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Identifying common mental disorders among perinatal and non-perinatal women in northern India: a cross-sectional validation study of the diagnostic accuracy of six self-report measures

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ABSTRACT

Objectives To translate and culturally adapt six self-report measures for depression, anxiety, post-traumatic stress disorder (PTSD) and somatic symptom disorder into Hindi and determine their diagnostic accuracy against a diagnostic clinical interview.

Design Cross-sectional validation study.

Setting Rural Kangra, Himachal Pradesh, northern India.

Participants 480 perinatal (pregnant or within 12 months postpartum) and non-perinatal (not currently pregnant and not given birth within 12 months) women at one tertiary hospital and district-level Anganwadi (community health) centres.

Primary and secondary outcome measures Symptom endorsement; and discriminant validity, sensitivity, specificity, positive and negative predictive values and area under the receiver operating characteristic curve (AUROC) of the Kessler Scale of Psychological Distress (K10), Patient Health Questionnaire (PHQ9), Edinburgh Postnatal Depression Scale (EPDS), Generalised Anxiety Disorder Scale (GAD7), Perinatal Anxiety Screening Scale (PASS), PTSD Checklist (PCL-5) and Scale for the Assessment of Somatic Symptoms (SASS).

Results Complete data were available for 443 participants. Tiredness and body weakness were the most commonly endorsed symptoms among participants with common mental disorders. Among perinatal participants, the AUROC was highest for the GAD7 (0.88, 95% CI 0.79 to 0.96) and SASS (0.84, 95% CI 0.71 to 0.96). Among non-perinatal participants, the AUROC was highest for the SASS (0.92, 95% CI 0.88 to 0.97) and PHQ9 (0.91, 95% CI 0.86 to 0.96).

Conclusions Measures which assess for fatigue, tiredness and somatic symptoms may help to identify women experiencing common mental disorders in this setting. Small numbers of participants with clinically diagnosed mental disorders in our sample mean results must be interpreted cautiously.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Validity of self-report measures was assessed against a diagnostic interview conducted by psychiatrists and clinical psychologists with extensive clinical and research expertise in the local community.
⇒ The concurrent assessment of six self-report measures enabled comparison of each measure against a diagnostic interview as well as against the other measures.
⇒ Comprehensive descriptive and statistical analyses allowed different dimensions of validity to be explored.
⇒ The small number of participants with clinically diagnosed mental disorders means results must be interpreted with caution.

Trial registration number NCT05485701.

INTRODUCTION

Mental disorders are a leading cause of disability globally.[1] The most common mental disorders are depression and anxiety, which disproportionately affect women, especially during reproductive years.[1] Along with depression and anxiety, post-traumatic stress disorder (PTSD) is increasingly recognised as an important mental disorder with higher prevalence among women than men.[2 3] The high prevalence of somatisation disorder, in which mental disorders present with physical rather than psychological symptoms, is also becoming more widely recognised.[4–6] There is significant comorbidity between these conditions.[7]

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When experienced during pregnancy or in the first year after childbirth (the perinatal period), mental disorders are associated with maternal morbidity and mortality as well as adverse neonatal, infant and child outcomes.[8] Early detection of mental disorders can improve outcomes for women and their families, but identifying affected individuals can be challenging due to stigma, under-reporting and under-diagnosis. Systematically assessing for symptoms of mental disorders during routine primary care or maternity appointments can improve detection.[9 10] Several countries including the UK and the USA recommend administering self-report measures at routine antenatal and/or postnatal visits to improve detection of mental disorders.[11 12]

Of the many existing self-report measures, the majority were conceptualised and developed in European, north American and Australasian contexts and in the English language.[13] Before administering these measures in other settings, they require translation, cultural adaptation and validation in the target population to ensure they are acceptable, reliable and valid. Culturally diverse manifestations of mental disorders, differences in population characteristics and where, in what format and by whom a measure is administered all impact how well a measure performs in a given setting.[14] The most appropriate cut-off may also differ across settings and population subgroups.[15] This is especially relevant in the perinatal period, when symptoms such as fatigue or changes in appetite may be attributable to pregnancy rather than a mental disorder, and different cut-offs may be required to avoid misattributing symptoms.

In India, the prevalence of depression and anxiety is higher in women than men, and one in five perinatal women experiences depression or anxiety.[16 17] However, to date, few measures have been psychometrically validated against a diagnostic interview among women in India. Among perinatal women, only one measure of generalised psychological distress and one measure of depression—and no measures of anxiety or PTSD—have been formally validated in India.[18] To address this significant evidence gap, our study aimed to translate and culturally adapt six self-report measures for depression, anxiety, PTSD and somatic symptom disorder into Hindi and to determine the diagnostic accuracy of these measures against a clinical interview among perinatal and non-perinatal women in a rural district of Himachal Pradesh, northern India.

METHODS

This cross-sectional validation study forms part of the Perinatal Mental Health Study (PMHS), an international collaboration between the Dr Rajendra Prasad Government Medical College (DRPGMC) in Kangra, Himachal Pradesh, India; the National Institute of Mental Health and Neuro Sciences (NIMHANS) in Bengaluru, Karnataka, India; and the University of Oxford, UK.[19] The PMHS uses the research platform of the Maternal and Perinatal Health Research Collaboration India (MaatHRI).[20] This paper focuses on the results of the validation study in Himachal Pradesh. The validation study follows the WHO Guidelines on the Translation and Adaptation of Instruments and is reported according to STARD guidelines.[21 22] The study is registered on ClinicalTrials.gov (NCT05485701). The study protocol is published as an open-access publication and available on the study website: www.npeu.ox.ac.uk/pmhs/publications.[19]

Setting

The study was carried out at DRPGMC and in rural clinics in Kangra, Himachal Pradesh, northern India. DRPGMC is a government hospital and referral centre which includes a large obstetrics and gynaecology department and a department of psychiatry. The state language of Himachal Pradesh is Hindi. Participant recruitment and data collection took place within DRPGMC antenatal clinics and in Anganwadi Centres (community-based child development centres).

