

ORIGINAL ARTICLE - PUBLIC HEALTH

VALIDATION OF EDINBURGH PERINATAL DEPRESSION SCALE (EPDS) TO SCREEN PRENATAL DEPRESSION AMONG RURAL TAMIL WOMEN

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Abstract

Introduction: Though all pregnant women got registered, prenatal depression was not looked for and treated. For the Government to undertake screening, locally validated screening scale was not available. Hence, this study was undertaken with primary objective of validating EPDS scale Tamil translation. Secondary objectives were to estimate prenatal depression prevalence and to arrive at shorter scale

Methods: Cross sectional study was conducted among rural Tamil speaking pregnant women. Mini International Neuro Psychiatric Interview was used to confirm diagnosis. ROC curve was constructed. Test retest reliability and internal consistency were calculated. Item based regression analysis was done to predict items to constitute short scale. ROC curve was constructed for short scale. Prevalence of prenatal depression was calculated.

Results : Best cut off for full scale was 9 or more. Sensitivity, specificity, positive & negative predictive values, positive and negative likelihood ratios were 92%, 77%, 34%, 99%, 4 and 0.1 respectively. Intra class correlation coefficient 0.86; Cronbach's alpha 0.77. Items 1, 6, 7 and 8 emerged as predictors for short scale; For best cut off of ≥ 3 , sensitivity, specificity, positive & negative predictive value, Positive and negative likelihood ratio were 87%, 80%, 35%, 98%, 4.37 and 0.16 respectively. Prevalence of prenatal depression was 11.1 % (8.1 to 15%).

Conclusions : EPDS Tamil translation could be a valid and reliable tool to screen for prenatal depression. Short scale could be of similar value. Prenatal depression was of considerable magnitude.

Key words : ROC curve, sensitivity, specificity, positive & negative predictive values, positive and negative likelihood ratios.

INTRODUCTION

Prenatal depression is one of the significant pregnancy related morbidities. It is typically defined as a nonpsychotic depressive episode of mild to major severity that occurs during pregnancy. In low and middle income countries, pooled prevalence estimate of antenatal depression was 25.3%.¹ According to a bulletin released by WHO, it was in the range of 8.3% to 59.5%. Most of the studies quoted in the bulletin had been conducted during third trimester of pregnancy.² Studies conducted at various places of India brought out frequency of antenatal depression in the range between 8.7% and 36.75%.³⁻⁶

In Southern most part of Tamil Nadu, one study had been conducted by a Medical College team among its community programme area, comprising antenatal mothers from coastal population of nearby state also, gave a prevalence of 16.3% for antenatal depression.⁷ Another study conducted at Northern Tamil Nadu, among third trimester mothers who attended Antenatal Clinic at Health Sub Centres of a primary health centre brought out a prevalence/ frequency of 14.82%.⁸

Psychological morbidity during pregnancy had been a predictor of postpartum depression.⁹ Untreated antenatal depression could have devastating effects on both mother and child; could lead on to unhealthy personal habits,

poor weight gain, increased occurrence of surgical delivery interventions and extended post-delivery hospital admission in mother.^{10,11} Regarding the offspring, there was a high chance for preterm birth, intra uterine growth retardation, low birth weight, small head circumference, admission at neonatal intensive care unit and behavioral & emotional problems in later life.¹¹⁻¹⁴

The above literatures pointed out the need for screening and treatment of antenatal depression. Literature review suggested that there was paucity of scientific evidence regarding validated screening tools in Tamil to screen pregnant mothers for depression. Worldwide in low resource settings, Edinburgh Postnatal Depression scale (EPDS) had been used for antenatal depression screening.¹⁵ It is a 10 item measure to screen women for depression during pregnancy and postpartum period; its application in post natal and prenatal period could be quite different.^{16,17} One study had validated EPDS Tamil version for use in postnatal women.



