Reliability and Validity of Depression Anxiety Stress Scale (DASS)-21 in Screening Common Mental Disorders Among Postpartum Women in Malawi

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Abstract

Background: Approximately one in five women who have recently given birth suffer from some form of common mental disorder (CMD) particularly depression and/or anxiety. Most available CMD screening tools in most low and middle income countries do not screen for more than one mental health problem. Having a screening tool that is free to use, short in assessment time and used to screen for more than one CMD is appealing in a resource constrained setting. This study aimed at assessing the reliability and validity of the Depression, Anxiety, and Stress Scale-21 items (DASS-21) for screening CMDs experienced by women who have recently given birth in Malawi.

Method: We used the gold-standard design for scale validation of comparing the responses to the Chichewa translated and adapted DASS-21 instrument with an independently administered Structured Clinical Interview for DSM-IV (SCID). Internal reliability was reported using Cronbach's alpha coefficient. The ability of DASS-21 and Edinburgh Postpartum Depression Scale (EPDS) to discriminate cases from non-cases was assessed by receiver operating characteristics (ROC) analysis and its curve was used to select cut-off points for DASS-21 and EPDS that maximise both sensitivity and specificity.

Results: The overall Cronbach's alpha for DASS-21 scale was 0.74. The internal consistency for DASS-21 depression subscale, anxiety subscale and stress subscale were 0.66, 0.29 and 0.52 respectively. The area under the ROC curve was 0.76 (95% CI: 0.6086; 0.9102) for DASS-21 depression subscale (DASS-D) and 0.65 for DASS-21 anxiety subscale (DASS-A). At a cut-off point of one or more, the sensitivity and specificity for DASS-D was 69.2% and 75.5% whilst DASS-A was 52.9% and 75.5% respectively. Pearson correlation coefficient for the association between DASS-D and EPDS was $r = 0.61$, $p < 0.001$.

Conclusion: DASS-21 as an overall item has good internal reliability but none of its subscales (DASS-D, DASS-A, DASS-S) have satisfactory internal reliability.

1.0 Background

Maternal mental health problems remain a global public health challenge. Approximately 13% of women who have given birth in high income countries suffer from some form of common mental disorder (CMD), primarily depression and/or anxiety.[1] The situation is worse in low and lower-middle income countries (LMICs) where one in five (19.8%) women who have recently given birth experience a CMD.[1] Untreated CMDs reduce maternal level of functioning,[2] and may consequently impair mother-infant interaction[3] and infant cognitive development.[4]

The current low detection and treatment rate of CMDs in LMICs is very concerning. There are several reasons for this. First, perinatal mental health for women living in LMICs is only an emerging area of interest for researchers and policy makers, as the international agenda has moved beyond survival to understand what is needed to enable women (and infants) to thrive.[1] Second, it has been thought that women living in LMICs are protected from experiencing postpartum mental disorders by social and traditional cultural practices during the postpartum period, a notion which has not been substantiated.

[1]Third, low detection and treatment rate of CMDs in LMICs might be attributed to lack of culturally sensitive screening tools that are simple to use. Lastly but important, in most LMICs perinatal mental health screening and treatment are yet to be integrated into a routine healthcare package of mother-child dyadic interventions offered when a mother attends well-baby clinics.[5]

Several perinatal CMD screening tools such as Edinburgh Postnatal Depression Scale (EPDS),[6] WHO Self-Reporting Questionnaire,[7] Patient Health Questionnaire-9,[8] and Post-Traumatic Stress Scale[9] have been validated for screening perinatal mental disorders in Malawi. However, these individual tools are not designed to screen for multiple separate common mental disorders (e.g. depression, anxiety, PTSD). Having a screening tool that is free to use, short in assessment time and used to screen for more than one CMDs is more appealing in a resource constrained setting. This study aimed at assessing the reliability and validity of the Depression, Anxiety, and Stress Scale-21 items (DASS-21) for screening common mental disorders among postpartum women in Malawi. Specifically, we aimed to 1) translate into Chichewa and adapt the DASS-21, 2) in postnatal women, establish the reliability of DASS-21 and its subscales and the criterion validity of the adapted DASS-21 against the gold standard of Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) diagnosis of major or minor depression and generalised anxiety disorder, and 3) compare the test characteristics of the DASS-21 depression scale and EPDS.

