ORIGINAL ARTICLE

Postpartum depression screening by telephone: a good alternative for public health and research

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Abstract This study verified the reliability and validity of the Edinburg Postpartum Depression Scale (EPDS) administered by telephone interviews. In a cross-sectional study of a cohort from Brazil (BRISA), the EPDS was administered by telephone to 1,083 women within 12 months postpartum, and 257 (23.7 %) participants had an EPDS score ≥10. At 67±48 days after their telephone interview, 199 (EPDS ≥10=96; EPDS <10=103) participants were interviewed face-to-face using the Structured Clinical Interview for DSM-IV (SCID) and completed the EPDS again by self-report. In 90 participants, the diagnosis of major depressive episode was confirmed by the SCID (EPDS ≥10=65; EPDS <10=25). The Cronbach's alpha coefficient was 0.861. The Spearman's correlation between the EPDS administered by telephone and the self-reported EPDS was 0.69 ($p<0.001$). The receiver-operating characteristic (ROC) curve for the EPDS administered by telephone was 0.78 (95 % confidence interval (CI)=0.72 to 0.84). Scores ≥10 showed a sensitivity of 72.2 %, a specificity of 71.6 %, and a positive predictive value of 67.7 %. The application of the EPDS by telephone is a suitable alternative for clinical practice and research and represents a method to optimize the diagnosis of postpartum depression.

Keywords Edinburg Postpartum Depression Scale · EPDS · Postpartum depression · Screening

Introduction

Depressive disorders during the postpartum period are prevalent and can cause significant damage to maternal health and child development (Kingston et al. 2012). During the puerperium, approximately 19.2 % of women can be affected by major or minor depression, which reflects one of the greatest periods of vulnerability to depressive disorders in the life span of women (Mann et al. 2010). The early diagnosis of postpartum depressive episodes reduces the morbidity and suffering of women during reproductive ages (Halbreich and Karkun 2006), which may also have an impact on the offspring and family morbidity (Dietz et al. 2009).

The current body of knowledge is inconsistent regarding the prevalence, impact, treatment, and pathophysiology of postpartum depression (Gjerdingen et al. 2007; Godderis 2011). The lack of consensus can be associated with several factors, including the use of different instruments for screening and diagnosis, the diversity in the definition of depression, and the lack of validation of screening and diagnostic tools in specific populations (Gavin et al. 2005; Halbreich and Karkun 2006; Mann et al. 2010). In addition, the pregnancy–puerperal period is frequently marked by changes in socioeconomic status, emotional state, life style, and demands of daily life (Halbreich and Karkun 2006; Clare and Yeh 2012), which can jeopardize data collection in population studies with representative samples (Patel et al. 2003; Halbreich and Karkun 2006).

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Thus, an effective, low-cost, and broad screening procedure may impact the detection rates and treatment of suspected cases, thereby decreasing the negative consequences of postpartum depression (Gjerdingen and Yawn 2007; Kim et al. 2007; Hanusa et al. 2008; Hewitt et al. 2009; Clare and Yeh 2012). The use of assessments through telephone interviews can be a method to overcome shortcomings regarding the detection of postpartum depression, particularly in population-based surveys, which also include individuals with low socioeconomic status and literacy skills (Bonnel et al. 1998; Visser et al. 2000; Kempf et al. 2007; Kim et al. 2007).

The Edinburg Postpartum Depression Scale (EPDS) (Cox et al. 1987) is the most widely used instrument for the assessment of postpartum depression (Hewitt et al. 2009) because of its simplicity and speed of application. Although the EPDS was originally proposed as a self-administered instrument (Cox et al. 1987), in some studies of participants with minimal years of schooling, a previously trained interviewer applied the EPDS via a face-to-face interview (Santos et al. 2007). The EPDS has also been used through telephone interviews for the early detection and estimated prevalence of postpartum depression in different cultures and settings (Zelkowitz et al. 1995; Sebastián Romero et al. 1999; Chaudron et al. 2005; Giakoumaki et al. 2009; Horowitz et al. 2011; Mohammad et al. 2011; Ross et al. 2011; Dennis et al. 2012; Giardinelli et al. 2012; Wisner et al. 2013).