Self-report measures

The selection of self-report measures to be validated was informed by results of a systematic review of mental health measures that have been validated in perinatal populations in India,[18] evidence from other South Asian settings and discussion among the PMHS team of clinical psychologists, psychiatrists, obstetricians, public health experts and epidemiologists in India and the UK. The following six measures were selected for validation:

The Kessler Psychological Distress Scale (K10) is a 10-item measure of general psychological distress developed in the USA.[23] It assesses anxiety and depressive symptoms experienced in the past 4 weeks. Each question is rated from one (none of the time) to five (all the time), with total scores ranging from 0 to 50.[23 24] Scores of ≥20 and ≥30 indicate moderate and severe psychological distress, respectively.[24] The K10 has demonstrated good internal consistency and construct validity across diverse populations, including perinatal populations in India.[25]

The Edinburgh Postnatal Depression Scale (EPDS) is a 10-item measure developed in the UK which assesses symptoms of depression during the past week.[26] Each question is rated from zero to three, with total scores ranging from 0 to 30. A cut-off of ≥13 is widely used to indicate probable major depression in perinatal women.[26 27] The EPDS has demonstrated good sensitivity, specificity and internal consistency (Cronbach's alpha 0.80–0.90) across multiple cultural settings.[27] The EPDS is the most commonly used measure for perinatal depression globally and has been translated into over 30 languages.[13 27] It has been validated in perinatal populations in India.[18]

The Patient Health Questionnaire (PHQ9) is a nine-item measure of depression developed in the UK for primary care settings.[28] Each question is rated from zero (not at all) to three (nearly every day), with total scores ranging from 0 to 27.[29] Cut-offs of 5, 10, 15 and 20 correspond to mild, moderate, moderately severe and severe

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depressive symptoms, respectively.[28] The PHQ-9 has demonstrated excellent criterion validity and internal consistency (Cronbach's alpha 0.86–0.89).[28]

The Generalised Anxiety Disorder Scale (GAD7) is a seven-item measure developed in the USA for symptoms of generalised anxiety in general populations.[30] It assesses the frequency of anxiety symptoms over the preceding 2 weeks. Each question is rated from zero (not at all) to three (nearly every day), with total scores ranging from 0 to 21. Cut-off scores of 5, 10 and 15 represent mild, moderate and severe anxiety, respectively. The GAD7 has shown good sensitivity, specificity and internal consistency (Cronbach's alpha 0.89–0.92).[30]

The Perinatal Anxiety Screening Scale (PASS) is a 31-item measure developed in Australia to detect a broad range of anxiety symptoms, including acute anxiety, general worry, perfectionism and social anxiety, in perinatal women.[31] Each question is rated from zero (not at all) to three (almost always), with total scores ranging from 0 to 93. The PASS was designed for community and hospital maternity and mental health settings. A cut-off of ≥26 indicates clinically significant anxiety warranting further assessment.[31] The PASS has demonstrated excellent internal consistency and convergent validity with other anxiety measures in perinatal populations (Cronbach's alpha 0.96).[31]

The PTSD Checklist for DSM-5 (PCL5) is a 20-item measure developed in the USA which assesses the presence of the 20 symptoms of PTSD listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5).[32] The PCL5 first establishes whether there has been exposure to a traumatic event. If this criterion is met, subsequent questions assess for symptoms of PTSD. Each question is rated from zero (not at all) to four (extremely), with total scores ranging from 0 to 80. Cut-off scores between 31 and 33 indicate probable PTSD.[32] The PCL-5 has demonstrated high internal consistency, test-retest reliability and convergent validity with clinician-administered PTSD measures (Cronbach's alpha >0.90).[32]

The Scale for Assessment of Somatic Symptoms (SASS) was developed in India and identifies somatic symptoms associated with psychological distress.[33 34] The version for pregnant women includes five subscales which assess pain-related, sensory somatic, non-specific somatic and biological function-related, specific somatic and any other symptoms with a total of 33 questions. The severity of each symptom is rated from zero (absence of the symptom) to three (severe), with total scores ranging from 0 to 99. Higher scores indicate greater symptom burden.[33] The SASS has demonstrated good internal consistency, test-retest reliability and construct validity in Indian perinatal populations.[35]

Diagnostic interview

The diagnostic interview used for this study was the Quick Structured Clinical Interview for DSM-5 Disorders (QuickSCID-5), a fully structured diagnostic instrument that uses questions adapted from the Structured Clinical Interview for DSM-5 (SCID-5).[36] This was selected as it is widely regarded as the gold standard for structured psychiatric diagnostic interviews. The following modules of the QuickSCID-5 were administered: current major depressive disorder ('depression'), current generalised anxiety disorder ('anxiety'), PTSD and somatic symptom disorder. The Quick-SCID-5 was used with appropriate permission through purchasing licensed copies, which permitted administration in accordance with the publisher's terms.

