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Research paper

Improving discrimination in antepartum depression screening using the Edinburgh Postnatal Depression Scale

Kartik K. Venkatesh[a,*], Anjali J. Kaimal[b], Victor M. Castro[d], Roy H. Perlis[c,d]

[a] Dept. of Obstetrics and Gynecology, Massachusetts General Hospital and Brigham and Women's Hospital, Boston, MA, United States
[b] Division of Maternal Fetal Medicine, Dept. of Obstetrics and Gynecology, Massachusetts General Hospital, Boston, MA, United States
[c] Center for Experimental Drugs and Diagnostics, Dept. of Psychiatry, Massachusetts General Hospital, Boston, MA, United States
[d] Center for Human Genetic Research, Massachusetts General Hospital, Harvard Medical School, Boston, MA, United States

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ABSTRACT

Background: Universal screening of pregnant women for postpartum depression has recently been recommended; however, optimal application of depression screening tools in stratifying risk has not been defined. The current study examines new approaches to improve the ability of the Edinburgh Postnatal Depression Scale (EPDS) to stratify risk for postpartum depression, including alternate cut points, use of a continuous measure, and incorporation of other putative risk factors.

Methods: An observational cohort study of 4939 women screened both antepartum and postpartum with a negative EPDS screen antepartum(i.e. EPDS < 10). The primary outcome was a probable postpartum major depressive episode(EPDS cut-off ≥10). Area under the receiver operating characteristics curve(AUC), sensitivity, specificity, and predictive values were calculated.

Results: 287 women(5.8%) screened positive for postpartum depression. An antepartum EPDS cut-off < 5 optimally identified women with a low risk of postpartum depression with a negative predictive value of 97.6%; however, overall discrimination was modest(AUC 0.66, 95%CI: 0.64–0.69); sensitivity was 78.7%, and specificity was 53.8%, and the positive predictive value was low at 9.5%. The negative predictive values were similar(> 95%) at all antepartum EPDS cut-off values from 4 to 8. Discrimination was improved(AUC ranging from 0.70 to 0.73) when the antepartum EPDS was combined with a prior history of major depressive disorder before pregnancy.

Limitations: An inability to assess EPDS subscales and a relatively low prevalence of depression in this cohort.

Conclusions: Though an antepartum EPDS cut-off score < 5 yielded the greatest discrimination identifying women at low risk for postpartum depression, the negative predictive value was insufficient to substitute for postpartum screening.

1. Introduction

Depression is common during pregnancy, and even more so in the postpartum period where it affects 8–15% of women (Andersson et al., 2003; Lee et al., 2007). Depression during pregnancy and the postpartum period has been associated with both increased maternal and neonatal morbidity (Andersson et al., 2004; Yonkers et al., 2009; Davalos et al., 2012; Grigoriadis et al., 2013; Szegda et al., 2014). These negative consequences of antepartum and postpartum depression have led many health agencies, including most recently the United States Preventive Task Force (USPTF) in 2016, to recommend proactively screening women during and after pregnancy so that those women who are identified to be at risk for postpartum depression can be linked to appropriate services (Yonkers et al., 2009; Connor et al., 2016; Siu, 2016). Prior observational data have suggested that both antenatal anxiety and depressive symptoms predict postpartum depression among pregnant women enrolled in antenatal care (Lee et al., 2007; Heron et al., 2008; Kim et al., 2008; McDonald et al., 2012). Such screening is often the first step in the pathway to depression treatment for pregnant women; however, it remains to be established whether all pregnant women require screening both antepartum and postpartum, and whether screening can be enhanced by taking into account other risk factors for peripartum depression (Kim et al., 2008; McDonald et al., 2012). Prior studies suggest the strongest risk factors for postpartum depression are history of depression or anxiety during pregnancy or postpartum, a personal or family history of mood

* Correspondence to: Department of Obstetrics and Gynecology, Brigham and Women's Hospital, 75 Francis St, Boston, MA, United States.
E-mail address: kvenkatesh@partners.org (K.K. Venkatesh).

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disorders, previous perinatal loss, experiencing stressful life events, and lack of social support (Robertson et al., 2004; O'Hara and McCabe, 2013; Consortium, 2015). That is, can current depression screening tools in pregnancy be improved by taking into account a woman's socio-demographic and psychiatric risk profile?

The 10-item Edinburgh Postnatal Depression Scale (EPDS) is one of the most commonly used screening tools for depressive symptoms in pregnancy (Cox et al., 1987), and has been validated both antepartum and postpartum at different cutoff values ranging from 7 to 13 (Murray and Cox, 1990; Chaudron et al., 2010; Kozinszky and Dudas, 2015). The original validation study for detecting major depression in English-speaking women was 13 or more, though a score of 10 or more would also detect women with minor depression (Cox et al., 1987; Matthey et al., 2016); additionally, it has been suggested that a higher cutoff score is valid antepartum compared to postpartum (Kozinszky and Dudas, 2015). The EPDS has the advantages of being short and easy to complete, and it has been used in many different socioeconomic and linguistic groups (Thombs et al., 2015). Other screening instruments that have been validated for antepartum and postpartum depression include the Patient Health Questionnaire 9, the Beck Depression Inventory, the Center for Epidemiologic Studies Depression Scale, which are generally longer and include assessment of constitutional symptoms (Yonkers et al., 2011; American College of Obstetricians and Gynecologists, 2015). Despite an understanding that depressive symptoms are associated with the development of a depressive disorder, there is limited data predicting the risk of postpartum depression based on antenatal screening alone for depressive symptoms using the EPDS (Evans et al., 2001; Milgrom et al., 2008; Lau et al., 2010; Meijer et al., 2014). Limitations of prior studies have been relatively small convenience samples, including all women in antenatal care without excluding women with a recent diagnosis of depression during pregnancy, and limited exploration of whether screening performance varied at multiple threshold values as well as among sub-populations of at-risk women.

