The Edinburgh Postnatal Depression Scale: Translation and antepartum validation for a Hungarian sample

Annamária Töreki (Clinical Psychologist)a, Bálint Andó (Clinical Psychologist)b, Attila Keresztúri, MD, PhD (Clinical Doctor)a, János Sikovanyecz, MD, PhD (Clinical Doctor)a, Robert B. Dudas, MD, PhD, MRCPsych (Clinical Doctor)c, Zoltán Janka, MD, DSc (Head of Department)b, Zoltan Kozinszky, MD, PhD (Clinical Doctor)a,e,1, Attila Pál, MD, PhD (Head of Department)a,1

a Department of Obstetrics and Gynecology, University of Szeged, Semmelweis u. 1., H-6725 Szeged, Hungary
b Department of Psychiatry, University of Szeged, Semmelweis u. 6., H-6725 Szeged, Hungary
c Department of Psychiatry, University of Cambridge, Addenbrooke’s Hospital, Cambridge, Box 189, Level 4, Hills Road, Cambridge CB2 2QQ, United Kingdom

The Edinburgh Postnatal Depression Scale is an important screening instrument routinely used during the peripartum period for the identification of depression. The purpose of the study was to assess the validity of the 10-item EPDS in screening for antepartum depression (APD) in Hungary.

Objective: the Edinburgh Postnatal Depression Scale (EPDS) is an important screening instrument routinely used during the peripartum period for the identification of depression. The purpose of the study was to assess the validity of the 10-item EPDS in screening for antepartum depression (APD) in Hungary.

Design: validation study carried out between July and December 2010.

Setting: Department of Obstetrics and Gynecology, University of Szeged, Hungary.

Participants: 219 women attending a routine check-up at 12 weeks antepartum.

Interventions: participants completed the newly translated Hungarian version of the EPDS and underwent a clinical assessment with the Structured Clinical Interview for DSM-IV disorders (SCID-I).

Measurement and findings: seven (3.2%) of the mothers were diagnosed with major antepartum depression and 22 (10.0%) with minor depression on the basis of the SCID. Internal consistency of the EPDS was satisfactory (Cronbach’s α coefficient ≥ 0.728). The best cut-off on the Hungarian version of the EPDS for major depression was 8/9, with a sensitivity of 71.4% and a specificity of 91.5%. The area under the ROC curve was found significant for combined depression as well and at a cut-off of 6/7 indicated a sensitivity of 81.8% and a specificity of 83.2%.

Key conclusions: the EPDS showed acceptable validity despite a considerable scatter in the total scores in our sample.

Implication for practice: the EPDS is a reliable instrument for the screening of depressive disorders, especially major depressive disorder in early pregnancy among Hungarian women.

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Introduction

Considerably more attention has been focused on postpartum as opposed to antepartum mental illness. In spite of this, not only antepartum but also postpartum depression often remains unrecognised (Glover, 1997). The lesser interest in antepartum depression (APD) has been attributed to the misconception that women were hormonally protected from mood disorders during pregnancy (Spinelli, 1997). APD is a strong predictor of a number of unfavourable obstetric events (low birth weight, premature birth and growth retardation) (Grote et al., 2010), and APD can precede postpartum depression (PPD) (Eberhard-Gran et al., 2001).

The signs of depression during pregnancy are the same as those in general. APD is a unipolar, non-psychotic depressive episode, beginning in or extending into pregnancy. Almost every fourth pregnancy is accompanied by depressive symptoms (Noble, 2005). However, these depressive symptoms often go unnoticed, because people around the mother do not recognise them and depressed mothers often try to hide them due to a fear of others questioning...
their abilities to care for the child, leading to a lack of support (Zuckermann et al., 1989; Noble, 2005). Self-report scales can help to detect these cases.

The Edinburgh Postnatal Depression Scale (EPDS) is the most widely used screening questionnaire for PPD (Bunevicius et al., 2009; Gibson et al., 2009), but it is only rarely used antepartum. Formerly, the EPDS was mostly validated in the postpartum period and it is often used as a screening tool for pregnant women with postnatally determined cut-offs (Bennett et al., 2004). It has been recently recognised that cut-offs could be different during and after pregnancy, as shown by a number of antepartum validation studies (Murray and Cox, 1990; Adewuya et al., 2006; Felice et al., 2006; Su et al., 2007; Bunevicius et al., 2009; Gibson et al., 2009). Although depression seems fairly prevalent in the antepartum period, a distinction between major and minor depression has often been neglected in the literature (Eberhard-Gran et al., 2001; Gibson et al., 2009) and data on minor depressive disorder were reported very rarely (Anastasia, 1990; Gibson et al., 2009).