Despite the plurality of approaches and the need to validate assessments considering differences regarding ethnicity and sociodemographic features (Pop et al. 1992; Lee et al. 1998; Adouard et al. 2005; Logsdon et al. 2009), studies regarding the psychometric properties of the EPDS administered by telephone interviews remain scarce. The EPDS (cutoff point ≥10) identified 62 % of cases of major depressive disorder according to a DSM-IV diagnosis, whereas the Patient Health Questionnaire (PHQ-9) identified only 31 % of depressed women. The Postpartum Depression Screening Scale (PDSS) identified 92 % of cases, but with a high level of false-positive results (94 %) (Hanusa et al. 2008). In a large study, 68.5 % of the women with an EPDS score equal to or higher than 10 had a diagnosis of major depressive disorder, whereas 22.6 % had a diagnosis of bipolar disorder (Wisner et al. 2013). These studies, however, did not include a comparison group of women with lower scores on the EPDS, which limited the complete assessment of the validity of the EPDS administered by telephone interviews.

Considering the impact of postpartum depressive states, the good acceptance of the EPDS as a screening instrument, and the importance of reliable and fast screening strategies for research and public health policies, this study aimed to verify the reliability and validity of the EPDS administered by telephone interviews.

Methods

Participants

This study was part of a larger project that aimed to evaluate the consequences of perinatal factors on child health. According to the original protocol, 1,400 pregnant women from 25 to 28 weeks of gestational age enrolled in prenatal care outpatient services in the city of Ribeirão Preto (SP), Brazil, from February 2010 to February 2011 were recruited. As part of the original study, during prenatal, delivery, and puerperium time points, extensive data regarding the socioeconomic variables, network support, health service availability, and gynecologic and obstetric and mental health problems were collected. Here, we only present data regarding the psychometric properties of postpartum depression screening by telephone interviews.

The local ethics committee approved the study, and all participants provided written consent after being fully informed of the research procedures. A referral for psychiatric follow-up was offered to all participants with a positive screening for postpartum depression.

Assessments

The occurrence of depressive symptoms was assessed by the EPDS (Cox et al. 1987), which was translated and adapted into Portuguese (Santos et al. 2007). The EPDS consists of ten questions, and each item is scored in four levels from 0 (not at all) to 3 (extremely). Scores between 9 and 13 are considered an indication of postpartum depression, depending on the validation study (Gibson et al. 2009). The Brazilian Portuguese version of the EPDS (Santos et al. 2007) has shown similar psychometric values compared with the original study (Cox et al. 1987), and a cutoff score of 10 has been considered indicative of depression (Santos et al. 2007; Figueira et al. 2009).

The diagnosis of a major depressive episode was assessed by the Structured Clinical Interview for the Diagnostic and Statistical Manual fourth edition (DSM-IV), clinical version (SCID-CV) (First et al. 1997), translated and adapted into Portuguese (Del-Ben et al. 2001); this interview yielded a diagnosis based on the DSM-IV criteria (Apa 2000).

Raters

Twelve graduated professionals (psychiatry medical residents and psychologists) conducted the telephone interviews. Prior to data collection, training sections were conducted, which featured a presentation of the methodology and interview protocol and standardization/training of the scale application through role-playing sections. Each interviewer subsequently conducted a minimum of two telephone interviews with the

direct supervision of the first author. A protocol to introduce the questions was elaborated to standardize data collection. The items of the EPDS were read in the same order of the original version of the instrument, and the interviewers were oriented to interpret the best response to each question.

The confirmation or exclusion of a postpartum depression (PPD) diagnosis using the SCID was made by three psychiatrists and four clinical psychologists with clinical experience and proper training on the application of standardized interviews. A professional not involved in the telephone interviews and unaware of the EPDS score obtained in the telephone interview conducted the diagnostic interviews.

Procedures

During the first year after childbirth, the women enrolled in the BRISA cohort were contacted by telephone. The participants were aware of this telephone call because a statement related to it was included in the consent form signed during the pregnancy. After a standardized presentation of the study's aims, the participants were invited to answer the EPDS.

After the telephone calls, a research technician, who was not involved in the telephone or SCID interviews and who did not have previous contact with the participants, selected the participants by means of the scores obtained in the EPDS administered by telephone interview. A score equal to or above 10 was indicative of a potential diagnosis of current postpartum depression (PPD).

Each potential case (EPDS ≥10) was invited to a face-to-face interview during which the SCID was administered. The participants with an EPDS score lower than 10 were selected as controls and were matched with potential cases by age and date of delivery. For the scheduling of the face-to-face diagnostic interview, up to five telephone calls were made. In the case of no attendance for the scheduled consultation for the diagnostic interview, a new telephone contact was initiated, and the visit was rescheduled according to the availability of the participant.

At the time of the diagnostic interview (SCID), the mothers completed the EPDS again, but in a self-administered approach. The diagnostic interviewers were conducted on a clinical research unit, and the EPDS was completed in an individual and quiet place.