Translation of measures

Existing Hindi translations of the K10, PHQ9, EPDS and GAD7 were retrieved, reviewed by the study team and modified to ensure terminology was appropriate to the local setting. The PASS, PCL5 and SASS were translated by the study team following WHO guidelines for the Translation and Adaptation of Instruments and the Translation and Cultural Adaptation Process for the Patient Reported Outcomes Framework.[22 37] Measures were translated from English into Hindi by a psychiatrist and clinical psychologist fluent in both languages. Translations were shared with the wider study team. Terminology, phrasing and semantics were discussed, and revisions were made with a focus on maintaining conceptual rather than literal equivalence. Hindi versions were back-translated into English by a member of the study team who had not seen the original version. Back-translated and original versions were compared, and a last round of edits was made to produce the final Hindi versions. Feedback on the translated measures was sought through focus group discussions (FGD) with perinatal women in the same study setting, the results of which are published separately.[38]

Participants and recruitment

Women were eligible if they were aged 18–45 years, spoke Hindi and lived in Kangra district. Participants were grouped into perinatal (currently pregnant or had given birth in the past 12 months) and non-perinatal (not currently pregnant and had not given birth in the past 12 months). Recruitment took place at DRPGMC antenatal clinics and community Anganwadi Centres between December 2022 and June 2023. Eligible individuals were approached by a research nurse who provided verbal and written explanations about the study. Those who agreed to participate provided written informed consent. The participants formed a convenience sample as we lacked the resources for consecutive or random sampling.

Procedure

Each participant completed a sociodemographic questionnaire followed by the self-report measures administered by the research nurse using a handheld tablet or computer. The PASS was only administered to the perinatal group because of its focus on pregnancy-associated symptoms; all other measures were administered to both perinatal and non-perinatal groups. All participants were

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then seen by a psychiatrist or clinical psychologist who was masked to the results of self-report measures and who administered the diagnostic interview to assess for the presence of depression, anxiety, PTSD and somatic symptom disorder. All assessments were conducted in Hindi and in private spaces to ensure confidentiality. The research nurse, clinical psychologist and psychiatrists administering self-report measures and clinical interviews are all residents of Himachal Pradesh, fluent in Hindi and English and have extensive experience of clinical practice and research in the local setting. All data collection was planned before self-report measures and diagnostic interviews were administered.

Sample size

The target sample was determined a priori as 150 pregnant women, 150 postpartum women and 150 non-perinatal women. These are the minimum sample sizes recommended to reliably determine psychometric properties and assess the validity and reliability of screening tools.[38–40]

Statistical analysis

Analyses were conducted separately for perinatal and non-perinatal women. Those who had missing data for the diagnostic interview were excluded. Sociodemographic characteristics of participants were summarised using proportions, means and medians. Participants diagnosed with depression, anxiety, PTSD or somatic symptom disorder on the diagnostic interview were considered true cases of these conditions. A composite outcome of 'any mental disorder' was defined as the presence of at least one of these disorders as diagnosed on the clinical interview.

Descriptive analyses were conducted to explore item endorsement and distribution of scores. First, the number of cases and non-cases of any mental disorder who endorsed each individual item on self-report measures was summarised graphically. A gradient score was calculated for each item by subtracting the proportion of endorsement among non-cases from the proportion of endorsement among cases, following a method used by Green *et al*.[41] Endorsement of an item was defined as ratings of 3, 4 or 5 on K10 items and ratings of 2 or 3 on items on all other measures. Next, the distribution of total scores among cases and non-cases of any mental disorder was summarised for each measure. Correlations between measures were assessed using pairwise correlation coefficients.

To assess discriminant validity (the ability of a measure to discriminate between cases and non-cases), differences in median scores were compared between cases and non-cases using the two-sample Wilcoxon rank-sum test of statistical significance.[42] To assess diagnostic validity, receiver operating characteristic (ROC) curves were plotted. The area under the ROC (AUROC) curve was calculated to provide an overall assessment of each measure's diagnostic performance, with AUROC curve values greater than 0.8 considered to represent an appropriate level of accuracy for clinical screening purposes.[43]

Sensitivity, specificity, positive and negative likelihood ratios and accuracy (the overall proportion of individuals who were correctly classified) were calculated for all cut-off scores along with 95% CIs. We planned to identify optimal cut-offs for each measure using two indices: Youden's index, which maximises the sum of sensitivity and specificity, and Liu's cut-point, which maximises the product of sensitivity and specificity.[44] Positive predictive values (PPV) and negative predictive values (NPV) at each cut-off were calculated based on the local prevalence as determined by diagnostic interviews. The internal reliability of each measure was assessed using Cronbach's alpha. All analyses were conducted using STATA/MP V.18.0.[45]

Deviation from protocol

We planned to assess the diagnostic accuracy of self-report measures separately for each individual mental disorder as well as for the composite outcome of any mental disorder. However, the small number of participants with clinically diagnosed mental disorders meant it was not statistically robust to conduct analyses for individual disorders. Therefore, we only proceeded with the analysis for any mental disorder. Due to the small number of cases, it was also necessary to merge the pregnant and postpartum groups into a single perinatal group for analysis.

Patient and public involvement

During study protocol development, the MaatHRI Community Engagement Panel was consulted for input into the recruitment, data collection and study remit.

RESULTS

Translation and cultural adaptation

The process of translation and cultural adaptation occurred through iterative discussion among the study team. A number of terms and phrases used in original English versions proved challenging to translate into Hindi. For example, the translation of the phrase "things have been getting to me" (EPDS item six) required several revisions and was finally translated as छोटी-छोटी बातेंया चीजेंमुझेपरेशान करती है, which back-translates as "small/little things are bothering or annoying me". Once consensus was reached, Hindi versions were circulated to all study team members for final approval. Final Hindi translations used for this study are available on request from the corresponding author.