These observations led us to design the present study with the main objective to validate the EPDS for the screening of APD in a clinical sample of women, in Hungary for the first time, using the non-patient version of the Structured Clinical Interview for DSM-IV disorders (SCID), Axis I Disorders (American Psychiatric Association, 1994), as the standard criterion for the diagnosis of depression and comparing the psychometric characteristics of the EPDS. We predicted good internal consistency for the EPDS and that it would show acceptable sensitivity and specificity for detecting both minor and major APD.

Our second objective was to assess the ability of the EPDS to distinguish major and minor APD. Also, we wanted to examine the multidimensional characteristics of this scale regarding the anxiety- and depression-related aspects of APD, with a factor analytic approach.

Methods

Study design

We initially invited 221 pregnant women who attended the Department of Obstetrics and Gynecology, University of Szeged, for a prenatal visit at roughly 12 weeks' gestation between July and December 2010. They all gave informed consent to participate. The sample was randomly selected from women residing within the Szeged locality. Inclusion criteria were fluency in spoken and written Hungarian and signed informed consent. Two participants (0.9%) were excluded because they were suffering from psychiatric conditions other than APD (depression in the context of organic causes). Eventually, 219 women participated in the interview-based questionnaire study.

Procedures

The Hungarian version of the EPDS—translation and pilot study

The 10 items of the EPDS were translated by two translators (R.D., Z.K., health professionals specialising into psychiatry and obstetrics, respectively, and R.D. holding a university degree in translation and working in an English language environment). A trainee Clinical Psychologist (B.A.) proficient in English who had not used the original instrument then back translated it into English. The backward translation was sent to the principal investigator (A.T.) and medical translators. The questionnaire was culturally adapted through detailed discussions and the semantic validity of each item was checked. We tried to ensure that respondents would understand the meaning of the questions well (Bowling, 2002). During this stage, the Hungarian version of the EPDS was piloted with 4 mothers. As part of the cultural adaptation process, in-depth interviews were carried out with them to check their understanding of the questionnaire, to detect inappropriately interpreted items and to examine translation alternatives. The participants of this pilot rated the clarity of each item, the relevance of the content to their situation, the comprehensiveness of the instructions, and their ability to complete the questionnaire on their own. Finally, the definitive version was unanimously accepted (Cox et al., 1987).

Data collection

Pregnant women attending antepartum check-up at roughly 12 weeks' gestation were invited to participate in our study as a random sample. Those who agreed to participate were given a letter explaining the purpose of the study, providing the researchers' affiliation and contact information, and clearly stating that answers would be confidential and anonymity would be guaranteed in the final data reports. Participants then completed the EPDS without the principal investigator (A.T.) being able to see their responses. The principal investigator then, blind to the EPDS score, has carried out the SCID interview. The principal investigator, who made the diagnosis based on the SCID, had obtained training in the use of the SCID and in the diagnosis of major and minor depression. As regards the minor depressive symptoms, the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria set reported in the ‘Criteria and Axes for Further Studies’ (i.e. the presence of depressed mood or loss of interest in activities with at least one but less than four additional symptoms such as guilt feelings, indecisiveness, suicidal ideation, etc.) were adopted. Minor depression was diagnosed with either (1) depressed mood or anhedonia and one to three criterion symptoms or (2) three or more criterion symptoms in the absence of depressed mood or anhedonia. Major depression is a mental disorder that is often confused with minor depressive disorders but has a different clinical outcome. Both diagnoses require that depressive symptoms cause significant social and occupational dysfunction, as specified by DSM-IV (American Psychiatric Association, 1994; First et al., 1997).

The study protocol and the questionnaire were approved by the Clinical Research Ethics Committee of the University of Szeged (date: 3 July 2010, Ref. no.: 49/3/118). The study was carried out according to the Principles of the Declaration of Helsinki. Informed consent was obtained from all the subjects recruited into the study. Two participants had not yet turned 18 at the time of recruitment; therefore, their legal representatives provided informed consent on their behalf. Women identified as in need of psychiatric treatment were referred on for treatment as appropriate.

Assessment instrument

The EPDS is a 10-item self-report questionnaire consisting of statements describing depressive symptoms and women are asked to rate how they have felt in the previous 7 days. Each question is scored on a scale from 0 to 3 (resulting in a total score range of 0–30), depending on the severity or duration of each symptom, and completion takes around 5 mins (Cox et al., 1987). The 10 symptoms of depression included are as follows: inability to laugh and look forward to things with enjoyment, blaming oneself unnecessarily, feeling anxious or worried, feeling scared or panicky, inability to cope, difficulty in sleeping, feeling sad or miserable, crying, and thoughts of harming oneself (Cox et al., 1987).

