessed with a 95% confidence interval (95% CI). Risk analysis was performed using multivariable stepwise logistical regression analysis in case of any link between some of the factors liable to cause confusion.

3. Results

3.1. General data

992 women gave birth in the study centre during the inclusion period. Their mean age was 28.8 years old (SD=5.6), with a range of 16–44 years old. 44.8% of them were primiparous and 3.6% had multiple pregnancy. 68.9% had normal delivery and 7.7% delivered prematurely. Out of a total of 992 deliveries, 815 women responded to the inclusion criteria and were accepted for participation in the study. 57 records were later excluded because of missing data about the main variable of interest (EPDS). 427 women were telephoned at 8 weeks postpartum, that is 227 women with an EPDS score of >8, and the control group of 200 women with an EPDS score of <8 (see Methods). It was not possible to contact 60 patients by telephone (a mean of 4 attempts). 367 had a standardized diagnostic interview. 4 women were excluded because schizophrenia was diagnosed during the MINI-DSM-IV assessment. The final analysis included 363 women (usable data, see Fig. 1).

3.2. Representivity of the population

There was no significant difference in the medical, social and demographic variables between the complete and incomplete medical records for EPDS, nor between the randomized controls and the other patients with a score of <8 (χ^2 test). The social data of the patients not included ($n=177$) differed from that of the study sample: isolation ($p<10^{-4}$), unemployment ($p<10^{-4}$) and no personal home ($p<0.01$). The patients, whom we were able to recontact at 8 weeks postpartum ($n=60$), also showed a significant difference for isolation ($p<0.05$) and unemployment ($p<0.05$) (see Fig. 1).

3.3. Distribution of EPDS scores

The EPDS scores ranged from 0 to 27/30. The mean EPDS score of those included in the study was 6.8±4.5. The distribution of EPDS scores between D3 and D5, with respect to the mood status of the women assessed by MINI-DSM-IV, is illustrated in Fig. 2. After checking the variance uniformity (Levene's test), variance analysis (ANOVA) and post-hoc analysis showed that the EPDS scores of the women with a diagnosis of a major depressive episode were statistically greater than those with a minor depressive episode, and they in turn were statistically greater than the scores of those who were not depressed [$F(2.363)=58.53$, $p<0.001$)].

3.4. Calculation of the positivity score for EPDS

ROC analysis (see Fig. 3) identified a positivity threshold of 9.5 as the best rate between the sensitivity and specificity of EPDS for screening for major and minor depression. The sensitivity of EPDS was 0.82 [0.78–0.86] and its specificity was 0.68 [0.63–0.73]. The area under the curve was measured as 0.79 [0.74–0.84]. For a threshold of 11.5/30 (Guedeney and Fermanian, 1998), the sensitivity of early EPDS was 0.70 [0.65–0.75] and its specificity was 0.74 [0.70–0.78] for major and minor depression. The optimal threshold increases to 10.5/30 if only major depressive episodes are included,