Participant characteristics

480 women agreed to participate and completed self-report measures (figure 1). Of these, 39 (8.1%) did not complete the diagnostic interview. The most common reason for not completing the diagnostic interview was not having time due to work, caring or domestic responsibilities. A comparison of those who completed

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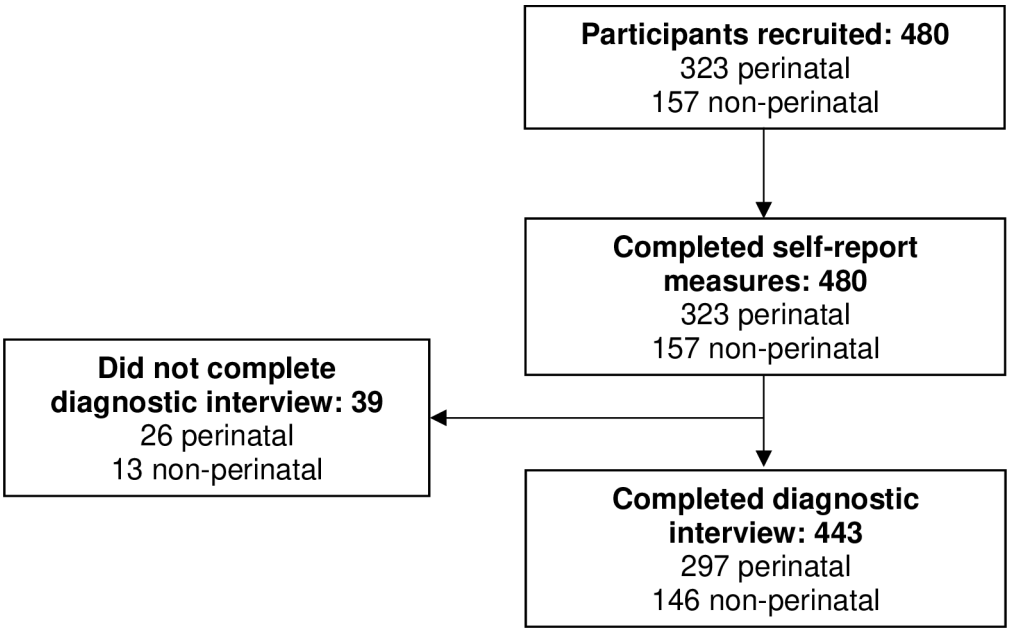

Figure 1 Flowchart of study participants.

and those who did not complete the diagnostic interview showed that the two groups were similar, but those who completed diagnostic interviews were on average more likely to report slightly higher household incomes (online supplemental SI1). Complete data was available for 443 women (148 pregnant; 149 postpartum; 146 non-perinatal). Given that the percentage of missing data was low, a complete-case analysis was done.

Table 1 shows participant characteristics according to perinatal status. Participants were predominantly of Hindu religion, had completed secondary or graduate education, lived above the poverty line and in extended family households. A higher proportion of non-perinatal participants were from scheduled caste or scheduled tribe backgrounds. The proportion of participants with any mental disorder according to the diagnostic interview was 5.4% (n=16) in the perinatal group and 15.8% (n=23) in the non-perinatal group. Among the 39 participants (n=16 perinatal; n=23 non-perinatal) with any mental disorder, 74.4% (n=29) had a single disorder and 25.6% (n=10) had two or more coexisting disorders. There were no cases of PTSD in our sample; therefore, the PCL5 was not included in psychometric analyses.

Item endorsement

Online supplemental SI2 and SI3 show the number of participants who endorsed each item on the K10, PHQ9, EPDS, GAD7, PASS and SASS among perinatal and non-perinatal groups, respectively. Overall, endorsement of symptoms was low, especially within the perinatal group. Among the 16 perinatal participants with any mental disorder, the most frequently endorsed symptoms were 'tiredness and lethargy' (SASS item C5; endorsed by n=13; 81.3%); 'things have been getting to me' (EPDS item 6; endorsed by n=12; 75.0%); and 'feeling tired out for no good reason' (K10 item 1; endorsed by n=12; 75.0%). Among the 23 non-perinatal participants with any mental disorder, the most frequently endorsed items were 'weakness of body' (SASS item C1; endorsed by n=20; 87.0%); 'weakness of mind' (SASS item C2; endorsed by n=19; 82.6%); 'tiredness and lethargy' (SASS item C5, endorsed by n=18; 78.3%); 'feeling tired out for no good reason' (K10 item 1; endorsed by n=18; 78.3%); and 'becoming easily annoyed or irritable' (GAD item 6; endorsed by n=18; 78.3%).

Figure 2 shows the gradient scores for each item among perinatal and non-perinatal women. Gradient scores greater than 0 indicate that an item was endorsed by a greater proportion of cases than non-cases. Among perinatal women, 'things have been getting to me' (EPDS item 6), 'tiredness and lethargy' (SASS item C5) and 'I have felt sad or miserable' (EPDS item 8) had the highest gradient scores. Among non-perinatal women, 'weakness of body', 'weakness of mind' and 'tiredness and lethargy' (SASS items C1, C2 and C5, respectively) had the highest gradient scores.

Distribution of scores

Online supplemental SI4 and SI5 show the distribution of total scores on self-report measures among participants with and without any mental disorder among perinatal and non-perinatal groups, respectively. Total scores were distributed widely. Among perinatal participants with a mental disorder, two scored zero on the PHQ9, two scored zero on the EPDS and three scored ten (the lowest possible score) on the K10, suggesting that these cases would not have been identified by the self-report measures. There was a moderate correlation of scores between measures. Among perinatal women, correlation coefficients ranged from 0.599 (between the K10 and SASS) to 0.799 (between the GAD7 and PASS) (online supplemental SI6). Correlation was stronger among

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Table 1 Participant characteristics according to perinatal status (n=443)