Reliability

Reliability coefficients as measured by Cronbach’s $z$ were calculated for the EPDS in order to assess reproducibility and
consistency of the instrument; the internal consistency of the Hungarian EPDS was also tested using Guttman’s split-half coefficient (Mckennell, 1970). The participants were invited to fill in the EPDS once more, one week after the first screening, and 123 (56.16%) filled in the EPDS repeatedly. Repeatability (test–retest reliability) of the EPDS was assessed using intra-class correlation coefficient (ICC). We expected that the ICC for the EPDS items would exceed 0.7 (Anastasia, 1990). The agreement between the EPDS and SCID diagnosis, as measured with the coefficient κ, was also checked.

**Factor structure**

The underlying dimensions of the scale were checked with an exploratory factor analysis using a Varimax rotation and Principal Components Analysis as a usual descriptive method for analysing grouped data (Tabachnick and Fidell, 2007). Factor analysis was used to determine the dimensional structure of EPDS using the following criteria: (a) eigenvalue > 1 (Kaiser, 1960); (b) variables should load > 0.50 on only one factor and on other factors less than 0.40; (c) the interpretation of the factor structure should be meaningful; and (d) Screeplot is accurate in the case that the means of Communalities are above 0.60 (Hakstian et al., 1982). Computations were based on a covariance matrix, as all variables were receiving values from the same measurement scale (Morrison, 1976); Bartlett’s test of sphericity with p < 0.05 and a Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy of 0.6 were used in performing this factor analysis.

**Face and content validity**

The meaning and acceptability of the items were found good during the administration of the scale by the principal investigator (A.T.). The EPDS was easily and very quickly (approximately 5 mins) completed. The pilot sample had a depressed participant in it and she found that the items were relevant to her problems. A.T. asked every woman about how they had found the EPDS after it had been filled in and the SCID interview had been completed. The items appeared to be relevant, reasonable, and clear.

**Criterion validity**

The EPDS was able to distinguish depressed from non-depressed mothers.

**Statistical analysis**

Frequency and percentages were used for categorical variables, whereas continuous variables (the scores achieved by respondents on the psychometric scales) were expressed as means ± standard deviation (S.D.). The distribution of the EPDS scores by depressive symptoms was illustrated with a box diagram. As the distribution of the EPDS scores in the diagnostic groups did not follow a normal distribution, we used appropriate non-parametric tests. Spearman’s correlation was used to establish concurrence between the DSM-IV diagnosis and the EPDS scores. Comparisons between mean EPDS scores by diagnostic groups were performed by analysis of variance models (ANOVA). Post hoc comparisons were made with the Bonferroni correction (Shaffer, 1995). For test–retest reliability we calculated Spearman’s correlation coefficient (ρ). A ρ of 0.40 or above was considered as satisfactory (Anastasia, 1990).

The validity of the EPDS was tested by calculating sensitivity, specificity, and positive and negative predictive values (PPV and NPV, respectively) at several cut-off scores against the DSM-IV major and minor depression criteria. Receiver operating characteristic (ROC) curve analyses were carried out to assess the global performance of the EPDS for detecting depression as a diagnosis and also for major depression specifically, as well as to optimise the cut-off points for the EPDS using the trapezoidal rule with 95% CI (Handley and McNeil, 1982).

Statistical analysis was performed with the Statistical Package for Social Sciences (SPSS 17.0, Inc., Chicago) software. Differences were considered significant if the p value was smaller than 0.05 and all tests were two-tailed.

**Findings**

**Sample characteristics (n=219)**

A total of 219 mothers completed the screening with the EPDS. Table 1 provides an overview of our participants’ sociodemographics. The mean age in the study sample was 30.0 years (S.D. = 4.71 years; range 17–42 years). Half of our participants (56.2%) were first-time mothers. Only 6.8% had primary education only and 46.1% had tertiary education. The majority (74.0%) lived in towns and a relatively small proportion in rural areas (26.0%). Predominantly, participants lived with a partner. An unplanned pregnancy was reported by 14.6%, and an unwanted pregnancy by 4.6%.

**Distribution of EPDS scores**

Fig. 1 shows the box diagram and the distribution of the EPDS scores for the controls and the women with depressive symptoms. Among the 219 mothers interviewed with the SCID, 15 met the DSM-IV criteria for minor and 7 for major depression. The EPDS scores correlated with the results of the SCID (r = 0.552, p < 0.001).