2.0 Methods

The gold-standard design for scale validation of comparing the responses to the Chichewa translated and adapted DASS-21 instrument with a blinded independent administration of the Structured Clinical Interview for DSM-IV (SCID) and the EPDS was used. Chichewa is the widely used language in most parts of Malawi.

2.1 Participants

Participants were women who had recently given birth in Zomba district, southern Malawi who participated in the Randomised controlled trial of the Effect of intravenous iron on Anaemia in Malawian Pregnant women (REVAMP) trial. The original study randomized 862 anaemic (haemoglobin level between 5g/dl and 10g/dl) pregnant women in their second trimester to either standard treatment of oral ferrous sulphate (200mg twice a day for 90 days or until birth whichever came first) or intravenous ferric carboxymaltose (20mgs/kg or maximum of 1000mg for ≥ 50 kgs) once for the whole duration of pregnancy (<https://www.anzctr.org.au/Trial/Registration/TrialReview.aspx?id=375587>). We included a sub-set of participants who came for their follow-up visits with babies aged between 1 and 12 months.

2.2 Measures

2.2.1 Depression Anxiety Stress Scale (DASS-21)

The DASS-21 is the most widely used screening tool which has the capacity to separately measure symptoms of depression, anxiety, and stress. The DASS-21 has been derived from the original 42-items DASS developed by Lovibond et.al (1995) which has three sub-scales namely Depression subscale (DASS-D), Anxiety subscale (DASS-A) and Stress subscale (DASS-S).[10]The DASS-D measures individual's hopelessness, positive affect and self-esteem. The DASS-A measures autonomic arousal, situational anxiety, musculo-skeletal symptoms, perceived experience of anxiety arousal and situation anxiety. Finally, DASS-S measures agitation, tension and negative affect.[11]Each subscale comprises of 7 items that are scored from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time) for the week preceding the interview to reflect severity. The total score for each DASS-21 subscale ranges from 0 to 21. The items scores are added and thereafter multiplied by two to obtain the total score that can be compared with the original DASS-42. The DASS-21 has been translated into more than 54 languages (<http://www2.psy.unsw.edu.au/groups/dass/translations.htm>) but not in Chichewa and has demonstrated good internal consistency and validity. However, very few studies have established cut-off points for severity classification hence limiting its use in clinical settings.[12]

2.2.2 Edinburgh Postnatal Depression Scale (EPDS)

The EPDS is a ten-item self-report scale that has been widely used to detect clinically significant depressive symptoms experienced by women during the postnatal period. Each question is rated on a scale of 0 to 3, and total scores can range from 0 to 30, with a higher score representing more depressive symptoms. If criteria for culturally sensitive translation are met, EPDS has shown to be a reliable screening tool for depression in LMICs.[13]Some authors suggest that EPDS items number 3, 4 and 5 (EPDS-3A) that assess guilt, anxiety and fear can detect anxiety disorders. However, studies have reported mixed findings on the reliability of EPDS-3A in screening symptoms of anxiety in other settings. [14-17]In Malawi, the EPDS has been validated for use among women who were pregnant, and the Chichewa-translated EPDS has shown to be a valid tool for screening and detecting episodes of both major and minor depression among antenatal women (AUC=0.767: 95% CI 0.695-0.839).[6]

2.2.3 Diagnostic and Statistical Manual of Mental Disorders: Fourth Edition (DSM-IV)

The DSM-IV remains the gold standard tool for making diagnosis of mental disorders. The Structured Clinical Interview for DSM-IV (SCID) uses categorical classifications to divide mental disorders based on set of criteria with defining features. It requires an individual with clinical training and experience to administer the SCID. The specific diagnostic criteria that are included in the SCID are only meant to guide but a diagnosis is informed by clinical judgment. This study used SCID modules for depression (minor and major) and anxiety (current generalised anxiety disorder) previously translated into Chichewa, adapted and used in Malawi.[18]

2.3 Procedures

2.3.1 Content Validation

The DASS-21 was translated from English into Chichewa (Appendix 1) by professional accredited translators at Malawi Liverpool Wellcome Trust Research Centre in Malawi. Thereafter, it was reviewed by a group of health workers and mental health clinicians for appropriateness of language and cultural idioms. Through this meeting, it was agreed that DASS-Stress subscale item questions measure different constructs from those in the stress module in DSM-V, and assessment for criterion validation has therefore not been done for this subscale. A field trial of the reviewed DASS-21 was conducted with 20 women who were pregnant and contributed information on clarity, comprehensibility, and suggestions of culturally sensitive phrases. The tool was then back-translated by an independent professional translator for verification.