	Perinatal (n=297)	Non-perinatal (n=146)
	n (%)*	n (%)*
Age		
Mean (SD)	27.5 (4.0)	30.7 (5.2)
Missing	0	1
Marital status		
Married or co-habiting	297 (100.0)	144 (100.0)
Single	0 (0.0)	0 (0.0)
Missing	0	2
Religion		
Hindu	294 (99.0)	142 (97.3)
Other	3 (1.0)	1 (0.7)
Missing	0	3
Education		
None / Primary	43 (14.5)	20 (13.7)
Secondary	137 (46.1)	71 (48.6)
Graduate	117 (39.4)	55 (37.7)
Missing	0	0
Poverty line†		
Below poverty line	34 (11.5)	9 (6.3)
Above poverty line	263 (88.5)	134 (93.7)
Missing	0	3
Annual household income		
Below Rs 10 000	64 (21.5)	24 (16.9)
Rs 10 001–20 999	97 (32.7)	36 (25.4)
Rs 21 000–30 000	59 (19.9)	28 (19.7)
Above Rs 30 000	77 (25.9)	54 (38.0)
Missing	0	4
Household structure		
Nuclear family	12 (4.0)	5 (3.5)
Extended (joint) family	285 (96.0)	138 (96.5)
Missing	0	3
Caste		
General	39 (13.2)	35 (24.5)
Other Backward Caste / other	206 (69.8)	71 (49.7)
Scheduled caste	28 (9.5)	23 (16.1)
Scheduled tribe	22 (7.5)	14 (9.8)
Missing	2	3
Occupation		
Homemaker	292 (98.3)	138 (96.5)
Other	5 (1.7)	5 (3.5)
Missing	0	3
Mental disorder‡		
Depression	10 (3.4)	13 (8.9)
Anxiety	5 (1.7)	9 (6.2)
Post-traumatic stress disorder	0 (0.0)	0 (0.0)
Somatic symptom disorder	6 (2.0)	8 (5.5)
Any mental disorder§	16 (5.4)	23 (15.8)
Missing	0	0

*Percentages exclude missing values.
†The poverty line threshold is defined as an annual household income of Rs 27 000.
‡As diagnosed on clinical interview.
§Presence of at least one mental disorder.

non-perinatal participants, with coefficients ranging from 0.716 (between the K10 and SASS) to 0.846 (between the K10 and PHQ9) (online supplemental SI7).

Discriminant validity

Table 2 shows median scores and IQRs on each measure among participants with and without any mental disorder. Participants with any mental disorder had higher median scores than those without any mental disorder ($p<0.01$), indicating high discriminant validity of all measures.

Internal consistency

With the exception of the PHQ9 among perinatal participants, all measures demonstrated acceptable internal consistency against a clinical diagnosis of any mental disorder as assessed by Cronbach alpha values greater than 0.8 (table 2). Among perinatal participants, the PASS, SASS and K10 demonstrated the highest internal consistency (Cronbach's alpha 0.927, 0.885 and 0.883, respectively). Among non-perinatal participants, the K10 and SASS demonstrated the highest internal consistency (Cronbach's alpha 0.920 and 0.912, respectively).

Diagnostic validity

Figure 3 shows the ROC curves for each self-report measure against a clinical diagnosis of any mental disorder for perinatal and non-perinatal groups. Among perinatal participants, the GAD7 (0.88, 95% CI 0.79 to 0.96) and SASS (0.84, 95% CI 0.71 to 0.96) had the highest AUROC curve values. Among non-perinatal participants, the SASS (0.92, 95% CI 0.88 to 0.97) and PHQ9 (0.91, 95% CI 0.86 to 0.96) had the highest AUROC curve values (table 2). AUROC values were generally lower among perinatal compared with non-perinatal participants.

Online supplemental SI8 and SI9 show the sensitivity, specificity, likelihood ratios, PPV, NPV, accuracy

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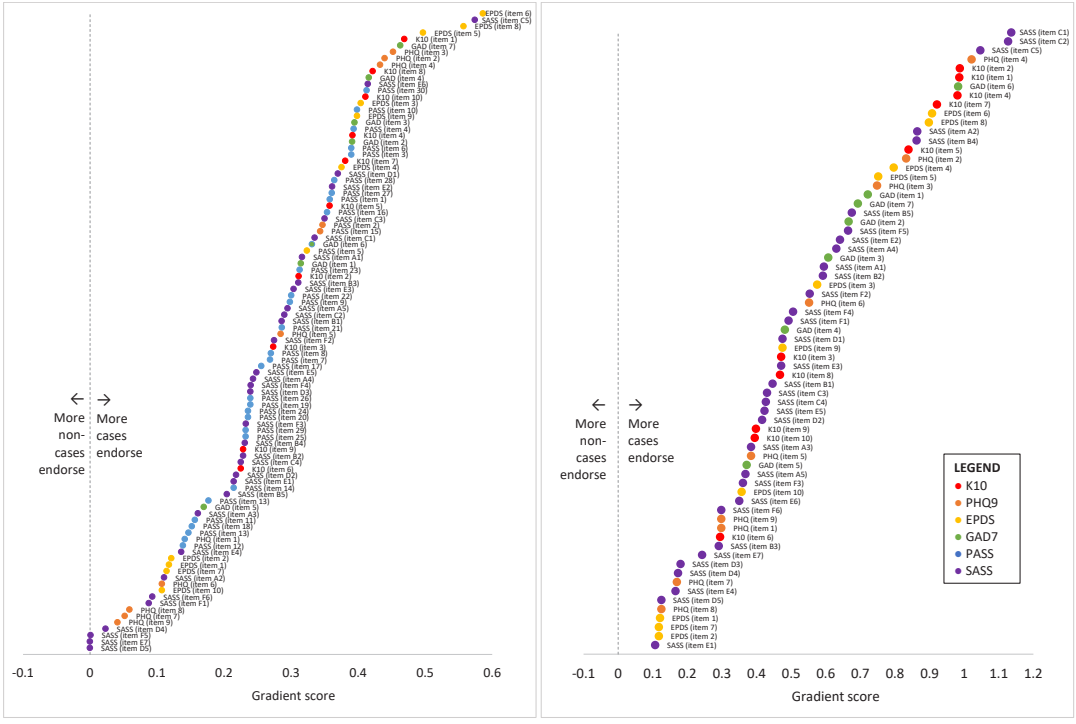