The mean EPDS scores of the non-depressed mothers and the mothers with minor and major depression were 4.11 (S.D. = 2.52; range: 0–13), 8.80 (S.D. = 3.75; range: 2–15), and 12.71 (S.D. = 7.27; range: 7–27), respectively. It should be noted that this indicates significant scatter in the scores and there is some overlap between the SCID-based diagnostic categories in terms of EPDS scores. Post hoc analysis of the EPDS total scores revealed a statistical difference between the group means for the control, minor depression, and major depression groups (p < 0.001). Significant agreement (p < 0.001) could be observed between the

**Table 1**

<table>
<thead>
<tr>
<th>Sociodemographic and obstetric anamnestic data on the study group (n=219).</th>
<th>n %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean ± S.D.)* (year) 30.0 ± 4.71</td>
<td>30.0 ± 4.71</td>
</tr>
<tr>
<td>≤ 24</td>
<td>28 12.8</td>
</tr>
<tr>
<td>25–30</td>
<td>89 40.6</td>
</tr>
<tr>
<td>≥ 31</td>
<td>102 46.6</td>
</tr>
<tr>
<td>Type of residence</td>
<td></td>
</tr>
<tr>
<td>Town</td>
<td>162 74.0</td>
</tr>
<tr>
<td>Village</td>
<td>41 18.7</td>
</tr>
<tr>
<td>Outlying area</td>
<td>16 7.3</td>
</tr>
<tr>
<td>Level of education</td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>15 6.8</td>
</tr>
<tr>
<td>Secondary</td>
<td>103 47.0</td>
</tr>
<tr>
<td>Tertiary</td>
<td>101 46.1</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
</tr>
<tr>
<td>Married or cohabitant</td>
<td>217 99.1</td>
</tr>
<tr>
<td>Single</td>
<td>2 0.9</td>
</tr>
<tr>
<td>Number of children (mean ± S.D.)* 1.38 ± 0.80</td>
<td>1.38 ± 0.80</td>
</tr>
<tr>
<td>Primiparity</td>
<td>123 56.2</td>
</tr>
<tr>
<td>Unplanned pregnancy</td>
<td>32 14.6</td>
</tr>
<tr>
<td>Unwanted pregnancy</td>
<td>10 4.6</td>
</tr>
</tbody>
</table>

* S.D. = standard deviation.

1 Only multiparous women (n = 96).
EPDS and SCID diagnosis (minor or major depression) with a coefficient of 0.525.

Reliability of the EPDS scores

Table 2 shows the reliability of the total EPDS score in terms of homogeneity and the Cronbach α coefficients for the total scale. The EPDS showed good internal consistency (Cronbach α=0.77). The α coefficients for all items were at least 0.727, indicating acceptable homogeneity (McKenhall, 1970). The Guttman half-split coefficient was 0.778, while the ICC 0.684.

Test–retest reliability was evaluated in a sample of one hundred and 23 mothers. The time between the two time points of measurement was on average 3–5 days with a maximum of 14 days. Fig. 2 shows the EPDS scores at the first and second assessment session. The ICC was 0.684 (p < 0.001). The EPDS showed acceptably good test–retest reliability (ρ: 0.52 and p < 0.001).

ROC analysis

The screening accuracy of the EPDS for major and minor depressive disorders at each possible cut-off point is demonstrated in the ROC analyses. Table 3 shows the predictive values of the EPDS at different cut-off points for major and combined depression (the latter being recommended for screening purposes). Combined depression represents the global functioning of the EPDS with regard to any type of depression as a diagnosable illness (minor+major depression), in this case APD.

The area under the curve (AUC) in a ROC analysis for combined depression (major + minor) was 0.88 (p < 0.001), with an asymptotic interval of confidence of 95% of 0.796 to 0.963. An ideal cut-off point of 6/7, generated a sensitivity of 81.8% (95% CI: 77.9, 86.7) and a specificity of 83.2% (95% CI: 78.6–88.2), with a positive predictive value of 35.3% and a negative predictive value of 97.6% (Fig. 3).

The ROC and the AUC (0.933; p < 0.001, 95% CI: 0.884–0.981) revealed that the EPDS discriminated well between subjects who suffered from major depression and those who did not, suggesting good criterion validity (Fig. 4). At a cut-off point of 8/9 for major depression, we found a sensitivity of 71.4% (95% CI: 66.0%, 76.2%), and a specificity of 91.5% (95% CI: 86.1%, 93.4%) and a PPV of 21.7%. Using a higher cut-off of 9/10, the PPV would worsen to 16.7%, and the sensitivity to 42.9%.