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But it had used Clinical Interview schedule Revised as a diagnostic tool for comparison.¹⁸ In a validation study, Clinical Interview schedule Revised, had been found to have poor sensitivity of 44% in comparison with SCAN ICD-10.^{19,20} Mini International Psychiatric Interview (MINI) had been a promising diagnostic tool for validating EPDS scale. It had been used in five out of eleven valid studies included in a systematic review for screening tools for low resource settings.¹⁵ It had been validated against Structural Clinical Interview for Diagnosis (SCID) and Composite International Diagnostic Interview and found to have better efficiency.^{21,22} It had been used during National Mental Health survey of India 2015-16.²³ Hence it was considered a diagnostic tool for validating EPDS scale in our setting.

A study conducted at South Africa had examined shorter versions of Edinburgh Postnatal Depression Scale using item based regression analysis.²⁴ Such an attempt if successful could deliver shorter versions which could be easily applied in field conditions by community health work force

Regarding Tamil Nadu, antenatal period is the time in which women are seeking health care on their own as well as by persuasive involvement of health care system. So there is an opportunity existing to screen for antenatal depression. Yet it had not been looked for and treated, currently, from programmatic point of view. There was paucity of data regarding screening tool validation and community prevalence of prenatal depression at Tamil Nadu. If Government should take up screening for antenatal depression, availability of scientific evidence regarding screening tool validation in local language (Tamil) could remain a bottleneck. For the mothers to be screened by Village Health Nurses (Female community health workforce in Tamil Nadu), user friendly shorter version(s) would be a boon. Hence it was decided to conduct a study which would validate EPDS Tamil version & bring out the burden of antenatal depression and to bring forth shorter versions if possible. Conducting a community based study would help validate the screening tool along with community prevalence data which would attract the attention of public health authorities and policy makers towards the problem of prenatal depression. The study was conducted at Kallandiri block which is one of the attached community programme areas of Institute of Community Medicine, Madurai Medical College.

OBJECTIVES

PRIMARY OBJECTIVE

To estimate the diagnostic accuracy and reliability of

Edinburgh Postnatal Depression Scale Tamil version for screening antenatal depression among Tamil speaking rural women in comparison to Mini International Neuropsychiatric Interview.

SECONDARY OBJECTIVE

1. To design shorter screening tool(s) for application by community health workers.
2. To estimate the prevalence of antenatal depression among second and third trimester pregnant mothers .

METHODS

STUDY SETTING AND STUDY POPULATION

Study was conducted at Kallandiri block of Madurai District. Our study population was second and third trimester pregnant mothers.

INCLUSION CRITERIA

Second and third trimester pregnant mothers who could understand and speak Tamil; residing at villages of Kallandiri block at the time of data collection.

EXCLUSION CRITERIA

Pregnant mothers who are in labour; seriously ill; having any sensory deficits or mental retardation; known to have any preexisting medical or mental illness (prior to onset of pregnancy) irrespective of whether they took/ take treatment for that or not.

STUDY PERIOD

Study period was 2019 to 2020. Data was collected during February and March 2020.

STUDY DESIGN

Study design was cross sectional study.

OPERATIONAL DEFINITION

Antenatal depression was defined as clinical depression during pregnancy. Clinical depression was defined as persistent sadness and/ or loss of interest/ less ability to enjoy the things one use to enjoy most of the time.

SAMPLING PROCEDURE AND SAMPLE SIZE

Cluster sampling was adopted. Health Sub Centers were considered as clusters. Our sample size was 350; 14 clusters with cluster size of 25 each. Sample size was calculated with following assumptions: Expected sensitivity 0.94; specificity 0.90(18); Precision 0.065, and Prevalence 15%(8). The following formulas were used for calculating sample size and highest sample size of two calculations was adopted: Sample size based on sensitivity= $\{Z_{21-\alpha/2} \times SN \times (1- SN)\} \div \{L2 \times Prevalence\}$. It was 347. Sample size based on specificity= $\{Z_{21-\alpha/2} \times SP \times (1- SP)\} \div \{L2 \times (1-Prevalence)\}$. It was 97; where SN= anticipated sensitivity, SP= anticipated specificity, $Z_{21-\alpha/2}$ = standard

normal deviate corresponding to the specified size of the critical region (α), L = absolute precision.