Figure 2 Gradient scores for individual items on self-report measures for perinatal (left panel) and non-perinatal (right panel) participants. EPDS, Edinburgh Postnatal Depression Scale; GAD7, Generalised Anxiety Disorder Scale; K10, Kessler Psychological Distress Scale; PASS, Perinatal Anxiety Symptom Scale; PHQ9, Patient Health Questionnaire; SASS, Scale for Assessment of Somatic Symptoms.

and proportion of participants who scored above the threshold for each self-report measure at a range of cut-offs for perinatal and non-perinatal participants, respectively. Because of the small number of true cases of mental disorders identified in our sample, it was not statistically appropriate to recommend optimal cut-offs. When applying commonly used thresholds, the proportion of participants scoring above these thresholds was generally low. For example, 9.6% (n=28) of perinatal women and 7.9% (n=23) of non-perinatal women scored ≥10

Table 2 Median scores, IQRs, area under the receiver operating characteristics curve and Cronbach's alpha for self-report measures among perinatal and non-perinatal participants

	Any mental disorder Median (IQR)	No mental disorder Median (IQR)	p value	Cronbach's alpha (95% CI)	AUROC curve (95% CI)
Perinatal	(*n=16*)	(*n=281*)			
K10	22 (14.5–26)	12 (10–15)	**<0.01**	0.883	0.79 (0.65 to 0.92)
PHQ9	7 (1.5–11)	1 (0–3)	**<0.01**	0.716	0.77 (0.62 to 0.92)
EPDS	11 (3–17)	0 (0–4)	**<0.01**	0.850	0.79 (0.65 to 0.94)
GAD7	8 (4.5–12)	1 (0–3)	**<0.01**	0.820	0.88 (0.79 to 0.96)
PASS	22.5 (12–44.5)	7 (2–13)	**<0.01**	0.927	0.77 (0.61 to 0.94)
SASS	31 (22.5–39.5)	11 (5–19)	**<0.01**	0.885	0.84 (0.71 to 0.96)
Non-perinatal	(*n=23*)	(*n=122*)			
K10	23 (19–27)	12 (10–16)	**<0.01**	0.920	0.88 (0.83 to 0.94)
PHQ9	9 (5–10)	1 (0–3)	**<0.01**	0.831	0.91 (0.86 to 0.96)
EPDS	10 (6–16)	0 (0–5)	**<0.01**	0.894	0.87 (0.81 to 0.94)
GAD7	9 (6–14)	2 (0–4)	**<0.01**	0.891	0.89 (0.82 to 0.96)
SASS	28 (23–40)	10 (5–17)	**<0.01**	0.912	0.92 (0.88 to 0.97)

AUROC, area under the receiver operating characteristics; CI, confidence intervals; EPDS, Edinburgh Postnatal Depression Scale; GAD7, Generalised Anxiety Disorder Scale; IQR, interquartile range; K10, Kessler Psychological Distress Scale; PASS, Perinatal Anxiety Symptom Scale; PHQ9, Patient Health Questionnaire; SASS, Scale for Assessment of Somatic Symptoms.

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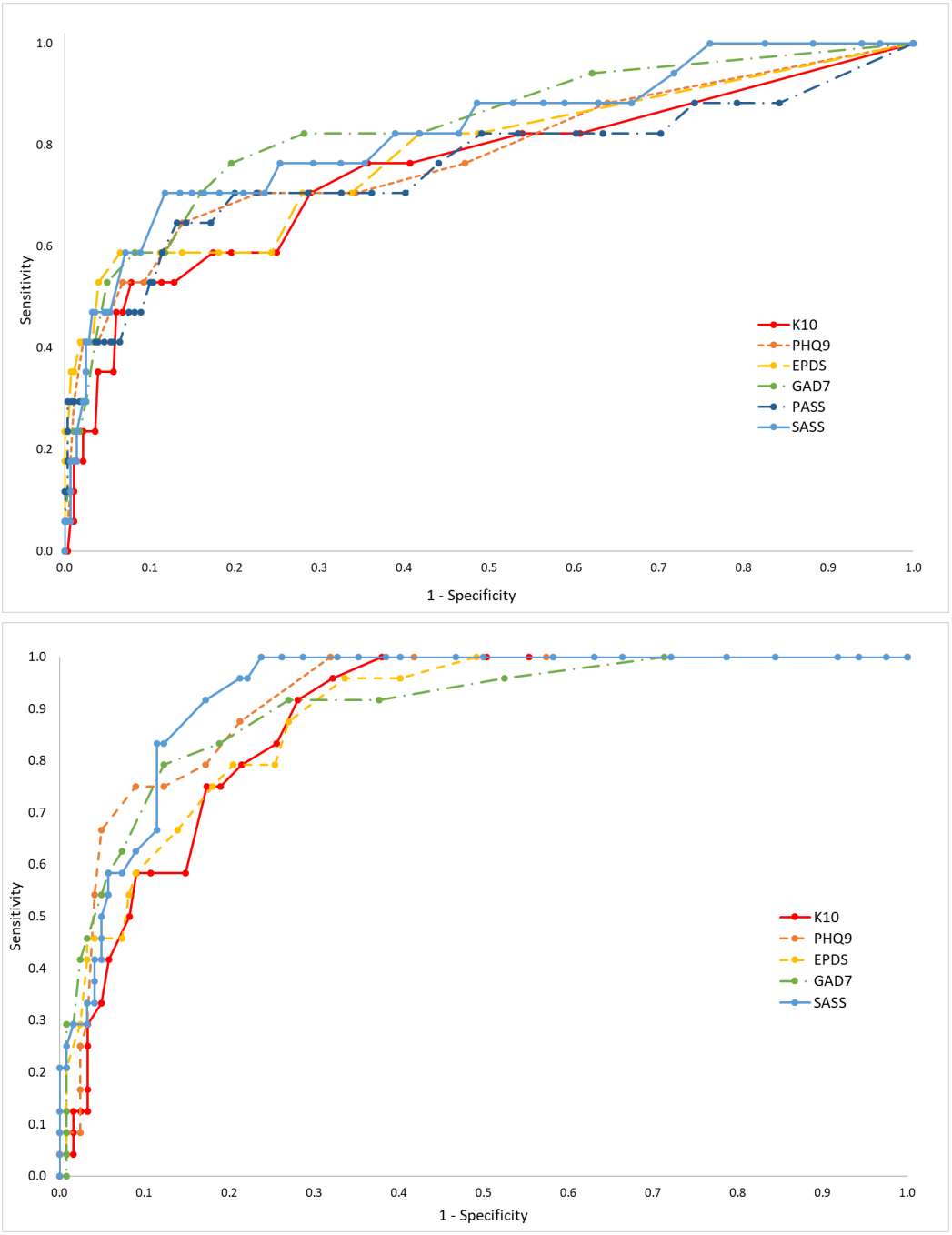