Table 4 shows the psychometric properties of EPDS at optimal cut-off points. The EPDS fared better both for combined depression, where the AUC was 0.880, and for major depression where the AUC was 0.933, than for minor depression (AUC: 0.827). At the chosen cut-off points, the misclassification rate was acceptable for major depression (9.1%), but fairly high for both combined (16.9%) and minor depression (20.1%).

Taken together, if we use the EPDS cut-off of 6/7 to estimate the prevalence of APD in our participants, 23.3% would be identified as depressed. Using the above recommended cut-offs for minor (6/7 points) and major depression (≥9 points), the total prevalence estimates of these would be higher than the actual prevalences established using the SCID. For the purposes of identifying participants for research with probable major depression, a cut-off of 8/9 is recommended, as this would identify the majority of major depression cases (71.4%) and the misclassification rate would be more favourable (9.1%).

Factor-analysis of EPDS

The principal components analysis with Varimax rotation analysis of the 10 items of the EPDS revealed three orthogonal factors (KMO measure of sampling adequacy=0.798 and Bartlett’s test of
sphericity = 450.377, df = 45, p < 0.001). Factor 1 included questions 2, 4, 5, 6, and 10, Factor 2 questions 3, 8, and 9, and Factor 3 questions 1 and 7. Unfortunately, these factors did not seem to reflect a multidimensional structure that the EPDS was formerly purported to have, and they did not appear to be clinically meaningful at all (Table 5).

Discussion

Although the Edinburgh Postnatal Depression Scale (EPDS) has been validated in over 30 countries, it has only been validated in some countries for screening for depression during pregnancy (Murray and Cox, 1990; Adewuya et al., 2006; Felice et al., 2006; Su et al., 2007; Bunevicius et al., 2009; Gibson et al., 2009). It is of particular note that the antepartum cut-off values have been found to be different from the postpartum ones.

We have demonstrated that the Hungarian version of the EPDS shows promise as a screening tool. Its psychometric properties for screening for antepartum depression (APD), however, require further investigation in a more representative sample. The EPDS has been recently validated in a Hungarian, nationally representative sample (Nagy et al., 2011). However, the authors used the Beck Depression Inventory (BDI) rather than a clinical interview based on DSM-IV criteria for diagnosis in the postpartum period. Their study found a 10.9% prevalence of PPD with the BDI in Hungary, and using a cut-off score of 13 on the EPDS, they found similar sensitivity and specificity values to those in our study (Nagy et al., 2011).

The cut-off scores in our study seemed very low compared to other studies validating the EPDS in the antepartum period (Murray and Cox, 1990; Adewuya et al., 2006; Felice et al., 2006; Su et al., 2007; Bunevicius et al., 2009). The only validation study that reported a comparable threshold (8/9) was performed in India in a postpartum sample (Benjamin et al., 2005). The optimal cut-off for major depression in previous antepartum studies looking at a similar time period of the pregnancy varied from 10.5 (Bergink et al., 2011) to 12.5 (Su et al., 2007) and for combined depression there is only one study (Felice et al., 2006) reporting a cut-off of 13.5 at any

Table 3

<table>
<thead>
<tr>
<th>EPDS* threshold</th>
<th>Sensitivity Major</th>
<th>Combined</th>
<th>Sensitivity Major</th>
<th>Combined</th>
<th>Positive predictive value Major</th>
<th>Combined</th>
<th>Negative predictive value Major</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/5</td>
<td>86.4</td>
<td>57.1</td>
<td>61.4</td>
<td>7.0</td>
<td>20.0</td>
<td>100</td>
<td>97.6</td>
<td>97.6</td>
</tr>
<tr>
<td>5/5</td>
<td>100</td>
<td>68.9</td>
<td>72.5</td>
<td>9.3</td>
<td>26.0</td>
<td>100</td>
<td>97.5</td>
<td>97.5</td>
</tr>
<tr>
<td>6/7</td>
<td>81.8</td>
<td>79.2</td>
<td>83.2</td>
<td>13.7</td>
<td>35.3</td>
<td>100</td>
<td>97.6</td>
<td>97.6</td>
</tr>
<tr>
<td>7/8</td>
<td>68.2</td>
<td>87.3</td>
<td>92.3</td>
<td>18.2</td>
<td>45.4</td>
<td>99.3</td>
<td>96.2</td>
<td>96.2</td>
</tr>
<tr>
<td>8/9</td>
<td>59.1</td>
<td>91.5</td>
<td>94.9</td>
<td>21.7</td>
<td>56.5</td>
<td>99.0</td>
<td>95.4</td>
<td>95.4</td>
</tr>
<tr>
<td>9/10</td>
<td>50.0</td>
<td>92.9</td>
<td>96.5</td>
<td>16.7</td>
<td>61.1</td>
<td>98.0</td>
<td>94.5</td>
<td>94.5</td>
</tr>
<tr>
<td>10/11</td>
<td>40.9</td>
<td>94.8</td>
<td>98.0</td>
<td>21.4</td>
<td>64.3</td>
<td>98.0</td>
<td>93.7</td>
<td>93.7</td>
</tr>
<tr>
<td>11/12</td>
<td>27.3</td>
<td>96.7</td>
<td>98.5</td>
<td>22.2</td>
<td>66.7</td>
<td>97.6</td>
<td>92.4</td>
<td>92.4</td>
</tr>
<tr>
<td>12/13</td>
<td>18.2</td>
<td>98.6</td>
<td>99.5</td>
<td>40.0</td>
<td>80.0</td>
<td>97.7</td>
<td>91.6</td>
<td>91.6</td>
</tr>
<tr>
<td>13/14</td>
<td>13.6</td>
<td>99.5</td>
<td>100</td>
<td>66.7</td>
<td>100</td>
<td>97.7</td>
<td>91.2</td>
<td>91.2</td>
</tr>
</tbody>
</table>