Fourteen Health Sub Centers (HSC) were selected by probability proportionate to size linear systematic sampling. The list of all antenatal mothers was obtained from VHNs for those 14 HSCs prior to data collection. For every HSC, 25 mothers were chosen from the list by simple random sampling. If the selected mother(s) was/ were unwilling or not available in the area or became ineligible because of exclusion criteria, replacement was made from the rest of mothers in the list by random selection. Two clusters (HSCs) among 14 clusters were selected randomly for repeating the screening scale for reliability assessment.

DATA COLLECTION PROCEDURE

Data was collected using a proforma to collect socio demographic data; Tamil translated version of Edinburgh Perinatal Depression scale was used for screening and Mini International Neuropsychiatric interview was used as diagnostic scale. All participants were interviewed with Tamil versions of Edinburgh Postnatal Depression Scale and Mini International Neuropsychiatric Interview (MINI). Screening scale was repeated for mothers from two randomly selected clusters;

INDEX TEST- EPDS

Tamil translation of EPDS scale was read to the mothers and their response was marked.

DIAGNOSTIC TEST- MINI

TMothers were interviewed with Mini International Neuropsychiatric Interview (MINI) for confirmatory diagnosis.

QUALITY ASSURANCE

The protocol including the Tamil versions of screening and diagnostic scales was submitted for review by faculty members/ experts of Community Medicine and Psychiatry. Mini International Neuropsychiatric Interview and Edinburgh Perinatal Depression Scale were translated into Tamil using simple words. Back translation was done into English for quality check. We got expert (in Psychiatry and Psychology) opinion regarding the translated versions. A pilot survey was conducted to test the instruments and necessary corrections were done in the scales in consultation with experts. Parallel form reliability was assessed by administering the three versions of EPDS scale (original, Tamil version and back translated English version) to volunteers who had proficiency in both Tamil and English. Reliability of scale was found to be 0.865 which is considered to be in better range (more than good). The principal investigator/ MD (Community Medicine) PG student got trained in using both scales during

Psychiatry clinical posting.

ANALYSIS

Receiver Operating Characteristic (ROC) Curve was constructed. Best cut off was arrived by analyzing sensitivity, specificity, predictive values and likelihood ratios of various cut offs.

Twenty six participants were assessed at interval of one week by same rater. Test retest reliability (kappa and intra class correlation coefficient) and internal consistency (cronbach's alpha) were also calculated. Responses were coded dichotomously based on best cut off arrived at for kappa calculation. Responses were in ordinal scale for intra class correlation coefficient & Cronbach's Alpha calculation.

Item based regression analysis was done using logistic regression. To identify the best predictors among 10 items of EPDS scale, logistic regression was done in which dependent variable is presence or absence of depression and explanatory variables were 10 item responses of EPDS scale. Items with statistically significant coefficient were considered for constitution of short scale. ROC curve was constructed for short scale (short scale as screening scale and depression diagnosis by MINI interview as confirmed diagnosis) and best cut off was arrived by analysing sensitivity, specificity, predictive values and likelihood ratios of various cut offs.

Proportion of antenatal depression with 95% confidence interval was calculated based on confirmatory scale.

HUMAN PARTICIPANT PROTECTION

Permission was obtained from Institutional Ethics Committee of Madurai Medical College. Informed written consent was obtained from all participants after properly explaining potential risks and benefits of the study. Strict confidentiality was maintained; all personal identifiers were avoided in all documents including data entry; Mothers who were found to have depression during the interview, were referred to Psychiatrist for further management.

RESULTS

We had to approach 397 mothers in order to achieve a sample size of 350. Among total 350 mothers participated, lowest age was 17; highest age 36 & median age 24. Mothers with higher secondary school education were 24%, graduates 20%, less than or equal to high school 34%, diploma around 10% and post graduate & professional education around 12%. Majority mothers (81%) were home makers. Around 12% were salaried employees. Others were self-employed, professionals or labourers. Around 52% mothers' husbands had education level less than or equal to high school; rest more than or equal to higher secondary education. Around

42 % mothers' husbands were salaried employees, 31% self-employed and 25% labourers. Around 47% mothers were primi gravida, 35% second gravida and remaining were third and fourth gravida mothers. Around 47% mothers had at least one living child.