Figure 3 Receiver operating characteristic curves for each self-report measure against a clinical diagnosis of any mental disorder among perinatal (top panel) and non-perinatal (bottom panel) participants. EPDS, Edinburgh Postnatal Depression Scale; GAD7, Generalised Anxiety Disorder Scale; K10, Kessler Psychological Distress Scale; PASS, Perinatal Anxiety Symptom Scale; PHQ9, Patient Health Questionnaire; SASS, Scale for Assessment of Somatic Symptoms.

on the EPDS and 4.1% (n=12) of perinatal women and 5.1% (n=15) of non-perinatal women scored ≥13 on the EPDS (online supplemental SI8 and SI9). Similarly, using the standard GAD7 thresholds of ≥10 and ≥15 to indicate moderate and severe levels of anxiety, 4.0% (n=12) and 1.3% (n=4) of perinatal women and 5.1% (n=15) and 2.0% (n=6) of non-perinatal women scored above these cut-offs (online supplemental SI8 and SI9).

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DISCUSSION

In this study, we translated, adapted and examined the psychometric properties of six self-report measures to identify the most common mental disorders among women in rural Himachal Pradesh, northern India. During translation, certain phrases were challenging to translate due to a lack of equivalent terms or verb modifiers in Hindi. Furthermore, although communities in rural Kangra are well-versed in the official state language of Hindi, in day-to-day life people tend to use Kangri, an Indo-Aryan dialect which is a mixture of Dogri and Punjabi languages. Sensitive and rigorous translation which takes into account the nuances of spoken dialects is essential to ensuring that measures are acceptable and appropriate within the local setting.

In our sample, 5% of perinatal and 16% of non-perinatal women had a clinically diagnosed mental disorder. Our study was not powered to assess prevalence and these proportions should be interpreted with caution. Nevertheless, the lower proportion among perinatal women is interesting given that the perinatal period is often considered a time of high risk for mental disorders. During and after pregnancy, many women in this region of India undergo a period of confinement within the maternal home, with an expectation that other family members provide care. This practice may have a protective effect on perinatal women's mental health. Future perinatal mental health studies should strongly consider including non-perinatal comparison groups, as limited data is currently available to allow direct comparisons.

A quarter of women with a mental disorder had two or more coexisting mental disorders. This finding supports a wider call within population mental health to move away from diagnosing individual disorders towards a more transdiagnostic approach.[7] Symptom endorsement was generally low in our sample. Other Indian studies have reported varying levels of symtom endorsement. For example, a study of women in southern Karnataka found that 5% scored ≥10 on the PHQ9 and 3% scored ≥10 on the GAD7.[46] These figures are similar to our findings in the non-perinatal group of 3.7% (PHQ9) and 5.1% (GAD7). Similarly, a study of pregnant women in Bengaluru found that 9% scored ≥20 on the K10[47]: the proportion among perinatal women in our sample was 10.4%. However, other studies have reported much higher levels of symptom endorsement. In a study of antenatal women in Tamil Nadu, 28% of participants scored ≥10 on the PHQ9 and 23% scored above ≥9 on the GAD.[48] These are substantially higher than the respective proportions among perinatal women in our sample of 2.7% and 5.7%. While some of these discrepancies may reflect true differences between populations and settings, it is also important to consider the role of methodological factors such as the mode of administration of self-report measures and the environment in which data was collected.

Among participants with mental disorders, the most commonly endorsed symptoms were tiredness and fatigue, body weakness and weakness of the mind. Fatigue is common in the perinatal period and as such risks being overlooked as a symptom of a mental disorder. Two recent studies have highlighted the importance of fatigue as a symptom of mental disorders in perinatal populations: a study from the USA found that sleep disturbance and fatigue in early pregnancy were associated with higher odds of postpartum depression, while a study from China identified fatigue as a key predictor of antenatal depression.[49 50] These findings highlight the importance of including tiredness and fatigue within a wider assessment of perinatal mental disorders.

