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Research report

Detecting perinatal common mental disorders in Ethiopia: Validation of the self-reporting questionnaire and Edinburgh Postnatal Depression Scale

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Abstract

Background: The cultural validity of instruments to detect perinatal common mental disorders (CMD) in rural, community settings has been little-investigated in developing countries.
Methods: Semantic, content, technical, criterion and construct validity of the Edinburgh Postnatal Depression Scale (EPDS) and Self-Reporting Questionnaire (SRQ) were evaluated in perinatal women in rural Ethiopia. Gold-standard measure of CMD was psychiatric assessment using the Comprehensive Psychopathological Rating Scale (CPRS). Community-based, convenience sampling was used. An initial validation study ($n=101$) evaluated both EPDS and SRQ. Subsequent validation was of SRQ alone ($n=119$).
Results: EPDS exhibited poor validity; area under the receiver operating characteristic (AUROC) curve of 0.62 (95%CI 0.49 to 0.76). SRQ-20 showed better validity as a dimensional scale, with AUROC of 0.82 (95%CI 0.68 to 0.96) and 0.70 (95%CI 0.57 to 0.83) in the two studies. The utility of SRQ in detecting 'cases' of CMD was not established, with differing estimates of optimal cut-off score: three and above in Study 1 (sensitivity 85.7%, specificity 75.6%); seven and above in Study 2 (sensitivity 68.4%, specificity 62%). High convergent validity of SRQ as a dimensional measure was demonstrated in a community survey of 1065 pregnant women.
Limitations: Estimation of optimal cut-off scores and validity coefficients for detecting CMD was limited by sample size.
Conclusions: EPDS demonstrated limited clinical utility as a screen for perinatal CMD in this rural, low-income setting. The SRQ-20 was superior to EPDS across all domains for evaluating cultural equivalence and showed validity as a dimensional measure of perinatal CMD.

Keywords: Validation studies; Pregnancy; Postpartum period; Culture; Mental disorders

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1. Introduction

Perinatal common mental disorders (CMD) are characterised by significant levels of depressive, anxiety, panic and/or somatic symptoms occurring in pregnancy and the postnatal period. In non-perinatal women from community and primary care settings, there are high levels of co-variance of these symptoms, indicating an underlying unitary construct of CMD (Goldberg, 1996, Lewis, 1992). In perinatal women, the focus of studies is typically narrowed to 'postnatal depression', although evidence supports the relevance of the broader concept of 'perinatal CMD' (Matthey et al., 2003, Aderibigbe et al., 1993).

Perinatal CMD is increasingly recognised to be an important public health issue in low-income countries. In sub-Saharan Africa, the estimated prevalence of CMD ranges from 12.5 to 27.1% in pregnancy (Assael et al., 1972, Cox, 1979, Aderibigbe and Gureje, 1992, Abiodun et al., 1993), and from 10.0 to 34.5% postnatally (Cox, 1983, Nhiwatiwa et al., 1998, Lawrie et al., 1998, Aderibigbe et al., 1993, Cooper et al., 1999, Uwakwe, 2003, Adewuya et al., 2005), and is comparable to estimates from high-income settings (O'Hara and Swain, 1996). Perinatal CMD in low-income settings, mostly South Asia, is associated with maternal disability and early cessation of breast-feeding (Patel et al., 2002), low birth weight (Rahman et al., 2004, Patel and Prince, 2006), infant undernutrition (Patel et al., 2003, Anoop et al., 2004, Rahman et al., 2004), impaired mother–infant relationships (Cooper et al., 1999), poorer infant mental development (Patel et al., 2003), increased frequency of infant diarrhoeal episodes and diminished help-seeking of the mother on behalf of her child (Rahman et al., 2004).

Simple, structured questionnaires may help to improve detection of perinatal CMD in primary health care, which is a prerequisite for appropriate intervention. The Edinburgh Postnatal Depression Scale (EPDS) (Cox et al., 1987) is the most widely validated screening instrument for depression in pregnancy and the postnatal period across a range of cultural settings (Cox and Holden, 2003), although with published validation data from only three countries in sub-Saharan Africa (Lawrie et al., 1998, Uwakwe, 2003, Weobong et al., in press). The EPDS was designed specifically to detect depression; however, the presence of an anxiety sub-scale suggests utility in detection of the broader concept of perinatal CMD (Jomeen and Martin, 2005, Brouwers et al., 2001).

While the omission of somatic symptoms from the EPDS avoids the risk of mislabelling physical changes associated with pregnancy and caring for an infant as somatic aspects of depression, this could be a disadvantage in developing world settings where somatic symptoms are considered to be a common presentation for CMD (Ebigbo, 1982, Harding et al., 1980). In Ethiopia, the Self-Reporting Questionnaire (SRQ-20) (Beusenberg and Orley, 1994), which has six somatic items (out of twenty), has been validated for detection of CMD (Kortmann and Ten Horn, 1988), although not specific to the perinatal period. A local version of the SRQ for Ethiopia, the SRQ-F, has also been developed by augmenting the original scale with local idioms of distress and found to have superior validity coefficients (Zilber et al., 2004).

Validation of a psychiatric rating scale in a new cultural setting requires attention to semantic, technical, content, criterion and conceptual equivalence (Flaherty et al., 1988). Few such studies have been carried out in sub-Saharan Africa for scales purporting to detect perinatal CMD, and none in Ethiopia. In this paper we present validation of the EPDS and SRQ for detection of CMD in pregnant and postnatal women in a predominantly rural area of Ethiopia.