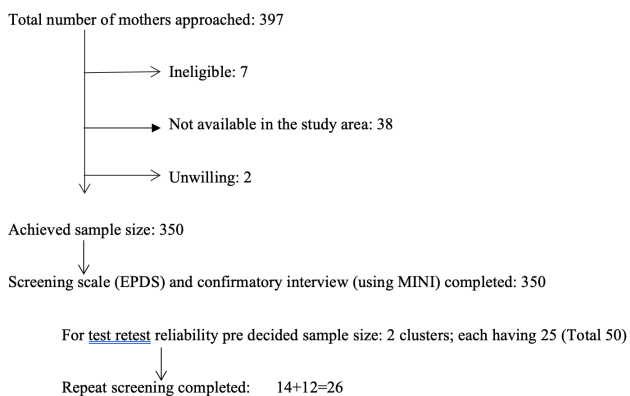


Figure 1: Flow of participants

ROC CURVE ANALYSIS OF WHOLE SCALE

For the cut off of more than 8, the sensitivity and specificity were 92.3 (79.1 - 98.4) and 77.1 (72.1 - 81.7) respectively. Positive and negative likelihood ratios were 4.0 (3.2 - 5.1) and 0.1 (0.03 - 0.3) respectively. Positive and negative predictive values were 33.6 (28.8 - 38.8) and 98.8 (96.4 - 99.6) respectively. In this cut off, likelihood ratios and predictive values were in good trade off. There was improvement in specificity also for which we could accept a little decrease in sensitivity.

Table 1: Criterion values and coordinates of the ROC curve of full scale (Tamil translation scale)

Criterion	Sensitivity	Specificity	Positive likelihood ratio	Negative likelihood ratio	Positive Predictive value	Negative Predictive value
≥0	100.00	0.00	1.00		11.1	
>0	100.00	8.04	1.09	0.00	12.0	100.0
>1	100.00	17.04	1.21	0.00	13.1	100.0
>2	100.00	27.33	1.38	0.00	14.7	100.0
>3	100.00	35.69	1.55	0.00	16.3	100.0
>4	100.00	46.30	1.86	0.00	18.9	100.0
>5	97.44	53.38	2.09	0.048	20.8	99.4
>6	97.44	61.41	2.53	0.042	24.1	99.5
>7	94.87	69.77	3.14	0.073	28.2	99.1
>8	92.31	77.17	4.04	0.100	33.6	98.8
>9	82.05	80.71	4.25	0.22	34.8	97.3
>10	79.49	84.89	5.26	0.24	39.7	97.1
>11	69.23	89.39	6.52	0.34	45.0	95.9
>12	61.54	92.60	8.32	0.42	51.1	95.0
>13	46.15	93.57	7.18	0.58	47.4	93.3
>14	28.21	95.50	6.27	0.75	44.0	91.4
>15	25.64	96.46	7.25	0.77	47.6	91.2
>16	23.08	97.75	10.25	0.79	56.3	91.0
>17	12.82	98.07	6.65	0.89	45.5	90.0
>18	7.69	99.04	7.97	0.93	50.0	89.5
>19	5.13	99.36	7.97	0.95	50.0	89.3
>20	0.00	99.56	0.00	1.01	0.0	88.8
>21	0.00	100.00		1.00		88.9

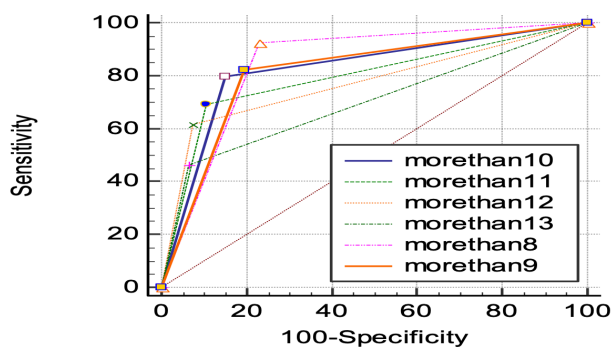


Figure 2: ROC curve of Tamil scale for various cut offs

We looked at next cut off of more than 9 to analyze whether it was better/ worse/ equal to cut off more than 8. For cut off more than 9, the sensitivity and specificity were 82.1 (66.5 - 92.5) and 80.7 (75.9 - 84.9) respectively. Positive and negative likelihood ratios were 4.3 (3.2 - 5.6) and 0.2 (0.1 - 0.4) respectively. Positive and negative predictive values were 34.8 (28.9 - 41.1) and 97.3 (94.8 - 98.6) respectively. In this cut off, for a little improvement of specificity, positive predictive value and positive likelihood ratio happened; but unfavourable shift in sensitivity and negative likelihood ratio made this cut off less appealing than the previous one.