2.3.3 Construct and Criterion Validation

2.3.2.1 Sample Size

Assuming that the prevalence of postpartum depression was at 10%, [6,19] a minimum sample of 120 participants (including 12 having clinical symptoms of depression) was adequate to achieve a minimum power of 90% to detect a change in the percentage value of sensitivity of DASS-21 items from 0.50 to 0.90 based on the target significance level of 0.05. This sample size was also adequate to detect a change in value of specificity from 60% to 80% which only required a minimum of 50 participants (including five participants with clinical signs of depression). The sample size was calculated based on prevalence of depression as it is the most common and significant public health with serious clinical impact compared to anxiety. [20]

2.3.2.2 Questionnaire administration

We used a convenience sampling technique to select 120 participants from the REVAMP trial participants who came for their scheduled visits with babies aged between one and 12 months. A maximum of five consecutive participants were assessed in a day to ensure quality assessments. Data collection was performed between November 2020 and May 2021. Participants were first interviewed by 1) a mental health clinician (TK) who administered the SCID modules for major or minor depression, current and generalised anxiety disorder and 2) a trained registered nurse (GK) administered the DASS-21 and EPDS in individual interviews thereafter. This is usual and best practice in settings where there is low familiarity with test-taking and where many people have low literacy. The two assessors worked independently, and were blinded to each other's scores.

2.4 Data Management and Quality Assurance

The paper-based SCID administered by the mental health clinician was checked for completeness by the Corresponding author (EM) before entry in Open Data Kit (ODK). The DASS-21 and EPDS were directly collected using a tablet (ODK) and data were checked for completeness before being uploaded to the server. Data were cleaned and checked for consistency before analysis by EM.

2.5 Statistical Analysis

2.5.1 Internal reliability

The reliability of any given measurement is the extent to which it is a consistent measure of a concept. Internal reliability was measured by Cronbach's alpha which reflects the extent to which different subsets of the test items produce similar measures.[21] We have reported both overall alpha and instrument (DASS-21) subscale alphas. The alpha coefficient of reliability ranges from 0 (all items are entirely independent from one another) to 1 (all items are highly related). Alpha coefficient between 0.70 and 0.80 will be regarded as acceptable, and less than 0.5 as not acceptable.[22] Further analysis of the internal consistency reliability was done by calculating item-test, item-rest and average inter-item correlations. All these influences and describes the overall item score reliability.

2.5.2 Correlation between DASS-21 subscale of depression and EPDS

We examined convergent validity of the DASS- Depression subscale by assessing its correlation with EPDS, a scale that has demonstrated to be a valid depression screening measure in Malawi. A Pearson's correlation coefficient (r) for DASS-21 subscale of depression and EPDS was also calculated as the scores in both tools were normally distributed. The r correlation measures the strength of linear relationship between two continuous variables. The following cut-off $0.1 < [r] < 0.3$, $0.3 < [r] < 0.5$ and $0.5 < [r] < 0.7$ and $[r] > 0.7$ were used to measure the strength of association and interpreted as very weak correlation, weak correlation, moderate correlation and strong correlation respectively.[24]

2.5.3 Criterion Validation for DASS-D, DASS-A and EPDS against the SCID

Compared to the scores from the DSM-IV structured interviews (SCID), we calculated the sensitivity, specificity, positive and negative likelihood ratio for DASS-21 and EPDS. Positive likelihood ratio (LR+) tells us how much to increase the probability of the disease if the test is positive while Negative likelihood ratio (LR-) tells us how much to decrease the probability of the disease if the test is negative. The larger the LR+ (≥ 5), the greater the likelihood of the disease and the smaller the LR- (< 5), the lesser the likelihood of a disease. (http://medtrain.chm.msu.edu/ebm/Diagnosis/at_likelihood_ratios.html).