Data analysis

Statistical analyses were performed using Stata/SE 10.0 for Windows (StataCorp, College Station, USA). The hypothesis of normal distribution was rejected by the Shapiro-Wilk test. Categorical data were analyzed using the chi-square test. The reliability of the scale was measured by the internal consistency using Cronbach's alpha coefficient. The predictive validity of the EPDS was calculated using the receiver-operating characteristic (ROC) curve. The correlation between the EPDS administered by telephone and the self-administered EPDS was determined by the Spearman's correlation test. The level of significance was set at 0.05.

Results

Participant flow

From the original sample (1,400), 1,083 (77.4 %) participants were assessed by telephone interviews. The telephone interview was performed, on average, after 111 days of delivery (SD=98.6). The main reason for non-assessment during puerperium was the loss of contact because of changes in the telephone number. The missing sample was composed by a higher proportion of women who were younger ($p<0.001$), less educated ($p=0.007$), poorer ($p=0.013$), and had a lower proportion of marital bond ($p<0.001$) compared with the participants who were assessed after delivery. The differences in ethnicity, anxiety, and depression during pregnancy were not significant ($p>0.05$) between the groups.

In 257 of 1,083 participants (23.7 %), the EPDS score administered by telephone was equal to or higher than 10, and all participants were invited to visit the clinical research unit for a diagnostic interview with a psychiatrist or psychologist. After matching by age and date of delivery, 239 women with EPDS scores lower than 10 were also invited to a face-to-face interview. More than half of the women refused to visit the research unit and dropped out of the study. The reasons for withdrawal were primarily mobility difficulties regarding travel to the clinical research unit and work commitments. The women with an EPDS score higher than 10 that withdrew from the study were referred to medical assistance in the public health system. The face-to-face interview was performed, on average, 67 days (SD=48.1) after the telephone interview. Figure 1 shows the flowchart of the participants included in the study.

Sample features

In this cross-sectional design, 199 women aged 14 to 39 years (mean=27.3, SD=5.5) were interviewed on two occasions (telephone screening and face-to-face interview). Among these mothers, 5.0 % had a university degree, 68.8 % completed high school, 25.6 % completed primary education, and 0.5 % were only literate. Regarding marital status, 80.4 % had a partner living with them. Regarding monthly income, 10.2 % of the women's families had received six units or more of the minimum Brazilian wage per month (R$ 545.00 in 2010, which was equivalent to US$ 291.54) and 63.1 % had received from 2 to 6 minimum wage units.
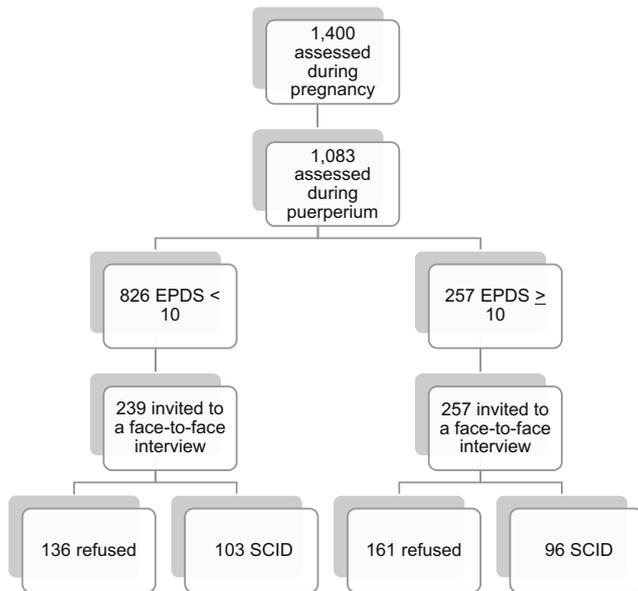
Fig. 1 Flowchart representing the assessment methodology

Fig. 2 Predictive validity demonstrated by the ROC curves of the EPDS by telephone interview and self-report

The diagnosis of a major depressive episode during the postpartum period was confirmed by the SCID in 90 participants (65 participants with an EPDS ≥10 and 25 participants with an EPDS <10). The occurrence of a current major depressive episode was ratified in 67.7 % of the 96 participants enrolled in the screening by telephone interview (EPDS ≥10) as a potential case, and the absence of a major depressive episode was confirmed in 75.7 % of the 103 participants screened as the control group (EPDS <10).

Psychometric parameters

The reliability was calculated considering the internal consistency of each item of the EPDS regarding the total score. From the resulting co-variance matrix, a Cronbach's $\alpha=0.861$ was obtained.