2. Materials and methods

2.1. Setting

The studies were undertaken in Butajira, a predominantly rural region of Ethiopia located 130 km south of the capital Addis Ababa. A Demographic Surveillance Site (DSS) was established in this area 20 years ago under the auspices of the Butajira Rural Health Programme (BRHP) (Berhane et al., 1999). Within the densely populated Butajira area there is much ethnic and linguistic diversity, although most people are conversant with Amharic, the working language of the marketplace and the national language of Ethiopia.

2.2. Validation

2.2.1. Semantic validity

2.2.1.1. Edinburgh postnatal depression scale (Cox et al., 1987). The EPDS is a ten-item scale asking about symptoms experienced in the preceding week. The EPDS was translated into Amharic and back-translated by two independent sets of Ethiopian physicians with psychiatric experience. The final version was agreed by a consensus meeting including two senior Ethiopian psychiatrists with extensive expertise in conducting community surveys within Butajira.

2.2.1.2. Self-reporting questionnaire-20 (Beusenberg and Orley, 1994). The SRQ-20 is a 20-item scale asking about symptoms in the preceding 1 month. Development of the local version of the SRQ-20 for Northern Ethiopia, the SRQ-F, resulted in addition of eight culturally-relevant idioms of distress and dropping item ll from the original scale (Zilber et al., 2004). The Amharic translation of the SRQ-20 previously used in Butajira (Alem et al., 1999) was taken as the basic scale for validation, with minor modifications made following review of the two other published Amharic translations. The eight additional items from the SRQ-F were then added to the Butajira-modified SRQ-20 scale. The translation of the SRQ-20 questions in our study therefore differed slightly from the original SRQ-F. This modification was necessary to improve acceptability and comprehensibility, as different variants of Amharic are spoken across regions of Ethiopia.

2.2.2. Technical and content validity

The Amharic version of the EPDS was piloted on a sample of 37 postnatal women attending a vaccination outreach clinic in a rural sub-district of Butajira. The EPDS was administered as an interview, with probing of responses to items which required repetition, appeared not to be understood or were answered affirmatively. Given the accumulated experience in use of the SRQ-20 in Ethiopia, this and the SRQ-F were checked for acceptability and feasibility only.

2.2.3. Criterion validity

Two separate criterion validation studies were carried out: the EPDS evaluated in Validation study 1, and the SRQ-20 in Validation studies 1 and 2.

2.2.3.1. Validation study 1. A convenience sample of 101 postnatal women was drawn from a rural sub-district in the Butajira area. The EPDS and SRQ-20 /SRQ-F were administered by twenty female high school graduates (tenth grade and above) who had received two days of training in administration of the EPDS and SRQ-20/SRQ-F, as well as extensive training in administering complex fully structured diagnostic interviews. To assess the effect of response sets, women were randomised to receive the SRQ-20/SRQ-F either administered with items altogether ('en-bloc') or dispersed amongst the socio-demographic questions. To test for order effects, participating women were randomised using a random number table to receive the lay-administered instruments (EPDS, SRQ-20/SRQ-F) or the gold standard diagnostic interview first.

The gold standard measure of perinatal CMD was full psychiatric assessment by one of four Ethiopian psychiatry trainees using the Comprehensive Psychopathological Rating Scale (CPRS) (Asberg et al., 1978). The CPRS is an observer-rated scale which provides a checklist of 67 items, including 40 subjectively reported symptoms and 25 observed signs indicative of psychopathology, as well as giving a global rating indicating whether the person has a clinically significant level of psychiatric morbidity (is a 'case'). Use of the CPRS ensured that the clinicians completed a comprehensive assessment, while allowing them the freedom to phrase questions in a way understandable to respondents, screen out culturally acceptable beliefs and behaviours and probe for indicators of clinical significance. Test–retest reliability prior to Validation 1 was fair (kappa = 0.29) but subsequent inter-rater reliability, assessed prior to Validation 2, was excellent (kappa = 0.82). The psychiatrists were also supplied with the DSM-IV guidelines for diagnoses coded 296.x (mood disorders) and 300.x (anxiety disorders) and determined whether any of these diagnoses were present.

2.2.3.2. Validation study 2. The SRQ-20 was administered to a convenience community sample of 80 postnatal and 39 pregnant women by our trained data collectors. Psychiatric interview by local clinicians using CPRS again constituted the gold standard for determining caseness for CMD.

Further evaluation of the validity of SRQ-20 was required following validation 1 due to an unexpectedly large effect of the scale being administered with items dispersed. Thus, results from 'en-bloc' and 'dispersed' administration of the SRQ could not be combined, effectively reducing the sample size by half. In both studies, the screening questionnaire and gold standard assessment were administered on the same day and interviewers were masked to the outcome of the other assessment. Validation 1 was held in Butajira Health Centre, some 30 km from the women's residence, and Validation 2 in the local village health post. Participating women were remunerated for transport costs and supplied with refreshments.