The ability of DASS-21 and EPDS to discriminate cases from non-cases was assessed by receiver operating characteristics (ROC) analysis and its curve was used to select cut-off points for DASS-21 and EPDS. The area under the ROC curve (AUC) is the best parameter for summarizing a screening tool's overall discriminative value. A value of ≥ 0.70 , 0.80 up to 0.90 and > 0.90 is interpreted as reasonable, good and excellent, respectively.[23] Comparisons were made between the AUCs for the DASS-D and EPDS. The criteria to choose an optimal cut-off value was to maximise both sensitivity and specificity, and to set sensitivity value higher than specificity in order to detect all potential cases. For a test to be useful, the sensitivity + specificity should be at least 1.5. Data analysis was conducted using Stata Version 15.1 (StataCorp LP, College Station, Texas, United States of America, 2017).

2.6 Ethical Considerations

This study was nested within the REVAMP trial, which was approved by the College of Medicine Research and Ethics Committee, Malawi (P.02/18/2357) and the Walter and Eliza Hall Institute of Medical Research Ethics Committee, Australia (WEHI REC 18/02). All participants were given information about the study and either signed a consent form or printed their thumbprint (as witnessed by impartial observer) for those who could not write. Assessments were done in closed rooms to maintain privacy. Participants were given unique identifying numbers and forms containing their names were kept separately from their files. Participants identified as needing further assessment and management were referred to local Ministry of Health psychiatric services.

3.0 Results

3.1 Descriptive analysis

Overall, 115/120 (95.8%) of the required sample provided complete responses to all the three questionnaires (SCID, DASS-21 and EPDS) administered. The mean age of the included participants was 24 (standard deviation: 6.8) years. Approximately 82% of the participants were either married or living together with their husband and 68.7% of them were Christians (Table 1). Most of the participants had either attended primary (60.9%) or secondary (34.8%) school and depended on either casual labour (35.7%) or farming (36.5%) to earn a living.

Using the SCID interviews, 13/115 (11.3%) participants were diagnosed with current depression (3 with major depression and 10 with minor depression) and 17/115 (14.8%) were diagnosed with current generalised anxiety disorder. The 3 participants diagnosed with major depression were referred to local psychiatric services for further management.

3.2 Internal reliability of DASS-21 items and EPDS

The results of the overall DASS-21 item test scale reliability are shown in Table 2. The overall Cronbach's alpha for DASS-21 was 0.74. The Cronbach's alpha for DASS-D subscale, DASS-A subscale and DASS-S subscale were 0.66, 0.29 and 0.52 respectively. Detailed results on item-test correlation, item-rest correlation and average inter-item correlation which influences the overall Cronbach's alpha are shown in Table 2. The internal reliability (Cronbach's alpha) of EPDS was 0.74 with item-test correlation and item specific alpha ranging from 0.30 to 0.81 and 0.67 to 0.76 respectively.

3.3 Correlation between DASS-D subscale and EPDS

A Pearson correlation coefficient examined the relationship between scores on the DASS-D subscale and EPDS. The results showed a statistically significant positive and moderate association ($r = 0.61$, $p < 0.001$).

3.4 Criterion Validity for DASS-21, DASS-D, DASS-A and EPDS against SCID

The results of sensitivity, specificity, cases correctly classified, positive likelihood ratio (LR+) and negative likelihood ratio (LR-) for both DASS-21 (Depression and Anxiety sub-scales) and EPDS compared to SCID are shown in Table 3. The receiver operating curve (ROC) analysis for DASS-21 depression subscale against criterion of DSM-IV current depressive episode (minor or major) gave an area under the curve (AUC) value of 0.7594 (95% CI: 0.6086; 0.9102) and details are shown in Figure 1A. The ROC analysis for DASS-21 anxiety subscale against criterion of DSM-IV current generalized anxiety disorder gave AUC value of 0.6505 (95% CI: 0.5150; 0.7857) as shown in Figure 1B. The ROC analysis for EPDS against criterion of DSM-IV current depressive episode (minor or major) gave AUC value of 0.7485 (95% CI: 0.6031; 0.8939). As shown in Figure 1A, although the AUC for DASS-depression subscale is larger than that of EPDS, the chi-squared test yielded a probability of 0.8844, suggesting that there is no significant difference between the two areas. The ROC area for the whole DASS-21 against the SCID depression and anxiety were 0.7059 (95% CI: 0.5433; 0.8685) and 0.7695 (95% CI: 0.6228; 0.9162) respectively.