RELIABILITY ANALYSIS OF WHOLE SCALE

Table 2: Test retest reliability- Cross tabulation of test positivity status for the cut off more than 8 (9 or more) during First time and Repeat screening

		Repeat screening		
		Positive	Negative	Total
First time screening	Positive	5	2	7
	Negative	0	19	19
	Total	5	21	26

kappa 0.79 P value < 0.001

Table 3: Test retest reliability- Intra class Correlation Coefficient between first and repeat screening

	Intra class Correlation Coefficient	95% Confidence Interval	P value
Considering single measures	0.85	0.70 to 0.93	<0.001
Considering average measures	0.92	0.83 to 0.97	<0.001

Internal consistency: Sample size 350 No of items 10 Cronbach's Alpha 0.77 P value <0.001

For the cut off of 9 or more, kappa was measured for repeat screening by the same rater. It was 0.79 with p value of < 0.001. Intraclass correlation coefficient was around 0.9. cronbach's alpha was 0.77.

ITEM BASED REGRESSION ANALYSIS TO CONSTITUTE SMALL SCALE

Table 4: Items of EPDS scale with their statistical significance level emerged as predictors / non predictors by logistic regression analysis

Item number in EPDS scale	P value
Item 1	.006
Item 2	.780
Item 3	.392
Item 4	.339
Item 5	.553
Item 6	.013
Item 7	.003
Item 8	.006
Item 9	.120
Item 10	.149
Constant	.000

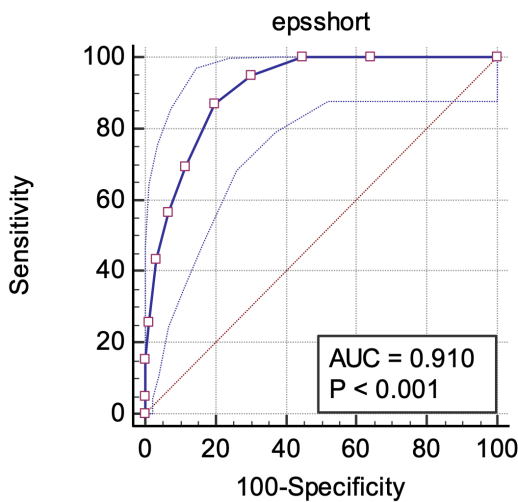


Figure 3: ROC curve of Short scale for various cut offs

Logistic regression was done by using Enter method. Dependent variable was depression/ no depression. Explanatory variables were scores (0, 1, 2, 3) of 10 items of EPDS scale. As per Hosmer and Lemeshow Test, the model had goodness of fit (chi square value:5.7 with degree of freedom 8 , P value: 0.68. Items 1(I have been able to laugh and see the funny side of things), 6 (Things have been getting on top of me), 7(I have been so unhappy that I have had difficulty sleeping) and 8 (I have felt sad or miserable) emerged as best

predictors (P value < 0.05). These items (could be) were considered as components of short scale; subsequent analysis was done to validate the short scale. For cut off more than 3, sensitivity 87%, specificity 80%, positive & negative predictive values were 35% and 98%; positive and negative likelihood ratio were 4.37and 0.16. So this cut off was preferred.

Table 5: Criterion values and coordinates of the ROC curve of short scale

Criterion	Sensitivity	Specificity	Positive likelihood ratio	Negative likelihood ratio	Positive Predictive value	Negative Predictive value
≥0	100.00	0.00	1.00		11.1	
>0	100.00	35.69	1.55	0.00	16.3	100.0
>1	100.00	55.31	2.24	0.00	21.9	100.0
>2	94.87	69.77	3.14	0.073	28.2	99.1
>3	87.18	80.06	4.37	0.16	35.4	98.0
>4	69.23	88.42	5.98	0.35	42.9	95.8
>5	56.41	93.25	8.35	0.47	51.2	94.5
>6	43.59	96.78	13.56	0.58	63.0	93.2
>7	25.64	98.71	19.94	0.75	71.4	91.4
>8	15.38	99.68	47.85	0.85	85.7	90.4
>9	5.13	99.68	15.95	0.95	66.7	89.3
>10	0.00	100.00		1.00		88.9

PREVALENCE OF PRENATAL DEPRESSION

Proportion of mothers with prenatal depression was 11.1 % with 95% confidence interval of 8.1 to 15% (as per MINI scale based interview which is the confirmatory scale used in the study).