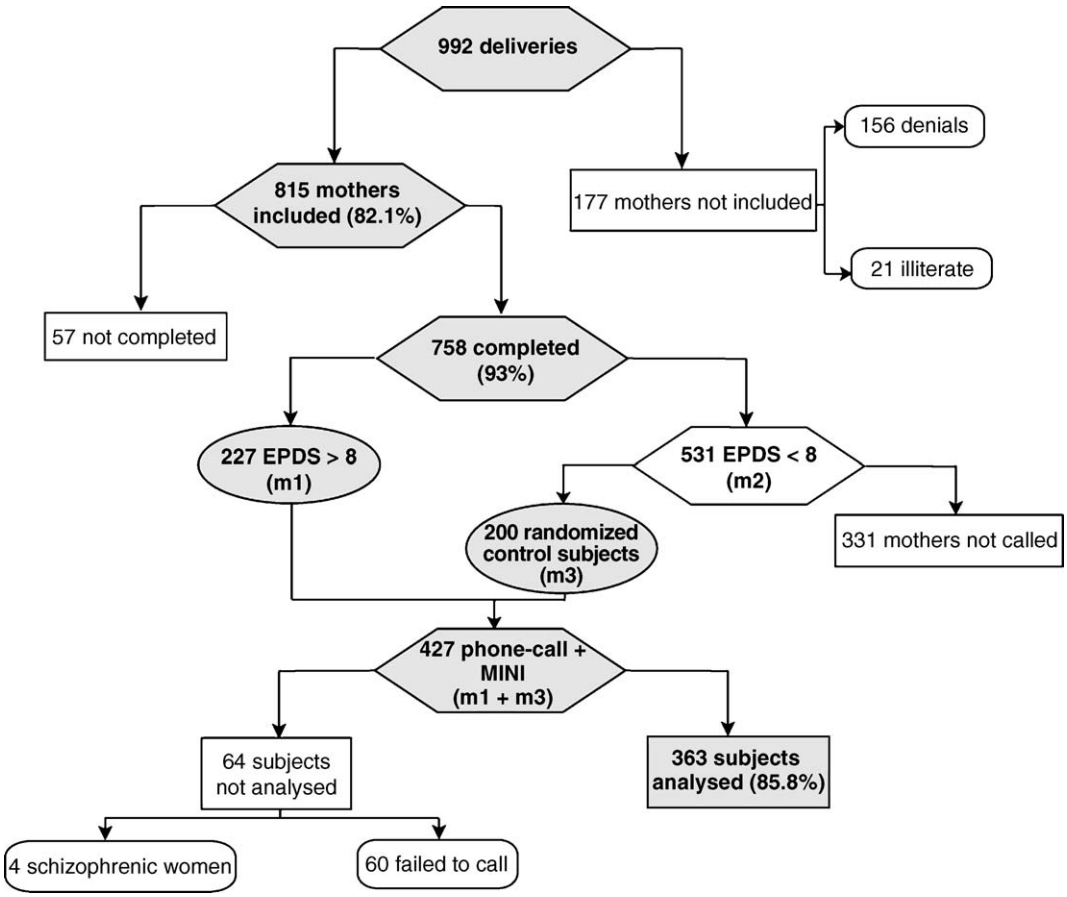

Fig. 1. A flow diagram of the women's outcomes in the study.

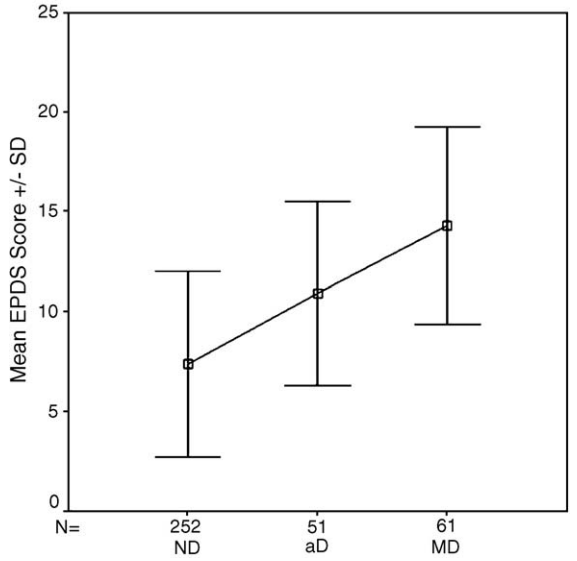

Fig. 2. EPDS score 3–5 days postpartum according to the depressive state. ND: not depressed; aD: attenuated depression; MD: major depression.

with a sensitivity of 0.84 [0.80–0.88] and a specificity of 0.71 [0.66–0.76]. All of the values are shown in Table 1.

3.5. Prevalence of postnatal depression and predictive values for EPDS

The prevalence of a major depressive episode at 8 weeks postpartum, according to the DSM-IV criteria, was 8.7%, 95% CI [6.6–10.8] (n=61), and for minor depression 7.4%, 95% CI [4.7–10.1] (n=51). For major and minor depressive episodes, the prevalence of postnatal depression at 8 weeks postpartum was estimated as 16.1% [13.4–18.8] (n=112). It should be noted that no seasonal effect was found as shown by the absence of a significant difference between the prevalence measurements from the two study periods. With a prevalence of postnatal depression of 16.1%, the positive predictive value (PPV) of EPDS was measured as 42.8% [39.1–46.5%] and the negative predictive value (NPV) of EPDS as 95.2% [93.6–96.8%].