2.2.4. Construct validity

The SRQ-20 was administered to a population-based sample of 1065 women living in the Butajira DSS who were in the third trimester of pregnancy during the recruitment period. We recruited 86.5% of eligible women. Non-recruited women did not differ significantly from participating women in terms of their age, religion, ethnicity, level of literacy or residence. Expected predictors of perinatal CMD, including poverty, marital difficulties, lack of social support, past psychiatric history,

Table 1
Socio-demographic characteristics of samples for criterion validation studies 1 and 2 and convergent validation study

	Criterion validation 1	Criterion validation 2	Convergent validation study
	% (n=101)	% (n=119)	% (n=1065)
Mean age in years	26.8 (SD 6.0)	26.2 (SD 5.6)	26.9 (SD 6.4)
Religious affiliation			
Muslim	82.2	86.6	77.6
Orthodox Christian	14.9	11.8	15.1
Protestant	2.0	1.7	6.2
Catholic	1.0	0	1.1
Ethnicity			
Meskan	73.3	69.5	45.5
Silti	13.9	17.8	24.1.
Mareko	5.0	0	13.8
Dobi	5.0	5.1	2.5
Sodo	1.0	4.2	8.0
Others	2.0	3.3	6.1
Non-literate	82.2	86.5*	84.5
No formal education	87.1	82.4	79.4
Marital status			
Monogamous marriage	85.1	81.5	80.3
Polygamous	12.9	15.9	18.8
Single, widowed or separated	2.0	2.5	0.9
Occupation			
Housewife	55.4	88.2	84.6
Farming	20.8	0.8	3.0
Trading	13.9	7.6	10.5
Roof composition			
Thatched	88.1	91.6	75.7
Corrugated iron sheet	10.9	8.4	24.3
Animals sleeping in home	75.3	69.7	61.9
Water supply			
Pipe	95.0	84.0	62.9
Protected well or spring	5.0	4.2	7.9
Unprotected	0	11.8	29.2
Sanitation			
Pit latrine	76.2	62.1	63.3
Field	23.8	37.8	36.7

*n=111.

somatic symptoms and experience of threatening life events (Assael et al., 1972, Abiodun et al., 1993, Cox, 1979, Aderibigbe et al., 1993, Nhiwatiwa et al., 1998, O'Hara and Swain, 1996) were examined to assess construct validity of the SRQ-20.

2.3. Statistical analyses

Data analysis was conducted using Stata version 8.0 (Stata Corporation, 2003). Sensitivity and specificity were estimated using caseness for CMD, DSM-IV depression and 'any DSM-IV diagnosis' as the validity criterion measures. Receiver Operating Characteristic (ROC) curves were obtained by plotting sensitivity against 1-specificity for each possible cut-off score. Optimal cut-off scores were sought on the basis of the maximum specificity which was not higher than sensitivity. Internal consistency was evaluated using Cronbach's alpha (Cronbach, 1951). Pearson's correlation coefficient was calculated for total scores on the different scales. Chi-squared analyses were used to evaluate differences in SRQ and EPDS symptom prevalence between cases and non-cases, and between AUROC curves for differing sub-samples. Risk ratios were calculated to examine the association between predicted risk factors and SRQ-defined caseness for perinatal CMDs, using a Poisson working model and sandwich estimators of the standard errors (Lumley et al., 2006).

2.4. Ethical approval

Ethical approval was obtained in Ethiopia and the UK. Informed consent was obtained and all interviews were conducted in private.

3. Results

3.1. Semantic validity

Translation of items 2 and 4 of the EPDS was problematic, for example the Amharic terms used to convey 'looking forward to' (Item 2) indicated the sense of anticipating or expecting something to happen, without requiring pleasure. In item 4, the Amharic word 'chenket' did not separate the concepts of 'anxiety' and worry'. Distinguishing between the four response categories was also difficult, and these were simplified where possible (Appendix A).

3.2. Technical validity

To facilitate administration of the EPDS as an interview rather than a self-completed questionnaire, each statement was turned into a question form. Questions were prefaced with 'In the last week…' to provide reminders of the time interval under consideration. Keeping the four possible response categories in mind was difficult for most participants and so responses were obtained in two stages, initially asking whether the woman had experienced the problem and then probing the response to establish the frequency or severity (Appendix A).

Table 2
Score distributions and psychometric properties of SRQ-20 and EPDS by gold standard of caseness for perinatal CMDs

	Criterion Validation 1			Criterion Validation 2
	EPDS	SRQ-20 (dispersed)	SRQ-20 (en-bloc)	SRQ-20 (en-bloc)
	Cases=17	Cases=10	Cases=7	Cases=19
	Non-Cases=83	Non-Cases=38	Non-Cases=45	Non-Cases=100
Median total score (IQR)				
Cases	7 (5)	1 (2)	4 (5)	10 (10)
Non-cases	6 (6)	1 (3)	1 (2)	4 (6.5)
Overall	6 (5)	1 (3)	1 (3)	5 (8)
AUROC (95%CI)	0.62 (0.49 to 0.76)	0.58 (0.39–0.77)	0.82 (0.68–0.96)	0.70 (0.56–0.84)

IQR: Inter-quartile range; AUROC: Area under the receiver operating characteristic curve.

3.3. Content validity

The EPDS items which most often needed to be repeated (41.7 to 58.3% of the time) were one to three. These items were also those most frequently not understood (16.7 to 30.6%). Probing responses for explanations and examples indicated misunderstanding of other items:

> Item four—Being anxious or worried *for no good reason*: 'Because my child was ill', 'My mother was gravely ill and I thought she might die'.
> Item five—Feeling scared or panicky *for no very good reason*: 'Due to problems in the house because of poverty', and 'When I have a problem with my family, for example if someone is ill'.
> Item nine—So unhappy that have been crying: Associated with attending funerals and the social obligation to visibly demonstrate distress.