* EPDS: Edinburgh Postnatal Depression Scale.

1 At a prevalence of 3.2% for major depression and 10% for combined minor and major depression.

Fig. 3. Receiver operating characteristic-analysis of the Edinburgh Postnatal Depression Scale total score against Structured Clinical Interview for DSM-IV disorders (SCID-I) diagnosis of antepartum combined (major + minor) depression.

Fig. 4. Receiver operating characteristic-analysis of the Edinburgh Postnatal Depression Scale total score against Structured Clinical Interview for DSM-IV disorders (SCID-I) diagnosis of antepartum major depression.

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time point during pregnancy (mean of 18.5 weeks of gestation). Studies looking at later stages of pregnancy yielded lower cut-offs; 9.5 points for major depression in the third trimester (Bergink et al., 2011) and also for combined depression (Adewuya et al., 2006). In summary, it is important to note that various validation studies used different diagnostic criteria and interview schedules for diagnosing depression, in study samples rather different from one another, and at different times during pregnancy. The Bergink study was the only one that looked at a community sample from the general population, testing pregnant women as measured by the EPDS. In general, the EPDS does not appear to be great for screening for antenatal minor depression, but its screening accuracy is acceptable for combined depression (recommendable for screening purposes) or for major depression. Setting a cut-off of 6/7 is ideal for screening for combined depression cases (100% of the cases with major depression being depression. It is not implausible that the illness itself manifests slightly differently in a different population due to genotypic and phenotypic variation. It is also seen that the SCID, which is currently one of the most often used diagnostic tool in perinatal psychiatry, includes somatic symptoms, the accurate measurement of which is problematic in the perinatal period, a question that has received surprisingly little research attention.

Although, overall, the performance of the Hungarian version of the EPDS was only moderate, our study proved that the Hungarian version of the EPDS is able to detect APD (minor and major depression combined) with above 80% sensitivity and specificity. This was qualified by the fact that the estimated misclassification rate was relatively high (16.9%).

Using the cut-offs from our study resulted in an estimated point prevalence of 11% for major and that of 23.3% for combined (major + minor) depression at 12 weeks of gestation. To our knowledge, only one other study has validated the EPDS in the first trimester (Bergink et al., 2011) and only looking at major depression. They found a prevalence rate estimate of 5% which is only somewhat lower than our estimated prevalence rate; however the prevalence of depression in their sample, as established with the CIDI interview, was higher (5.6%) than in our study (3.2%).

In Hungary, the point prevalence of major depressive disorder (MDD) in the general population is 4.7% (Szádőczky et al., 1997), whereas in our sample of pregnant women it was 3.2% (7/219). In contrast with other studies, which asserted that pregnancy has no protective effect on APD (Ryan et al., 2005) or even a definite increase in the prevalence of MDD during pregnancy (Evans et al., 2001; de Tychey et al., 2005), in our sample a hint of a decrease in the rate of MDD can be observed during pregnancy as compared to the general population (Szádőczky et al., 1997). Studies looking at the prevalence of MDD in women before pregnancy, during pregnancy and postpartum have been riddled with various methodological problems; as far as we are aware, no prospective study using different versions of a diagnostic instrument appropriately adapted for the above periods has been published.