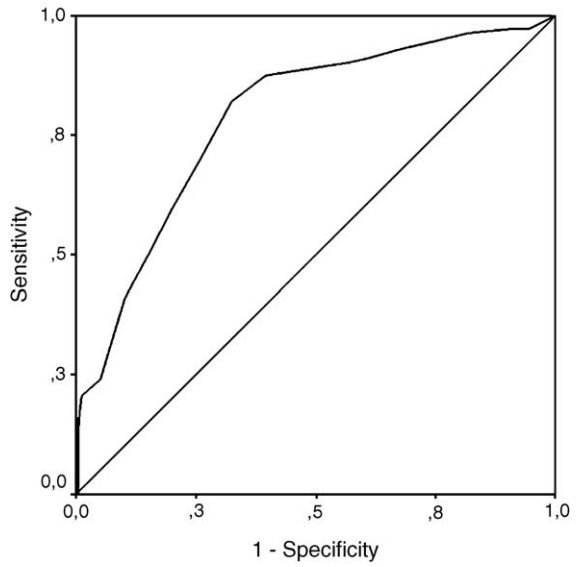

Fig 3. EPDS 3–5 days postpartum R.O.C. curve (n=363).

Table 1
Results of R.O.C. analysis for EPDS in the first week postpartum, validated against the DSM-IV depression criteria (n=363; 1/2 95% CI: semi 95% confidence interval)

Threshold score	Sensitivity	1/2 95% CI	Specificity	1/2 95% CI
6.5	0.90	0.03	0.43	0.05
7.5	0.89	0.03	0.49	0.05
8.5	0.87	0.03	0.60	0.05
9.5	0.82	0.04	0.68	0.05
10.5	0.70	0.05	0.74	0.04
11.5	0.60	0.05	0.80	0.04
12.5	0.50	0.05	0.85	0.04

3.6. Analysis of the risk markers

The first step of the logistic regression was univariate analysis of all the medical, social and demographic data. Seven factors were found to be linked to depression at 8 weeks postpartum (major or minor depressive syndrome according to MINI). In the second step, these factors were included successively in the logistic regression multivariate analysis. Only 5 of these factors were identified as risk markers for postnatal depression: unemployment (adjusted odds ratio (aOR)=2.8, 95% confidence interval (95% CI) [1.1–4.9]), a positive history of postnatal depression (aOR=4.3, 95% CI [1.7–10.9]), a positive history of depression (aOR=4.4, 95% CI [2.2–9.0]), a preterm delivery of <37 weeks (aOR=4.5, 95% CI [1.4–14.6]) and stopping breast

Table 2
Logistic regression model of the most significant risk factors of postnatal depression (n=363)

Predictors for major and minor depressive disorder	aOR	CI
Unemployment	2.8	1.1–4.9
Positive history of postnatal depression	4.3	1.7–10.9
Positive history of depression	4.4	2.2–9.0
Preterm delivery <37 weeks	4.5	1.4–14.6
Stopping breast-feeding during 1st month (non-medical reasons)	5.4	1.4–20.3

feeding during first month for non-medical reasons (aOR=5.4, 95% CI [1.4–20.3]) (see Table 2). For the other 2 markers, the study numbers were too small to judge if they were linked with postnatal depression: multiple pregnancies (aOR=3.3, 95% CI [0.6–16.0]) and postpartum complications (aOR=2.3, 95% CI [0.8–6.3]). The explained variance for the 5 risk markers identified was estimated as 72%.

4. Discussion

This study confirms that it is valid to use EPDS between D3 and D5 postpartum with a positivity threshold lowered to 9.5/30, as opposed to its classical use at 6 weeks postpartum. This result is compatible with the data in the literature (e.g. Jardri, 2004). Hannah et al. noted a significant correlation between the mother's affective state on the fifth day postpartum and at 6 weeks, both measured using EPDS ($r=0.60$, $p<0.001$, $n=217$). The women whose score was >9/30 on Day 5 had 8 times more chance of having a score of >9/30 at 6 weeks postpartum (Hannah et al., 1992). Tesseidre and Chabrol also assessed the fidelity with time of EPDS, using a larger number of women ($r=0.59$, $p<0.0001$, $n=1154$). They measured EPDS twice and classified it into 4 categories [0/1–9/10–12/>13], on the third day postpartum and between 4 and 6 weeks postpartum (Teissedre and Chabrol, 2004). They suggested that the detection score should be reduced from 11.5/30 to 10.5/30, when it is used early on, at 3 days postpartum. Finally, Dennis found the EPDS scores to be stable with time, between the first measurement at 1 week postpartum, the second at 4 weeks ($r=0.72$, $p<0.001$, $n=535$) and the third at 8 weeks ($r=0.65$, $p<0.001$, $n=498$). She discovered that the women who obtained a score of >9/30 in the first week postpartum had a 30.3 times greater risk of having depressive symptoms at 4 weeks postpartum (95% CI=17.5–42.3), and a 19.1 greater risk at 8 weeks postpartum (95% CI=11.0–32.9). The depressive symptoms included in the studies by Hannah, Tesseidre and Dennis, however, have not been assessed using a standardized tool for diagnosing depression. Since the diagnosis of PND was confirmed in our study at 8 weeks using MINI-DSM-IV, since a large number of individuals were tested by these two psychometric tests (EPDS and MINI-DSM-IV) and since a distinction was made between major and minor depression, this allows us to validate early use of EPDS and shows that the detection threshold needs to be reduced with respect to its classical use at 6 weeks postpartum.