As shown in Fig. 2, the ROC curve for the EPDS applied by telephone interview was 0.78 (95 % CI=0.72 to 0.84), and the ROC curve for the data obtained by the self-administered EPDS administered immediately after the diagnostic interview (SCID) was 0.89 (95 % CI 0.84 to 0.93). The EPDS administered at the time of the diagnostic interview showed a higher predictive validity compared with the EPDS administered during the telephone screening ($\chi^2=10.49$, $p=0.001$).

Table 1 shows the validity parameters for the EPDS administered at both time points according to different cutoff points. For the EPDS administered by telephone interview, scores ≥10 showed a sensitivity of 72.2 %, a specificity of 71.6 %, and a positive predictive value of 67.7 %. With a cutoff ≥12, the sensitivity was lower (58.9 %), the specificity was increased (81.6 %), and the positive predictive value was slightly higher (72.6 %).
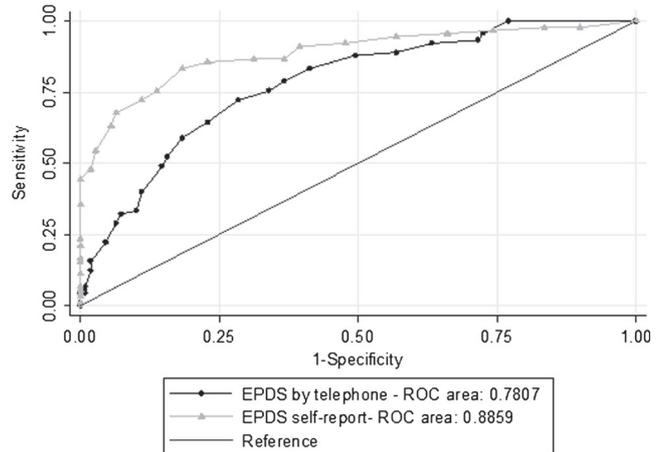
In the self-report assessment, scores ≥10 in the EPDS showed the following values: sensitivity=85.6 %, specificity=77.1 %, and positive predictive value=75.5 %. With a cutoff ≥12, the sensitivity was 75.6 %, the specificity was 86.2 %, and the positive predictive value was 81.9 % (Table 1).

Table 1 Predictive validity of the EPDS according to the cutoff point and interview method ($n=199$)

Cutoff point	EPDS by telephone (%)	EPDS by self-report (%)
Sensibility		
≥9	75.6	86.7
≥10	72.2	85.6
≥11	64.4	83.3
≥12	58.9	75.6
≥13	52.2	72.2
≥14	48.9	67.8
Specificity		
≥9	66.1	68.8
≥10	71.6	77.1
≥11	77.1	81.6
≥12	81.6	86.2
≥13	84.4	89.0
≥14	85.3	93.6
Positive predictive value		
≥9	64.8	69.6
≥10	67.7	75.5
≥11	69.9	78.9
≥12	72.6	81.9
≥13	73,4	84.4
≥14	73.3	89.7

The Spearman's correlation was conducted between the total scores of the EPDS administered by the telephone interview and the self-administered EPDS. There was a strong, positive correlation between the EPDS administered at both time points (rho=0.69, $p<.001$).

Discussion

This study aimed to verify if the application of a largely used screening scale by telephone is a suitable alternative for the detection of postpartum depression for clinical assessments and research purposes. We demonstrated that when administered by a telephone interview with skilled professionals, the Edinburg Postpartum Depression Scale (EPDS) maintains its psychometric properties compared with previous reports of the self-administered EPDS (Gibson et al. 2009).

When a cutoff point equal to or higher than 10 was adopted, we identified a sensibility of 72.2 % and a specificity of 71.6 % of the EPDS administered by a telephone interview compared with a gold standard diagnostic interview (SCID/DSM-IV). Although our results regarding the psychometric properties of the postpartum depression screening by telephone interview are clearly satisfying, they are slightly lower compared with the values obtained by studies in which the application was based on a face-to-face approach. For example, in Brazilian studies that used a cutoff point ≥10, a higher sensitivity (82.6 %; 86.4 %) and a similar or higher specificity (65.4 or 91.1 %, respectively) were attained (Santos et al. 2007; Figueira et al. 2009). These previous data are closer to the data obtained in this study with the self-reported EPDS (sensitivity=85.6 %, specificity=77.1 %). The lower values obtained with the telephone interview can be to the result of discomfort, anxiety, and the interference of external factors associated with the telephone approach (Manning et al. 2012). More importantly, the time gap between the telephone and face-to-face interviews in our study was approximately 2 months, on average, and during this period, changes in the symptoms may have occurred. Nevertheless, the high reliability (internal consistency) and the significant positive correlation between the EPDS administered by telephone and the self-report EPDS administered on the same day as the face-to-face diagnostic interview were associated with relatively high values of sensibility and specificity. Thus, these findings support the application of the EPDS by telephone as a suitable alternative for the screening of postpartum depression.