Major depression cases tend to fall above a cut-off of 8/9 points on the Hungarian version of the EPDS. However, there is a significant scatter in the scores and the distributions show a clear overlap between minor and major depression and non-depressed women as measured by the EPDS. In general, the EPDS does not appear to be great for screening for antenatal minor depression, but its screening accuracy is acceptable for combined depression (recommendable for screening purposes) or for major depression. Screening for combined (as opposed to major) depression carries the advantage of also identifying those women who are in the process of developing depression but not yet have the full-blown illness.

Table 4
Validation statistics of the EPDS.*

<table>
<thead>
<tr>
<th></th>
<th>Minor depression</th>
<th>Combined depression</th>
<th>Major depression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal cut-off</td>
<td>6/7</td>
<td>6/7</td>
<td>8/9</td>
</tr>
<tr>
<td>Area under the curve (95% CIs)</td>
<td>0.827 (0.711–0.943)</td>
<td>0.880 (0.796–0.963)</td>
<td>0.933 (0.884–0.981)</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>73.3</td>
<td>81.8</td>
<td>71.4</td>
</tr>
<tr>
<td>Specificity</td>
<td>80.4</td>
<td>83.2</td>
<td>91.5</td>
</tr>
<tr>
<td>Positive predictive value</td>
<td>21.6</td>
<td>35.3</td>
<td>21.7</td>
</tr>
<tr>
<td>Negative predictive value</td>
<td>97.6</td>
<td>97.6</td>
<td>99.0</td>
</tr>
<tr>
<td>False-positive rate</td>
<td>19.6</td>
<td>16.8</td>
<td>8.5</td>
</tr>
<tr>
<td>False-negative rate</td>
<td>26.7</td>
<td>18.18</td>
<td>28.6</td>
</tr>
<tr>
<td>Misclassification rate</td>
<td>20.1</td>
<td>16.9</td>
<td>9.1</td>
</tr>
</tbody>
</table>

* EPDS: Edinburgh Postnatal Depression Scale.

Table 5
Rotated factor matrix for EPDS.*

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1 (anhedonia)</td>
<td>0.605</td>
<td></td>
<td>0.760</td>
</tr>
<tr>
<td>Item 2 (anhedonia)</td>
<td>0.605</td>
<td>0.851</td>
<td></td>
</tr>
<tr>
<td>Item 3 (guilt)</td>
<td></td>
<td>0.744</td>
<td></td>
</tr>
<tr>
<td>Item 4 (anxiety)</td>
<td>0.552</td>
<td>0.774</td>
<td></td>
</tr>
<tr>
<td>Item 5 (panic attack)</td>
<td>0.552</td>
<td>0.573</td>
<td>0.645</td>
</tr>
<tr>
<td>Item 6 (overwhelmed)</td>
<td>0.552</td>
<td></td>
<td>0.654</td>
</tr>
<tr>
<td>Item 7 (sleep disorders)</td>
<td>0.552</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 8 (sadness)</td>
<td>0.621</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* EPDS: Edinburgh Postnatal Depression Scale.

Only values > 0.400 are reported.
identified), but at that cut-off almost 21% will be incorrectly flagged up as potentially depressed. At the higher cut-off point of 8/9 the sensitivity (71.4%), specificity (91.5%), and PPV (21.7%) for major depression remains acceptable, and therefore we suggest using this higher cut-off for major depression.

Taken together, in our opinion, an EPDS total score above 6 points could be used for screening for any type of depression (minor and major), whereas a score of 9 or higher for major depression in antepartum women.

The misclassification rate with the EPDS, as calculated using the SCID diagnoses as gold standard was much lower for major (only 9.1%) than for combined depression (16.9%). This misclassification rate for major depression sits in the middle of a range of previously reported values from 3.6% (Murray and Cox, 1990) to 20% (Adoudou et al., 2005) in antepartum validation studies. In terms of combined depression, our value was the highest amongst the studies we are aware of, although only slightly higher than the nearest reported value (13.51%; Murray and Cox, 1990). Our low cut-off scores allow us to screen out all suspected major depression cases, who tended to have relative low scores in our sample, at the expense of generating a proportionately larger number of false positives. The SCID diagnoses indicated lower rates of minor (6.8%) and major (3.2%) depression, consistent with previous reports in the literature (Murray and Cox, 1990; Adewuya et al., 2006; Felice et al., 2006; Su et al., 2007; Bunevicius et al., 2009). Our predictive values were influenced by these low prevalences (Friis and Sellers, 1966).