The EPDS was accordingly modified with standardised examples to assist understanding of items one, two and three, as shown in Appendix A. Contrary to expectations, respondents were forthcoming about suicidal ideation (item 10): 'I tried to drink poison when I was living with my parents and they were quarrelling a lot', and for another woman, 'When I found out I was pregnant, I was worried and thought I should take my life'.

3.4. Criterion validity

3.4.1. Sample characteristics

The socio-demographic characteristics of women in both criterion validation studies (Validation 1 and 2) and the convergent validation study are displayed in Table 1. In Validation 1, all women were in the postnatal period; median 5 months (Inter-quartile range (IQR): 2). In Validation 2, 80 (67.2%) of women were postnatal, median 12 weeks (IQR 17), and the median gestational age of the 39 pregnant women was 7 months (IQR 3).

3.4.2. Gold standard

The prevalence of perinatal CMD as defined by the global CPRS rating was 16.0% and 17.0% in validation studies 1 and 2 respectively. Median CPRS symptom counts (IQR) in case vs. non-cases were 23.0 (16) vs. 6.0 (6) and 22.0 (16) vs. 6.5 (8) in studies 1 and 2 respectively. A DSM-IV diagnosis was made in 40.0% of women in study 1 and 27.7% in study 2. In both studies, the commonest diagnoses were major depressive disorder (study 1: 12.0%, study 2: 14.3%) and generalised anxiety disorder (study 1: 12.0%, study 2: 4.2%).

In validation 1, SRQ-20 and SRQ-F were correlated with total CPRS score: Pearson correlation coefficients 0.50 and 0.46 respectively. In Validation 2 the correlation coefficient for SRQ-20 and CPRS was 0.43. In Validation 1, the EPDS was poorly correlated with both CPRS and SRQ-20: 0.28 and 0.38 respectively.

Table 3
Validity coefficients for EPDS and SRQ-20 in detecting cases of perinatal CMDs according to gold standard (optimal cut-offs highlighted in bold)

	Cut-off	Sensitivity (%)	Specificity (%)
Criterion Validation 1(n=52)			
EPDS	**5/6**	**76.5**	**36.1**
	6/7	52.9	61.4
SRQ-20 (en-bloc)	1/2	85.7	57.8
	2/3	**85.7**	**75.6**
	3/4	57.1	84.4
Criterion Validation 2 (n=119)			
Pregnancy/postnatal	2/3	78.9	30.0
	3/4	73.7	61.0
	4/5	73.7	49.0
	5/6	68.4	58.0
	6/7	**68.4**	**62.0**
	7/8	68.4	71.0

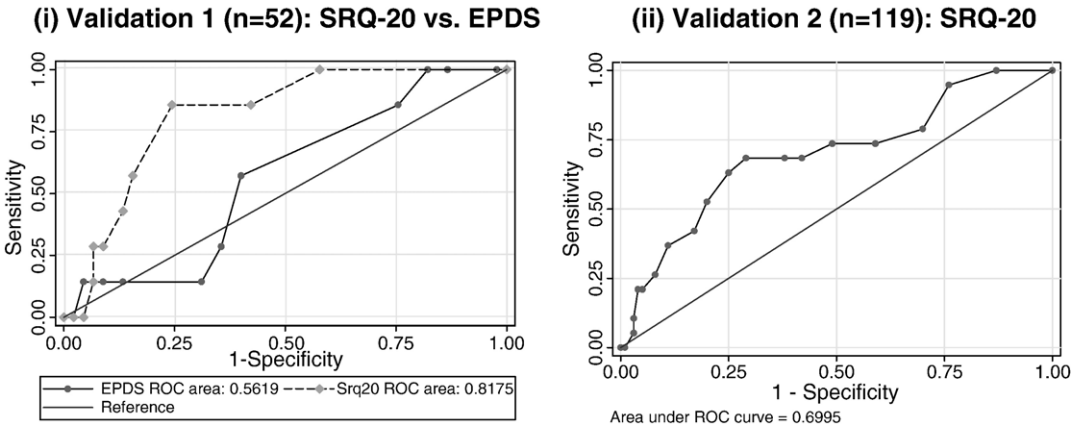

Fig. 1. Receiver Operating Characteristic curves for: (i) Validation 1 ($n=52$): SRQ-20 vs. EPDS (ii) Validation 2 ($n=119$): SRQ-20.

3.4.3 . EPDS

The EPDS was administered in Validation 1 only and performed poorly against both the criterion of CMD caseness and that of major depressive disorder (Tables 2 and 3; Fig. 1). The frequency of item endorsement is shown in Fig. 2. The great majority of women reported being sometimes or very often anxious or worried for no good reason, higher in non-cases (89.1%) than cases (82.4%). Only two items discriminated significantly between cases and non-cases: feeling sad or miserable (χ^2 9.98; $p=0.019$) and thoughts of self-harm (χ^2 15.88; $p=0.001$). Internal consistency, measured by Cronbach's alpha, was poor (0.47).