3.4 Choice of cut-off points

A cut-off point of 1 or higher on the DASS-D depression subscale provided the best combination of sensitivity and specificity (optimal point) in detecting a diagnosis of either minor or major depression. This cut-off point gave 69.2% and 75.5% for sensitivity and specificity respectively. At this cut-off point (1 or higher), the correct classification was 74.8% with positive likelihood ratio of 2.8 and negative likelihood ratio of 0.4 (Table 3). For the DASS-A (anxiety subscale), the optimal cut-off point was obtained at a cut-off point of 1 or higher that gave a sensitivity of 52.9% and specificity of 75.5% (Table 3). This cut-off point gave a correct classification value of 72.2%, and 2.16 and 0.62 for positive and negative likelihood ratio respectively (Table 3). For EPDS, the best combination for sensitivity and specificity was 76.9% and 66.7% respectively at a cut-off point of 1 or higher. This cut-off point gave correct classification value of 72.2% with positive likelihood ratio value of 2.16 and negative likelihood ratio value of 0.62 (Table 3).

4.0 Discussion

4.1 Reliability and Validity of DASS-21

The aim of this study was to determine the reliability and validity of DASS-21 in screening for common mental disorders (CMDs) among postpartum women in Malawi. The findings indicated that the internal consistency of the whole DASS-21 was good (Cronbach's $\alpha=0.74$). However, internal consistency was unsatisfactory for DASS-21 depression subscale and stress subscale, and poor for DASS-21 anxiety subscales. Our findings are not consistent with what has been reported in high income countries where the Cronbach's α coefficient for the DASS-21 subscales ranged from good to excellent indicating good internal consistency.[25-27] A study in Nigeria also reported high Cronbach's α for all DASS-21 subscales.[28] These discrepancies in findings might be due to difference in participants' level of education among studies. Most of the participants in our study had received primary school education compared to a study in Nigeria which involved medical students and high-income countries where majority of the study participants had a minimum of first degree. It has been suggested that participants

with low literacy might have difficulties in understanding and rating subjective emotional state presented in a Likert scale.[26] Stewart et. al (2009) addressed the challenges of Likert scale rating among low literate participants by introducing pictorial faces that demonstrates variation in emotional state.[6] However, these additions might add complexity in tool use which will require adequate training before use and also raises feasibility constraints especially in LMICs where resources are limited.

It is known that DASS-21 anxiety subscale items measure two different constructs namely somatic symptoms and negative emotional symptoms. Additionally, it has been suggested that women with common mental disorders tend to endorse more somatic symptoms than negative emotions.[29] This was evident in this study as three of DASS-21 anxiety subscale items indicated negative inter-item correlation (Table 2). This consequently reduced the average inter-item correlation as items that are not related and going in different directions end up cancelling each other thereby affecting the overall Cronbach alpha (Cronbach alpha coefficient for DASS-A subscale = 0.29).

Another important finding in this study is that none of the DASS-21 item subscales combined sufficiently to give high sensitivity and specificity for routine screening for common mental disorders even at a cut-off point of 1 or more. Similar findings were reported by Tran et. al (2013) in the validation of the DASS-21 as a screening instrument for depression and anxiety in a rural community-based cohort of northern Vietnamese women. Using exploratory factor analysis, Tran et. al (2013) found DASS-21 being not good at distinguishing different conditions, but the single factor in which all subscales are added had some value in detecting any CMD.[29] Hanlon et al (2015) argued that in low-literacy settings, it is possible that potential accuracy of a screening tool can be off-set by the complexity of the multiple response categories presented in Likert scales.[30] The area under the ROC curve for DASS-21 depression subscale was found to be 0.76 and EPDS was 0.75, this is moderately high value suggesting reasonable diagnostic ability of both DASS depression subscale and EPDS. The AUC for EPDS in this study is almost similar to what was reported (0.77: 95% CI; 0.695-0.839) in a previous study that validated use of EPDS in screening minor or major depression among antenatal women in our setting.[6] Comparison of AUCs between EPDS (which is an established tool in our setting for screening postpartum depression) and DASS-D subscale indicated no significance difference between the two areas. Our results have also showed a statistically significant positive and moderate association between DASS-21 depression subscale and EPDS score suggesting DASS-21 depression subscale as a reliable tool for screening minor or major depression.