DISCUSSION

Mothers in the age group of 21 to 30 predominated in the sample. Nearly two third of the mothers had attended high school to Graduate level of education. Four fifth of mothers were home makers. Education level of husbands had been found to be somewhat similar to that of mothers. Nearly two third of the participants' husbands were either salaried employees or self-employed. Nearly half of mothers were primi gravida. Nearly half of mothers had at least one live child.

Coordinates of ROC curve revealed that a cut off more than 8 had been found to have reasonably better sensitivity of 92.31(79.1 - 98.4) and specificity of 77.17 (72.1 - 81.7). Likelihood ratios of this cut off got interpreted as positive test occurs 4 times frequently in depressed mothers in comparison to normal mothers & negative test occurs 0.1 times in depressed mothers in comparison to normal mothers. Positive predictive value was only 34% (only one in three test positive mothers would be having depression truly in the reference population) as it could be influenced by prevalence. Negative

predictive value was found to be better (99%) in this cut off. If the mother scored less than 9, she could be safely considered normal not warranting further work up for depression. A cut off of more than 9 had been found to have better specificity of 80.7(75.9 - 84.9). Even though specificity of this cut off was little more attractive, other coordinates namely likelihood ratios and predictive values were similar or less attractive in comparison to that of cut off of more than 8. As screening scale needs to be more sensitive, cut off more than 8 could be considered for positivity in screening for prenatal depression. Reliability statistics suggested that the Tamil scale was having good to better reliability.

Four items number one, six, seven and eight were significantly predictive to constitute a short scale; A cut off score of more than 3 could be suggested for positivity of screening based on criterion values trade off. Though sensitivity a little lower and specificity a little higher than full version of Tamil scale, other parameters namely likelihood ratios and predictive values were very much similar to the full version. As these things influence the practicality of a screening test, the short scale could be a time and effort saving alternative to full scale in the hands of community level health worker (Village Health Nurses). Roughly one among nine mothers in the second and third trimester had been having depression.

Benjamin D et al in their study titled "Validation of the Tamil version of Edinburgh post-partum depression scale", had suggested a cut off more than 8/9 for post natal mothers with sensitivity 94% and specificity 90%.¹⁸ In a study conducted by Sea Kyung Choi et al, they validated a simplified version of EPDS scale consisting of item 5 and 8, which was found to have 92% sensitivity and 86% specificity for cut off score of 3.25 Tamsen J. RoCHAT et al arrived at short and ultra short versions of EPDS by item based regression analysis. Those short scales had poorer sensitivity but better specificity and positive predictive value than full scale.²⁴ Jane Phillips et al validated 7 item (items 1, 2, 6, 7, 8, 9 & 10) depression sub scale of EPDS among post natal women which was found to have a sensitivity of 88% and specificity of 62%.²⁶

CONCLUSIONS

Tamil version of EPDS scale could be used to screen rural Tamil women for prenatal depression using the cut off score of more than 8 (9 or more) during second and third trimester. Short scale consisting of items 1, 6, 7, and 8 of original version of EPDS could be used with the cut off score of more than 3. Prenatal depression was a problem of significant magnitude among rural pregnant women.

RECOMMENDATIONS

Screening and subsequent management of prenatal depression among Tamil speaking pregnant women was highly recommended considering the magnitude of problem. Tamil version of EPDS with cut off score of more than eight (nine or more) as screening positive was recommended for use at rural PHCs for screening pregnant women in their second and third trimesters. Short scale having four items (items 1, 6, 7 and 8) with cut off score of more than 3 was recommended for use by village health Nurses during their outreach visit.

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