3.4.4 . SRQ-20/SRQ-F

In validation study 1, the ability of SRQ-20 with items dispersed amongst the socio-demographic questions to discriminate between 'cases' and 'non-cases' was no better than chance (Dispersed SRQ-20: AUROC 0.57; 95%CI 0.37 to 0.76) and significantly worse that

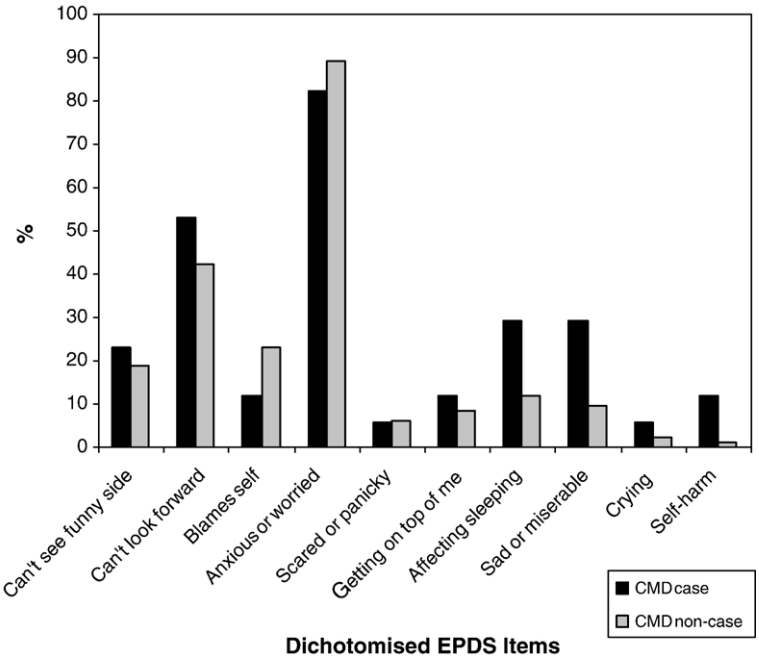

Fig. 2. EPDS symptom frequency in cases ($n=17$) and non-cases ($n=83$) of perinatal CMD as defined by the gold standard (EPDS items dichotomised 0/1=0 and 2/3=1).

Table 4
Frequency and ratios of SRQ-20 items in CMD cases vs. non-cases for criterion validation studies 1 and 2

SRQ item	Criterion validation 1 ($n=52$)			Criterion validation 2 ($n=119$)		
	Symptom % in cases ($n=7$)	Ratio in cases vs. non-cases	χ^2 test p-value	Symptom % in cases ($n=19$)	Ratio in cases vs. non-cases	χ^2 test p-value
1. Frequent headaches	42.9	1.1	0.89	73.7	1.3	0.13
2. Poor appetite	28.6	1.1	0.92	57.9	1.2	0.38
3. Sleeping badly	28.6	13.0	0.005	52.6	2.5	0.004
4. Easily frightened	28.6	4.3	0.07	47.4	1.5	0.20
5. Hands shake	14.3	2.1	0.48	36.8	2.3	0.04
6. Nervous, tense or worried	42.9	3.2	0.06	63.2	1.9	0.02
7. Digestion poor	14.3	0.9	0.93	52.6	1.5	0.15
8. Trouble thinking clearly	28.6	2.6	0.21	31.6	2.1	0.08
9. Unhappy	42.9	6.4	0.005	26.3	1.1	0.83
10. Crying more than usual	0	0	0.57	36.8	1.8	0.14
11. Difficulty enjoying daily activities	0	0	0.57	26.3	1.9	0.18
12. Difficulty making decisions	14.3	3.3	0.30	21.1	2.3	0.12
13. Daily work suffering	14.3	3.3	0.30	21.1	2.6	0.08
14. Unable to play useful part in life	0	0	0.69	10.5	2.1	0.35
15. Lost interest in things	42.9	6.4	0.005	36.8	2.2	0.05
16. Worthless person	14.3	1.1	0.95	57.9	1.8	0.03
17. Thought of ending life	57.1	6.4	0.001	57.9	1.7	0.05
18. Tired all the time	14.3	1.6	0.65	73.7	1.6	0.02
19. Uncomfortable feelings in stomach	14.3	1.6	0.65	42.1	1.6	0.19
20. Easily tired	28.6	6.5	0.03	78.9	1.4	0.09

when administered en-bloc ($\chi^2(1)=3.88$; $p=0.049$). Subsequent analyses were thus restricted to the sub-sample receiving SRQ-20 en-bloc ($n=52$). See Fig. 1 for ROC curve. The AUROC for SRQ-20 and SRQ-F were not statistically different ($\chi^2(1)=1.63$; $p=0.20$) and so only results using SRQ-20 are presented. The optimum cut-off score for SRQ-20 detection of CMD caseness in Validation 1 was three and over; sensitivity 85.7%, specificity 85.6%. There was no evidence of response sets for SRQ or order effects for either EPDS or SRQ (results not shown).

In Validation 2, the optimum SRQ cut-off score for determining caseness for CMD was seven and over; sensitivity 68.4%, specificity 62%. Compared to validation study 1, the frequency of self-reported symptoms was higher despite a comparable frequency of CPRS symptoms and prevalence of clinician-diagnosed perinatal CMD and DSM-IV diagnoses (Table 4). Pregnant women were included in Validation 2 but not in Validation 1. Post-hoc analyses showed that pregnant women reported a significantly higher prevalence of poor appetite (64.1 vs. 41.3%; $\chi^2(1)$ 1.80, $p=0.019$), sleeping badly (41.0 vs. 18.8%; $\chi^2(1)=6.75$, $p=0.009$), poor digestion (61.5 vs. 26.3%; $\chi^2(1)=13.88$, $p<0.0001$), and feeling easily tired (74.4 vs. 55.0%; $\chi^2(1)=4.14$, $p=0.042$). However, pregnant women were also significantly more likely to report non-somatic symptoms such as feeling unhappy (35.9 vs. 18.8%; $\chi^2(1)=4.18$, $p=0.041$). The overall performance of the SRQ as indicated by the AUROC did not differ significantly between pregnant and postnatal women ($\chi^2(1)=2.06$, $p=0.151$).