4.2 Strength and Limitation

This study is the first study in Malawi to use the criterion validation (gold standard) against DASS-21 subscales which is the most acceptable method in the field of perinatal health. We used Cronbach's alpha which is a standard analysis of internal reliability (item inter-relatedness) of psychometric tools. However, we acknowledged that we did not do test-retest reliability due to resource constraints. Our study findings may have reduced generalisability as we only included mothers who had babies aged between one and 12 months old who were previously enrolled in a randomisation study which recruited only anaemic

pregnant women. Lastly, most of the participants in this study received primary education and the findings should not be generalised in a population with high literacy level.

5.0 Conclusion

In summary, the study found DASS-21 as an overall item having good internal reliability but none of its subscales (DASS-A and DASS-S) had satisfactory internal reliability except for the depression subscale. There was a positive and statistically significant moderate correlation between DASS-D subscale and the EPDS and that there is no significance difference between their ability to detect either minor or moderate depression among women who have recently given birth. Although the DASS-21 depression subscale can be used with caution in screening for minor or major depression in this setting, it is not recommended to use the other subscales independently due to their low internal reliability consistency, sensitivity and specificity values.

Abbreviations

CMDs: Common Mental Disorders; DASS-21: Depression Anxiety Stress Scale-21 items; EPDS: Edinburgh Postpartum Depression Scale; GK: Gladys Kusiwa; LMICs: Lower and Middle-Income Countries; ROC: Receiver Operating Characteristics; SCID: Structured Clinical Interview for DSM-IV; TK: Twisile Kalinga

Declarations

Ethics approval and informed consent

The protocol was approved by College of Medicine Research and Ethics Committee, Malawi (P.02/18/2357) and the Walter and Eliza Hall Institute of Medical Research Ethics Committee, Australia (WEHI REC 18/02) in accordance with the International Conference on Harmonisation Guidelines for good clinical practice and the Declaration of Helsinki.

Consent for Publication

Not applicable

Availability of data and material

The datasets generated and/or analysed during the current study are not publicly available as the main study (REVAMP trial) is still ongoing but are available from the corresponding author on reasonable request.

Competing Interests

All authors declare that they have no competing interests

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Authors' Contributions

EM, LML, JF, MM and KP were involved in conception of research work and data collection. RS was involved in the design and statistical analysis. EM prepared figures, analysed the data and drafted the manuscript. All authors read and approved the final version of the manuscript

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Tables

Table 1: Characteristics of the study participants (N=115)

Age (in years) *	n (%)
<20	37 (32.2)
20 - 29	55 (47.8)
30 – 39	19 (16.5)
≥ 40	4 (3.5)
Marital status	
Never married	19 (16.6)
Married/Living together	94 (81.7)
Divorced/Separated	2 (1.7)
Education level	
Not attended school	3 (2.6)
Primary	70 (60.9)
Secondary	40 (34.8)
Tertiary	2 (1.7)
Religion	
Christianity	79 (68.7)
Islam	36 (31.3)
Source of income	
Casual work	41 (35.7)
Farming	42 (36.5)
Permanent Employment	32 (27.8)
Tribe	
Chewa	16 (13.9)
Yao	43 (37.4)
Lomwe	33 (28.7)
Mang'anja	5 (4.3)
Tonga	14 (12.2)
Others	4 (3.5)

Age* mean: 24, standard deviation (SD): 6.8

Table 2: DASS-21 Item test scale reliability

Item question	Obs.	Sign	Item-test correlation	Item-rest correlation	Average inter-item correlation	Alpha
DASS-Depression subscale						
I found it difficult to work up the initiative to do things	115	+	0.5908	0.3907	0.2151	0.6219
I couldn't seem to experience any positive feeling at all	115	+	0.4552	0.2263	0.2515	0.6685
I felt that I had nothing to look forward to	115	+	0.6124	0.4183	0.2093	0.6137
I felt down-hearted and blue	115	+	0.5742	0.3697	0.2196	0.6280
I was unable to become enthusiastic about anything	115	+	0.4266	0.1934	0.2592	0.6774
I felt I wasn't worth much as a person	115	+	0.7136	0.5532	0.1822	0.5720
I felt that life was meaningless	115	+	0.6536	0.4720	0.1983	0.5974
Test Scale Reliability (Cronbach's alpha)					0.2193	0.6629
DASS-Anxiety subscale						
I was aware of dryness of my mouth	115	+	0.4242	0.1068	0.0587	0.2722
I experienced breathing difficulty	115	+	0.4748	0.1657	0.0484	0.2336
I experienced trembling (e.g. in the hands)	115	-	0.3392	0.0130	0.0760	0.3305
I was worried about situations in which I might panic and make a fool of myself	115	+	0.4485	0.1347	0.0537	0.2541
I felt I was close to panic	115	-	0.4349	0.1190	0.0565	0.2643
I was aware of the action of my heart in the absence of physical exertion	115	+	0.5410	0.2467	0.0349	0.1781
I felt scared without any good reason	115	-	0.3961	0.0751	0.0644	0.2923
Test Scale Reliability (Cronbach's alpha)					0.0561	0.2937
DASS-Stress subscale						