Women with a mental disorder had significantly higher scores on self-report measures than those without a mental disorder. This indicates high discriminant validity and suggests that the measures are useful as a first step to discern individuals at greater risk. However, a small number of participants with a diagnosed mental disorder endorsed no items on the self-report measures. It is possible that these individuals felt more comfortable disclosing symptoms during a clinical interview, which allows for a more nuanced and detailed exploration of symptoms, compared with the more direct, closed questions on self-report measures. Previous studies have suggested that different population groups may have different preferences for how they are asked about depression and anxiety.[51 52] In a study of postnatal women of South Asian background in the UK, EPDS scores were higher when the EPDS was self-completed compared with when it was interviewer-administered.[53] These findings raise important questions around the role of social desirability and possible responder bias. More in-depth qualitative research is needed to better understand preferred modes of administration among women in our setting.

The small number of participants with mental disorders in our sample means that our psychometric analyses must be interpreted with caution. In addition, the wide distribution of scores means that even a one-point increase or decrease in an individual's scores substantially changes the sensitivity and specificity estimates at any given cut-off. As a result, we were not able to recommend optimal thresholds. Overall, there was a trend for higher AUROC values in the non-perinatal group, suggesting that the self-report measures were slightly better at identifying mental disorders in this group.

The SASS stood out as performing well among both perinatal and non-perinatal groups. This is important as it suggests that a measure focusing on somatic symptoms may perform as well as one that focuses on psychological symptoms. It also confirms the importance of physical symptoms within the constellation of broader symptoms of mental disorders, corroborating previous other evidence particularly from South Asian settings.[54] In settings where mental health remains highly stigmatised, it may be easier to talk about physical rather than psychological symptoms. Our results suggest that somatic symptoms should be assessed alongside psychological symptoms in order to maximise detection.

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Along with the SASS, the K10 and PASS also performed well. Both of these measures are broad: the K10 identifies symptoms of generalised psychological distress and incorporates symptoms of depression as well as anxiety, while the PASS assesses for multiple forms of anxiety (unlike the GAD7 which focuses specifically on generalised anxiety). Given the high levels of comorbidity and symptom overlap, administering a single, broad measure may be more helpful than using several condition-specific measures.[55] Subsequent assessment of individuals with high scores can then be used to explore symptomatology in more detail and refine the diagnosis. Such an approach is especially relevant in busy, low-resource settings, where the priority is finding a way to efficiently identify individuals at risk without overburdening healthcare staff. While the feasibility of maternal mental health screening and management within LMIC settings has been demonstrated, further work is needed to understand how best to integrate screening programmes and referral processes into primary care in a way that is effective and sustainable in the long term.[56 57]

Strengths and limitations

Strengths of this study include the concurrent assessment of six self-report measures capturing symptoms of the most common mental disorders. This enabled us to compare the performance of each measure against a diagnostic interview as well as against each other. To our knowledge, this is the first study to establish the psychometric validity of the PHQ9, GAD7 and PASS against a clinical interview among women in Hindi. A further strength is that diagnostic interviews were administered by experienced psychiatrists and clinical psychologists with extensive clinical and research expertise in the local community. Finally, we conducted comprehensive descriptive and statistical analyses to explore different dimensions of validity.

There were a number of limitations to our study. Recruitment was from a single rural district, limiting generalisability to other regions and populations of India. Women who took part were predominantly living above the poverty line and had high educational backgrounds, and those who did not complete the diagnostic interview were more likely to be from lower-income households. Given the importance of socioeconomic gradients in mental health, this may have resulted in under-representation of higher-risk women, leading to attenuation of prevalence estimates and impacting our reported screening accuracy.

While measures were forward- and back-translated to ensure appropriateness to the local population, we did not conduct cognitive interviews to assess participant-level understanding. However, women's feedback on the translated measures was sought as part of a separate qualitative study, in which participants generally felt that questions were clearly worded and easy to understand.[38] In the current study, self-report measures were administered verbally by a research nurse rather than self-completed. This may have impacted participants' willingness to disclose symptoms through social desirability, particularly as mental illness remains stigmatised in this setting. In our previous qualitative study, one participant suggested that self-completing assessments were preferable.[38] However, individual preferences may vary and it is also important to ensure literacy is not a barrier to identifying symptoms. Future studies should explore women's preferences for mode of administration.

The small number of women with clinically diagnosed mental disorders limited statistical power, resulting in wide CIs and volatility in sensitivity and specificity across cut-offs. Our psychometric analyses should be interpreted as preliminary data and confirmed through larger samples. Due to the small number of cases, we were unable to analyse pregnant and postpartum groups separately as planned, which may have obscured clinically important differences in symptom profiles and optimal cut-offs between pregnant and postpartum women.

Collapsing depression, anxiety and somatic symptom disorder into a single outcome may have inflated the apparent accuracy of measures that in fact were capturing generalised distress or somatic burden. However, in resource-limited settings, there is value in self-report measures that identify individuals at increased risk of *any* mental disorder so that these individuals can subsequently be assessed in greater depth. Finally, in low-prevalence settings, AUROC curves alone may overstate clinical utility. Future studies should include calibration analyses to allow comparisons between predicted and observed outcome probabilities to inform real-world screening implementation.

CONCLUSION

Findings from this validation study suggest that symptoms of fatigue and tiredness, which are often overlooked during the perinatal period, may be key features of common mental disorders among women and should not be dismissed. Somatic symptoms should be assessed alongside psychological symptoms in order to improve detection of mental disorders in this setting. Although the measures tested had good discriminant validity, further research with larger sample sizes is needed to identify clinically important differences in symptom profiles and optimal cut-offs between pregnant, postpartum and non-perinatal women. This will help inform which self-report measures might be most appropriate for the early identification of women with mental disorders in this region of Himachal Pradesh.

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Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

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