In both validation studies, the most frequently endorsed SRQ items were somatic. Poor sleep, loss of interest and thoughts of harming oneself were among the most discriminating items (Table 4).

Internal consistency, measured by Cronbach's alpha, was excellent for SRQ in both validation studies: 0.84 (study 1), 0.88 (study 2).

3.4.5. Construct validity

Convergent validity was evaluated using SRQ both as a linear scale and as ordered categories of SRQ symptom burden: No symptoms (scored 0), low symptoms (one to five) and high symptoms (six and above). The category of 'high' symptoms was chosen to correspond to the cut-off for caseness for CMD which has been most commonly employed in previous studies in Ethiopia. Out of 1065 pregnant women, 128 women (12.0%) had high levels of symptoms, 59.5% were 'low' and 28.5% 'no symptoms'. As hypothesised, increasing levels of SRQ symptoms (linear scale and ordered categories) were associated in a dose-dependent way with a variety of previously demonstrated risk factors

Table 5
Risk ratio for SRQ score/ordered categories and variables expected to be associated with perinatal common mental disorders, with robust standard errors

	n (%)	Risk Ratio (95% CI) (compared to SRQ zero-scorers)			RR for SRQ as continuous variable (95% CI)
		Low symptoms	High symptoms	*p*-value ($\chi 2$ test-for-trend)	
Non-literacy	900 (84.5)	1.0 (0.9 to 1.1)	1.1 (1.0 to 1.1)	0.28	1.01 (1.00 to 1.01)
No education	846 (79.5)	1.0 (0.9 to 1.0)	0.9 (0.8 to 1.0)	0.14	0.99 (0.98 to 1.00)
Hungry last month	167 (15.7)	1.4 (1.0 to 2.1)	3.6 (2.4 to 5.5)	<0.0001	1.11 (1.08 to 1.15)
Indebted	82 (7.7)	4.7 (1.9 to 11.6)	13.3 (5.2 to 33.6)	<0.0001	1.17 (1.13 to 1.21)
Unmarried	10 (0.9)	2.9 (0.3 to 23.7)	7.1 (0.7 to 67.7)	0.06	1.12 (0.97 to 1.29)
Worse marital relationship	104 (9.8)	2.2 (1.3 to 4.0)	5.5 (3.0 to 10.3)	<0.0001	1.15 (1.11 to 1.18)
Husband unhappy about pregnancy	64 (6.2)	0.9 (0.5 to 1.7)	2.6 (1.4 to 5.1)	0.01	1.11 (1.05 to 1.16)
Not enough help from husband	124 (11.7)	1.4 (0.9 to 2.3)	4.0 (2.5 to 6.5)	<0.0001	1.13 (1.10 to 1.17)
Sees family ≤1/yr	64 (6.0)	1.1 (0.6 to 2.1)	2.1 (1.0 to 4.2)	0.08	1.08 (1.02 to 1.14)
Lack of family support	213 (20.0)	1.6 (1.2 to 2.3)	2.5 (1.7 to 3.7)	<0.0001	1.07 (1.04 to 1.10)
Sees friends annually or less	87 (8.2)	1.0 (0.6 to 1.6)	1.7 (1.0 to 3.2)	0.13	1.00 (0.99 to 1.02)
Lack of support from friends	658 (61.9)	1.0 (0.9 to 1.1)	1.1 (0.9 to 1.3)	0.52	1.06 (1.00 to 1.11)
No groups in pregnancy	799 (75.0)	1.0 (0.9 to 1.1)	1.1 (1.0 to 1.3)	0.08	1.01 (1.01 to 1.02)
≥1 life events	433 (40.7)	2.2 (1.7 to 2.8)	3.7 (2.9 to 4.7)	<0.0001	1.09 (1.08 to 1.11)
Violence during pregnancy	24 (2.3)	2.1 (0.6 to 7.2)	6.3 (1.7 to 23.4)	0.003	1.15 (1.07 to 1.23)
Unwanted pregnancy	487 (45.8)	1.3 (1.1 to 1.6)	1.6 (1.3 to 1.9)	<0.0001	1.04 (1.02 to 1.06)
Past mental illness	48 (4.5)	1.7 (0.6 to 5.0)	17.8 (6.4 to 49.4)	<0.0001	1.28 (1.24 to 1.32)
Family history of mental disorder	107 (10.1)	1.4 (0.9 to 2.2)	2.8 (1.7 to 4.9)	0.0003	1.11 (1.07 to 1.15)
Poorer health	41 (3.9)	1.7 (0.6 to 4.6)	8.5 (3.2 to 22.5)	<0.0001	1.22 (1.17 to 1.27)
≥1somatic symptom	444 (41.9)	5.7 (3.9 to 8.2)	10.4 (7.2 to 15.2)	<0.0001	1.13 (1.12 to 1.15)

for and co-determinants of CMD (Table 5). Only educational level and literacy were not significantly associated.