We found the behaviour of the EPDS typical in the ROC analyses. It was unsurprising that the EPDS was better at identifying major (as opposed to minor) depression, as there are fewer major depression cases and for major depression the patient has to have more marked symptoms. Also driven by clinical considerations, we decided to accept the low cut-off scores suggested by the ROC analyses and not to raise them, in order to avoid the increase in false negatives with a higher cut-off score, i.e. avoiding missing those with a possible depressive illness.

The increasing number of validation studies in various languages and cultural contexts (Aydin et al., 2004) may highlight the need for modifying or adding further items. The psychometric properties of the EPDS in a previous, postpartum validation study (Nagy et al., 2011) in a Hungarian sample also appeared to be acceptable but not excellent, suggesting the same.

The criterion validity of the EPDS as a screening instrument for depression according to DSM-IV diagnostic interview as the criterion standard is respectable. Semantic and content validity of the EPDS were found acceptable for the Hungarian population by the interviewer (A.T.) who carried out the interviewing. We found the psychometric characteristics of the EPDS generally satisfactory. We suspect that the fact that during the creation of the EPDS somatic items were removed rather than modified may have resulted in an instrument that is less skillful at identifying depression and picks up cases with anxiety and depressive symptoms that are not necessarily suffering with a depressive illness primarily. Therefore, it would be useful to examine its discriminant validity with other instruments, e.g. those measuring anxiety.

One of the limitations of this validation study was that participants were recruited from a tertiary referral centre. Random arrangement of the participants according to age and locality has reduced the effect of the fact that our sample is not representative for the entire Hungarian community. Furthermore, more representative studies need to be carried out to confirm (or otherwise) these cut-off values. We only piloted the test in four pregnant women; however, this included a depressed patient and detailed feedback post testing from all of our participants did not draw attention to the need for any further changes. The limitations of this Hungarian version of the EPDS highlight the need for treating a test score on its own with sufficient caution and as what it is: a screening test total score, something that should alert health-care workers to the possibility of depression (and the need for further enquiry) in a pregnant woman.

In summary, the Hungarian version of the EPDS proved to be an acceptable, reliable, and valid, but not excellent antepartum screening instrument, bringing attention to some potential problems with the EPDS in this context.

Conflict of interest statement

None of the authors has a political, personal, intellectual, commercial, financial, religious interest, and/or other relationship with manufacturers of pharmaceuticals, laboratory supplies, and/or medical devices or with commercial providers of medically related services.

Appendix 1. The Hungarian version of the EPDS

(in Hungarian)

Mivel Ön terhes, vagy mostanában született gyermekje, azt szeretnénk megtudni, hogyan érzi magát. Kérem, jelölje be azokat a válaszokat, amelyek a legközelebb álltak ahhoz, ahogy Ön érezte magát az elmúlt 7 napan (és nem csak jelenleg).

Az elmúlt 7 napan

1. Képes voltam nevetni és a dolgok mutatásvagos oldalát nézni.

   Ugyanolyan gyakran, mint korábban
   Talán kicsit ritkábban
   Égyértelműen ritkábban
   Egyáltalán nem

2. Örömmel várta a bizonyos dolgokat.

   Ugyanúgy, mint régen
   Talán kicsit ritkábban
   Égyértelműen ritkábban
   Egyáltalán nem

3. Feleslegesen hibázttattam magam, amikor a dolgok rosszul mentek.

   Többnyire igen
   Elég gyakran
   Nem től gyakran
   Soha

4. Minden különösebb ok nélkül szorongóvá, aggodalmassá váltam.

   Soha
   Kivételes esetekben
   Több alkalommal
   Nagyon gyakran

5. Minden különösebb ok nélkül felelem vagy pánik tört rám.

   Nagyon gyakran
   Több alkalommal
   Kivételes esetekben
   Soha

6. Összcseaptak fejem fölött a hullámok.

   Igen, többnyire nem tudtam megbírózkíni a dolgokkal.
   Igen, néha nem tudok oly mértékben megbírzközt azokkal, mint korábban.
   Nem, többnyire jól elboldogulok azokkal.
   Nem, ugyanolyan jól megbírzköz azokkal, mint korábban.

7. Olyan boldogtal voltam, hogy problémáim volt az alvással.

   Többnyire igen
   Több alkalommal
   Csak ritkán
   Soha nem fordult elő
8. Szomorúnak vagy szerencsétlennek éreztem magam. Többnyire igen 
Elég gyakran 
Soha nem fordult elő

Igen, legtöbbször 
Elég gyakran 
Soha nem fordult elő

10. Eszembe jutott már, hogy kárt teszek magamban. 
Elég gyakran 
Néha 
Szinte soha 
Soha

References