I found it hard to wind down	115	+	0.6744	0.4705	0.0963	0.3899
I tended to over-react to situations	115	+	0.2857	0.0052	0.1886	0.5824
I felt that I was using a lot of nervous energy	115	+	0.3669	0.0923	0.1693	0.5501
I found myself getting agitated	115	+	0.6929	0.4963	0.0919	0.3777
I found it difficult to relax	115	+	0.5571	0.3158	0.1241	0.4595
I was intolerant of anything that kept me from getting on with what I was doing	115	+	0.3083	0.0291	0.1832	0.5737
I felt that I was rather touchy	115	+	0.6929	0.4963	0.0919	0.3777
Test Scale Reliability (Cronbach's alpha)					0.1355	0.5233

Table 3: Operating characteristics of DASS-D, DASS-A and EPDS at various cut-off scores for identifying depression and anxiety against the SCID

Cut-point	Sensitivity	Specificity	CorrectlyClassified	LR+	LR-
DASS-D (Depression subscale)					
>= 0	100.00%	0.00%	11.30%	1.0000	
>= 1	69.23%	75.49%	74.78%	2.8246	0.4076
>= 2	53.85%	89.22%	85.22%	4.9930	0.5173
>= 3	38.46%	95.10%	88.70%	7.8462	0.6471
>= 4	30.77%	96.08%	88.70%	7.8462	0.7206
>= 6	7.69%	99.02%	88.70%	7.8462	0.9322
>= 7	0.00%	99.02%	87.83%	0.0000	1.0099
>=8	0.00%	100.00%	88.70%		1.0000
DASS-A (Anxiety subscale)					
>= 0	100.00%	0.00%	14.78%	1.0000	
>= 1	52.94%	75.51%	72.17%	2.1618	0.6232
>= 2	23.53%	89.80%	80.00%	2.3059	0.8516
>= 3	17.65%	96.94%	85.22%	5.7647	0.8495
>= 5	5.88%	100.00%	86.09%		0.9412
>=6	0.00%	100.00%	85.22%		1.0000
Edinburgh Postpartum Depression Scale (EPDS)					
>= 0	100.00%	0.00%	11.30%	1.0000	
>= 1	76.92%	66.67%	67.83%	2.3077	0.3462
>= 2	53.85%	81.37%	78.26%	2.8907	0.5672
>= 3	30.77%	87.25%	80.87%	2.4142	0.7934
>= 4	30.77%	94.12%	86.96%	5.2308	0.7356
>= 5	30.77%	95.10%	87.83%	6.2769	0.7280
>= 6	30.77%	97.06%	89.57%	10.4615	0.7133
>= 7	30.77%	98.04%	90.43%	15.6923	0.7062
>= 8	23.08%	99.02%	90.43%	23.5385	0.7768
>= 9	15.38%	100.00%	90.43%		0.8462

>= 12	7.69%	100.00%	89.57%	0.9231
>= 13	0.00%	100.00%	88.70%	1.0000

LR+: Likelihood Ratio Positive

LR-: Likelihood Ratio Negative

SCID: Structured Clinical Interviews for Diagnostic
Statistical Manual

Figures

a

b

Figure 1

A; Comparing predictive ability of DASS-D and EPDS in screening postpartum depression

Ho: DASS-D ROC area = EPDS ROC area; $\chi^2(1) = 0.02$, $\text{Prob} > \chi^2 = 0.8844$

B: Predicting ability of DASS-A in screening current generalised anxiety disorder

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Appendix1DASS21ChichewaVersion.docx](#)