4. Discussion

In contrast to reports from other developing countries, the EPDS was not found to be a valid measure of perinatal CMD in this rural Ethiopian community setting. The EPDS was poorly understood by participating women, discriminated inadequately between cases and non-cases and showed unacceptably low internal consistency. The SRQ-20 performed somewhat better, proving easy to administer and valid as a dimensional indicator of CMD, with good evidence of convergent validity. The 29-item culturally-modified version of the SRQ, the SRQ-F, showed no significant benefits compared to the original 20-item SRQ in this population.

4.1. The EPDS

In this study, difficulties in validation of EPDS were evident across all the proposed domains for cross-cultural equivalence. The endorsement frequency of the first five items of the scale barely differed between cases and non-cases, indicating that respondents were not tapping into the pathological underlying construct of perinatal CMD intended by the developers of the scale.

Misunderstanding persisted despite efforts to improve the comprehensibility of the first three EPDS items by providing standardised examples, indicating a perhaps unbridgeable conceptual divide. For example, future-orientation and reflecting on one's personal sense of enjoyment, may not be as meaningful in this traditional and religious society compared to Western settings. EPDS validation studies from other developing countries have mostly been conducted in urban, clinic-based settings (Regmi et al., 2002, Lawrie et al., 1998, Uwakwe, 2003, Pollock et al., 2006), except for a recent study in rural, non-literate, postnatal women in Ghana (Weobong et al., in press). Education and urbanicity are likely to increase a person's exposure to Western concepts of mental ill-health, perhaps helping to explain the poorer validity of measures reported from this Ethiopian sample. However, in the Ghana study, where the methodology was based on the Ethiopian study presented in this paper, EPDS performed well, with an AUROC of 0.84 (0.76 to 0.92). Generalisability across sites in sub-Saharan African may be limited, reflecting the marked diversity of cultures across the continent.

Although it could be argued that altering the format of the EPDS adversely affected the psychometric properties of the scale and thus its technical validity (Matthey et al.,

2006), we consider that these modifications were essential in trying to achieve cultural equivalence.

Further attempts to validate EPDS in other rural African settings with high levels of non-literacy would provide important comparative data for the unexpected findings of this study.

4.2. The SRQ-20

Validation of the SRQ-20 in Ethiopia has previously focused on urban and/or help-seeking populations, and not evaluated perinatal women. Kortmann cautioned against the use of SRQ-20 in health-care settings in Ethiopia, concluding that affirmative responses were indicative of attempts to elicit help, rather than a manifestation of emotional distress (Kortmann and Ten Horn, 1988). In his comparative study, the performance of SRQ-20 was substantially better in the urban community sub-sample ($n=40$) compared to an out-patient sample. Likewise, the culturally-modified version of SRQ (the SRQ-F) performed well in a small community sample in rural northern Ethiopia ($n=40$) (Zilber et al., 2004). Both studies were too small to estimate optimal cut-off points with adequate precision. Population surveys in Ethiopia have used various cut-off points to define cases of CMD, ≥ 6 in Addis Ababa (Kebede et al., 1999) and ≥ 11 in two rural settings (Alem et al., 1999, Tafari et al., 1991), none of which were supported empirically. Where SRQ-20 has been validated in other sub-Saharan countries, the optimal cut-off for defining caseness for CMD has also varied widely (from ≥ 4 in Sudan (Harding et al., 1980) to ≥ 10 in South Africa (Freeman et al., 1991).

The validation studies mentioned all focus on the ability of the SRQ to discriminate between cases and non-cases of CMD, rather than on the properties of SRQ as a dimensional scale, with higher scores indicating higher symptom burden. While this may reflect a public health drive to quantify the prevalence of disorder in a population, the resulting array of possible cut-off points, even from studies within a country, demonstrate the limitation of this approach. Evaluating SRQ as a dimensional scale accords with the conceptualisation of CMD in the literature and the finding that functional impairment is related to symptom burden rather than crossing a threshold of caseness (Rucci et al., 2003). In addition, this approach has benefits in studies in non-Western settings when it may be prudent to exert caution before attaching pathological labels ('case') to self-reported symptom burden.

The optimal SRQ-20 cut-off score for determining caseness of CMD differed between our validation studies. Given the limited precision around estimates of sensitivity and specificity, it is unclear which of the cut-off estimates truly discriminates best between cases and non-cases. However, the area under the ROC curve and scale properties from both studies indicated validity of the SRQ as a scale, with increasing levels of endorsed symptoms associated with increased likelihood of caseness for perinatal CMD. Strong convergent validity of SRQ as a dimensional measure was demonstrated in a large population-based sample, with the expected predictors of CMD associated with both ordered categories of SRQ symptom level and SRQ as a linear scale in a dose-dependent fashion. Our findings are comparable to two previous SRQ validation studies conducted in populations with high levels of non-literacy, where reported estimates of AUROC were 0.72 (95%CI 0.62 to 0.80) in Afghanistan (Ventevogel et al., 2007) and 0.74 (0.62 to 0.86) in postnatal women in Ghana, indicating reasonable dimensional validity of SRQ across settings (Weobong et al., in press).

The use of a community rather than clinic-based sample in our study may have contributed to lower AUROC estimates in our study compared to other validation studies. A community-based validation in the UK found similarly poorer validity coefficients compared to clinic-based validations (Murray and Carothers, 1990). As our intention was to measure perinatal CMD in a large population-based study, it was necessary that our instruments be validated in a similar sample.