When our data were compared with the findings from other studies that used a telephone approach, we identified a slightly higher (Hanusa et al. 2008) or similar (Wisner et al. 2013) predictive positive value regarding the diagnosis of a major depressive episode. In the former study (Hanusa et al. 2008), the diagnosis of postpartum depression was confirmed by the

Diagnostic Interview Schedule (DIS) (Robins et al. 1981), whereas in our study and in the later study (Wisner et al. 2013), the diagnosis was confirmed by the SCID. The DIS is a fully structured interview developed to access psychiatric disorders in large-scale, epidemiological surveys; as a structured interview, it is suitable for trained lay interview administration and clinical judgments are not required (Hewitt et al. 2009). The use of highly structured interviews designed to access general psychiatric disorders in a puerperal population can lead to false-positive results because of the higher incidence of somatic symptoms and mood changes during the pregnancy and puerperal periods (Westdahl et al. 2007). In our study, in addition to assessing the validity of the screening by a telephone interview, we also correlated it with a self-report assessment. With these data, we can approximate the EPDS administered by telephone with a personal interview.

The postpartum period provides mobility difficulties for the mother with a newborn that requires special care. When added to depressive states, the difficulties in attending clinics for consultations and surveys may be even higher. The use of instruments by telephone represents an approach to optimize the methods of research, particularly in populations with limited access to the face-to-face approach. In addition, there is the benefit of the reduction of costs and the ease of detection of common morbidities in the general population, such as postpartum depression (Hewitt et al. 2009; Manning et al. 2012). At a time in which public health resources are scarce, awareness regarding its use is warranted (Da Silva Lima et al. 2013) and the use of a screening instrument for postpartum depression administered by telephone could represent an alternative for face-to-face assessments. On the other hand, the economic impact of the increased detection of false-positive cases should be considered and further studied (Hewitt et al. 2009).

It is important to highlight that although telephone screening can reduce time and costs, the application of instruments via telephone requires a training program of communication skills, including the recognition of situations in which the response of the listener may not be correct (Kempf et al. 2007; Manning et al. 2012). Other limitations of telephone screening include the lack of visual cues from the patient, doubts regarding the reliability of the information provided, the impossibility of controlling environmental factors, and the difficulty of establishing a complete rapport with the patient (Manning et al. 2012). The study reported here was careful to conduct this training and to recruit interviewers familiarized with the diagnostic process in mental health, which may have contributed to the high psychometric indices.

An important limitation of this study is the large number of subjects who did not attend the diagnostic assessment (61.3 %) despite multiple attempts to schedule the face-to-face interviews. The missing participants were significantly younger, poorer, less educated, and more likely to be single

than the participants enrolled in the study. This finding may reflect a major difficulty of population-based studies, i.e., the follow-up loss (Booker et al. 2011). An alternative to overcome this limitation would be to conduct home visits for the diagnostic interviews (Wisner et al. 2013) or to opt for the use of interviews via phone for the confirmatory diagnosis. For example, in a low and middle income country such as Brazil, approximately 84 % of women aged 20 to 29 years have access to mobile phones (Ibge 2011). Even in Brazilian regions with lower socioeconomic status, access to a telephone reaches 72 % (Ibge 2011). Thus, the application of a telephone interview represents a method to reduce the underdiagnosis, undertreatment, and harmful impact of postnatal depression for women, children, and families.

We identified a high prevalence of postpartum depression in our sample. When a cutoff point ≥10 was considered, the prevalence of PPD obtained in this study (23.7 %) was similar to that obtained in other studies previously described in Brazil (Figueira et al. 2009) and observed among low-income women (Kim et al. 2007) with Hispanic (Chaudron et al. 2005) or Arabic (Mohammad et al. 2011) backgrounds, but higher than that reported in populations from countries with higher incomes (Dennis et al. 2012; Giardinelli et al. 2012; Wisner et al. 2013). These data reinforce the relevance of fast, easy, and cheap methods for the early detection of postpartum depression.

The study reported here has implications for health care during the postpartum period in planning health strategies and research on the subject. Telephone interviews represent a useful tool for epidemiological studies because of the low cost and simple logistics. The EPDS is an instrument that can be easily administered and requires little training for its correct use. Therefore, the EPDS administered by telephone may be used to assess the presence and severity of depressive symptoms during the postpartum period.

Conflict of interest The authors certify that they have no commercial or associative interest that represents a conflict of interest in connection with the manuscript.

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