For this threshold of 9.5/30, the NPV is high (95.2%), important for a screening tool. On the other hand, the PPV is low (42.8%). The fact that depressive episodes were diagnosed using the DSM-IV criteria may explain these values, since they are less sensitive to atypical postnatal depression. We tried to correct this effect by taking into account minor depressive episodes, nevertheless defined from a strictly "criteriological" point of view. It should be noted that the positive EPDS scores should always be followed by a complementary assessment by an experienced clinician, in order to judge if postnatal depression is indeed present. We consider that it is important to remember that the instructions given to the patients for filling out the questionnaire made it clear that the answers should correspond with the 7 days preceding the assessment. In our study, this means that the EPDS score obtained between D3 and D5 postpartum contain information about the pre-, peri- and the immediate postpartum. In the light of our results, our hypothesis is that the EPDS score could therefore, at the time of childbirth, be a measurement of the mother's own perinatal affective state, which would be predictive of a depressive state at 8 weeks postpartum. To avoid an excessively rigid interpretation of the EPDS score, it would seem to be necessary to use an uncertainty interval (grey area for scores close to the EPDS threshold), or to repeat the scores close to the threshold. Matthey proposed the use of the Reliable Change Index (RCI), in order to see if a change between two measurements was significant. At 6 weeks postpartum, the RCI was calculated to be within four points of the EPDS score (Matthey, 2004). The results of our study could be repeated by measuring EPDS again, in order to calculate the RCI value in the early postpartum.

With respect to our study's design, our choice of using a "naturalistic" approach, was based on the idea that EPDS could be used in practice as a mass screening tool for postpartum depression in the maternity unit by non-psychiatric staff. With this in mind, we did not look for any complex psychopathological indices, such as a personality disorder, which could confuse non-specialists. The 60 patients lost to follow up after discharge underline the difficulty in following up women with a low socio-economic level or who are isolated, even though they are a population with a high frequency of one or more of the risk markers for postnatal depression (unemployment<0.05, aOR=2.8 [1.1–4.9)]. The prevalence of postpartum depression is certainly underestimated in this sample. Authors like Wickberg et al. noted that if PND was not identified using EPDS during the screening phase, there was a risk that it would not be found later on either (Wickberg and Hwang, 1996). We would add that if depression is not screened for in the Maternity Unit, irrespective of the screening programme

used, it will not be detected later on, in particular in those women who were lost to follow up. These results show how important it is to identify these risk markers early, so that these patients can be offered suitable management and follow up by home care services (general practitioners and nursery nurses from maternal and child protection centres).

The results of logistic regression are compatible with the data in the literature (Warner et al., 1996). These markers are weakly linked with postnatal depression, with adjusted OR ranging from 2.8 to 4.5. The antenatal mood (Green, 1998) or the presence of a personality disorder were not assessed according to the study's protocol. However, the presence of a psychological distress during pregnancy has previously been identified as a risk marker for postnatal depression (Nielsen Forman et al., 2000). We consider that it is important to include this risk analysis in this validation study, since clinical screening by EPDS can not be dissociated from the medical history data if a usable protocol is to be defined. The risk markers identified in this study constitute key items for clinical screening by midwives, nursery nurses, paediatricians and obstetricians. Socio-economic difficulties, a previous history of mood disorders and mother–baby interaction difficulties (early separation due to prematurity or stopping breast-feeding in the first month for non-medical reasons), are indices which limit bias in filling out the EPDS patient questionnaire. These results should be confirmed and completed. With this in view, we are currently assessing the quality of clinical screening by midwives in the Maternity Unit, before and after training to help them identify these risk markers.

5. Conclusion

EPDS is a simple, quick-to-use tool for early screening of postnatal depression in the maternity unit by using a positivity threshold of 9.5/30 between D3 and D5 postpartum. To optimize this screening strategy, the psychiatrists need to be available to provide adequate treatment when necessary. Finally, the use of an integrated medical, psychiatric and social network at the patients' home would allow treatment and tertiary prevention to be continued by encouraging interaction between the parents and the baby early on.

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