Previous experience with the SRQ-20 in Butajira (personal communications: Frissa 2003, Deyessa 2004) suggested that the positive phrasing of all questions could lead to a response-set of 'nay-saying', whereby respondents reply 'no' regardless of whether the symptoms is absent or not. Our results did not suggest an important role for response sets but did demonstrate that the psychometric properties of SRQ-20 depend upon it being administered en-bloc, as designed.

4.3. Perinatal somatic symptoms

Somatic items were those most frequently endorsed in this perinatal sample, both in cases and non-cases, although 'sleeping badly' was also among the items which discriminated best between cases and non-cases in both studies. This may help to explain the better performance of the SRQ-20 compared to the EPDS in this population. Somatic symptoms are well-recognised indicators of affective disorders in sub-Saharan Africa (Tomlinson et al., 2007, Halbreich et al., 2007), with increasing number of somatic complaints indicative of CMD in this setting (Harding et al., 1980). Although, in

pregnancy, somatic symptoms may be a common and normal phenomenon, women who complain of several symptoms may be more likely to have CMD. Scales which include somatic items have been shown to have excellent criterion validity in detection of perinatal CMD in Nigeria (Uwakwe, 2003, Abiodun et al., 1993, Aderibigbe and Gureje, 1992), China (Lee et al., 2001) and Mongolia (Pollock et al., 2006). In antenatal women in Nigeria, only the somatic and anxiety sub-scales of the General Health Questionnaire (and not the depression scale) were significantly correlated with the gold standard symptom count (Aderibigbe and Gureje, 1992).

4.4. Potential limitations

The test–retest reliability of the gold standard in the first validation study was moderate and may have led to underestimation of the criterion validity of the EPDS and SRQ.

The instruments for detecting perinatal CMD were translated into Amharic which was the second language of the many participating women. It is possible that subtleties of understanding were lost leading to some invalid responses.

Although the CPRS rating of CMD caseness gives a similar prevalence of CMD in both validation studies, the SRQ symptom frequencies in cases are higher in study 2. This could be due to inclusion of pregnant women, who may have been experiencing higher levels of somatic symptoms related to their physiological state, in the second validation study. No significant difference was observed between the AUROCs for pregnant compared to postpartum women, but type II error cannot be excluded. Previous validation of the EPDS in pregnant women (the 'Edinburgh Depression Scale') supports the need for a higher cut-off score to define those likely to be cases (Murray and Cox, 1990).

Use of a convenience, community sample could have introduced a selection bias if factors leading to participation affected the relationship between presence of symptoms of CMD and willingness to endorse scale items. Although the benefits from participating in the validation studies were minimal (small transport allowance, bread and soft drink), it is possible that more disadvantaged women had greater motivation to participate, and that they may have perceived potential for further benefits from expressing distress and answering affirmatively. Nonetheless, we believe that our sampling strategy was preferable to recruitment from antenatal clinics (attended by a minority of women in Ethiopia) where stronger selection biases are likely to be operating.

5. Conclusion

The SRQ-20 was found to have superior validity to the EPDS across all domains for evaluating cultural equivalence in detection of perinatal CMD in rural Ethiopia. Identifying an optimal cut-off to distinguish cases from non-cases proved difficult, although the SRQ demonstrated good convergent validity as a dimensional measure. Using symptom burden rather than designating 'cases' of perinatal CMD on the basis of a lay-administered self-report scale in a non-Western community setting may be a more culturally valid approach. The findings support our planned use of the SRQ as a dimensional scale in a cohort study to test for the effects of psychological morbidity on infant outcomes.

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Conflict of Interest

All authors declare that they have no conflicts of interest.

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Appendix A

Modified version of Edinburgh Postnatal Depression Scale (EPDS) Cox et al., 1987

1. In the last week, have you been able to laugh and see the funny side of things?

For example: can you laugh at things which normally make you laugh?

Yes	As much as I always used to	0
No	Not as much as I used to	1
	Certainly not as much as I used to	2
	Not at all	3

2. In the last week, have you looked forward with enjoyment to things?

For example if your cow is pregnant would you be able to look forward to it giving birth? Another example is, are you able to look forward to market day? Or to something like this?

Yes	As much as I always used to	0
No	Rather less	1
	Certainly less	2
	Never looked forward	3

3. In the last week, have you blamed yourself unnecessarily when things went wrong?

Appendix A (*continued*)

For example if your child gets ill do you blame yourself? Or, for example, if the crops fail? Or something like this?

Yes	Most of the time	3
	Sometimes	2
No	Rarely	1
	Never	0

4. In the last week, have you been anxious or worried for no good reason?

Yes	Most of the time	0
	Sometimes	1
No	Not often	2
	Never	3

5. In the last week, have you felt scared or panicky for no good reason?

Yes	Most of the time	3
	Sometimes	2
	Rarely	1
No	Never	0

6. In the last week, have things been getting on top of you?

Yes	Most of the time unable to cope	3
	Sometimes unable	2
No	Mostly able	1
	Coping as usual	0

7. In the last week, have you been so unhappy that you have had difficulty sleeping?

Yes	Most of the time	3
	Sometimes	2
No	Never	1
	Rarely	0

8. In the last week, have you felt sad or miserable?

Yes	Most of the time	3
	Sometimes	2
No	Occasionally	1
	Never	0

9. In the last week, have you felt so unhappy that you have been crying?

Yes	Most of the time	3
	Sometimes	2
	Occasionally	1
No	Never	0

10. In the last week, has the thought of harming yourself occurred to you?

Yes	Frequently	3
	Sometimes	2
No	Not often	1
	Never	0

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