In the current study, we examined to what degree the 10-item EPDS administered antepartum, using a range of severity thresholds, can be used as a valid tool to identify pregnant women at the highest risk for postpartum depression among those who are not depressed antepartum. We incrementally calculated the sensitivity, specificity, and operating characteristics of the antepartum EPDS. We further examined the improvement in discrimination and calibration afforded by adding other putative predictors of postpartum depression to better incorporate a prior probability for depression. We hypothesized that screening for postpartum depression could be further improved during pregnancy by combining the EPDS with an individual woman's unique profile of socio-demographic and psychiatric risk factors for depression.

2. Methods

2.1. Study setting and participants

This observational cohort was drawn from Massachusetts General Hospital, MGH (Boston, MA), a large tertiary-care academic medical center. All women delivered at the obstetrics unit at MGH between July 2010 and October 2013. Use of de-identified clinical data were approved by the Partners Healthcare Institutional Review Board under a waiver of the informed consent requirement.

A universal depression screening program was initiated in July 2010 with the intention of screening all women for depression both during pregnancy and then again postpartum. Further details about implementation of this screening program have been described elsewhere (Venkatesh et al., 2016). Early in the third trimester between 24 and 28 weeks, all women were screened with the EPDS. Women were then screened again using the EPDS in the postpartum period between 2 and 6 weeks following delivery. Women with a positive EPDS screen ≥12 were then referred to onsite clinical social work or psychiatry for further diagnostic evaluation and treatment by clinic staff.

All completed depression screens were reviewed and scored in real-time and entered into the patient's electronic health record (EHR). After tabulation of the EPDS by a clinic social worker, only the total aggregate EPDS score was entered into the electronic medical record, limiting further analyses by individual questions. The present analysis utilized data from the Partners Healthcare EHR using i2b2 server software, which is a scalable computational framework for managing human health data. Further details about the i2b2 platform can be found in earlier reports by this study group (Blumenthal et al., 2014; Uchida et al., 2015).

2.2. Edinburgh postnatal depression scale (EPDS)

The EPDS, a 10-item questionnaire, focuses on psychic symptoms of depression and is designed to reduce the focus on somatic symptoms (i.e. poor sleep, weight gain/loss) that are common among pregnant women (Cox et al., 1987). The EPDS has established psychometric properties and is one of the most widely used self-reported instruments to assess depressive symptoms in pregnant women, including minorities and teenagers. Each question response is coded from 0 to 3, and the maximum total score is 30. The cutoff point used to identify women as high-risk for postpartum depression varies, with most studies using a cutoff score of ≥10 or ≥12 (Murray and Cox, 1990; Lawrie et al., 1998). Validation studies conducted among American women have suggested an optimal cut off score ≥9, particularly among minority and adolescent women (Chaudron et al., 2010; Tandon et al., 2012; Venkatesh et al., 2014); however, the optimal cut-off has generally been lower in the postpartum than in the antepartum period (Kozinszky and Dudas, 2015). Throughout the manuscript, we refer to an EPDS cutoff score of ≥10 as a depressive episode, recognizing that the sensitivity and specificity for a current depressive episode is > 90% and > 80% (Cox et al., 1987; Murray and Cox, 1990), respectively.

For this study, the primary outcome of screening positive for postpartum depression was defined as an EPDS cut-off of ≥10. (For consistency with some prior reports, an alternative cut-point of ≥12 was also examined in secondary analysis.) The analysis was limited to women with a negative antepartum EPDS depression screen (i.e., EPDS < 10). The antepartum EPDS was assessed sequentially at thresholds starting at a cut-off of ≥4.

The following socio-demographic and clinical characteristics were assessed from the EHR: age, race, household zip code, parity, pre-pregnancy body mass index (BMI), tobacco use during pregnancy, and enrollment in a government insurance program. Median household income was imputed using 2013 US Census Bureau data for the patient's residential zip code (Bureau, 2014). The following psychiatric characteristics were assessed: past and current diagnosis of major depressive disorder and anxiety and psychotherapy and psychopharmacology visits up to two years prior to pregnancy.

2.3. Statistical analyses

Descriptive statistics for socio-demographic, clinical, and psychiatric variables were calculated overall and then according to the likelihood of the presence of postpartum depressive symptoms (i.e. postpartum EPDS ≥10). We constructed receiver operating characteristic curves (ROC) and computed the areas under the curve (AUC). ROC curves plot the sensitivity of a measure on the y-axis and (1 minus the specificity) on the x-axis. The AUC, which ranges from 0 to 1, is a measure of the discrimination of a test. Screening instruments that identify cases better than chance have AUCs > 0.5. We present results at sequential intervals of the antepartum EPDS. Continuous measures identify an optimal cutoff score for screening positive for postpartum depression; dichotomous measures identify participants at high risk for postpartum depression. Differences between the AUCs obtained from