

# Cultural validation of the Sinhala version of the Hospital Anxiety and Depression Scale (HADS-S) in Sri Lanka

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## Abstract

### Background

This study culturally adapted and validated the Hospital Anxiety and Depression Scale for Sri Lanka's Sinhala-speaking population (HADS-S). Given the importance of culturally appropriate mental health screening tools, this adaptation aimed to ensure linguistic relevance while maintaining psychometric validity.

### Aims

The primary objectives were to establish the HADS-S's cultural appropriateness and evaluate its psychometric properties, including reliability, validity, sensitivity, and specificity for anxiety and depression screening.

### Methods

A cross-sectional study at a Sri Lankan tertiary hospital medical outpatient clinic, recruited 154 Sinhala-speaking participants. Researchers assessed internal consistency (Cronbach's  $\alpha$ ), factor structure, sensitivity, specificity, and clinical agreement (Kappa statistic). Correlation analysis examined the anxiety-depression relationship.

### Results

The HADS-S demonstrated strong internal consistency

for anxiety ( $\alpha=0.803$ ) but weaker performance for depression ( $\alpha=0.563$ ), with overall good reliability ( $\alpha=0.775$ ). Factor analysis confirmed two distinct domains, though some items loaded unexpectedly. The scale showed excellent anxiety screening performance (94.1% sensitivity, 86.4% specificity) and moderate depression sensitivity (82.9%). Clinical agreement was strong for anxiety ( $\kappa=0.764$ ) but moderate for depression ( $\kappa=0.489$ ). A moderate positive correlation existed between anxiety and depression scores.

### Conclusion

The HADS-S proves reliable and valid for anxiety screening in Sinhala-speaking populations, though the depression subscale requires refinement. While clinically useful for anxiety detection, further development of the depression items is recommended to improve psychometric properties. The tool shows promise for mental health screening in Sri Lankan clinical and research settings.

**Keywords:** anxiety, depression, psychometrics, translations, cultural characteristics

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## Background

The Hospital Anxiety and Depression Scale (HADS) is a well-established tool designed to assess anxiety and depression, particularly in individuals with physical illness (1). It has been commonly used in studies worldwide, offering reliable and valid results in identifying symptoms of depression and anxiety. Initially developed by Zigmond and Snaith, the HADS tool consists of 14 items, split into two subscales: seven for anxiety and depression (2). Each item is rated on a four-point scale, with scores ranging from 0 to 21 for each subscale,

reflecting the frequency of symptoms experienced in the past week. HADS tool has demonstrated strong reliability and validity in non-psychiatric hospital outpatient clinics, making it particularly useful in settings where physical symptoms overlap with emotional distress.

Although HADS was initially validated in Sri Lanka over two decades ago, the statistical methods used are outdated, necessitating a revalidation for contemporary clinical use (3). Furthermore, while a Sinhala translation of the HADS was validated in a study involving patients

with ischemic heart disease, there has not been a comprehensive validation of the tool for a broader population of individuals with physical illnesses (4).

## Objectives

### General objective

The primary objective of this study is to culturally adapt and validate the Hospital Anxiety and Depression Scale (HADS) for the Sinhala-speaking population in Sri Lanka.

### Specific objectives

1. To translate and culturally adapt the HADS into the Sinhala language, ensuring its linguistic and cultural appropriateness for Sri Lankan patients.
2. To establish psychometric properties (reliability and validity) of the HADS-S, assessing its effectiveness in identifying anxiety and depression in a Sri Lankan medical outpatient clinic setting.

## Materials and methods

### Study design and participants

This descriptive cross-sectional study design aimed to validate the Sinhalese version of the Hospital Anxiety and Depression Scale (HADS-S) among medical outpatient clinic patients at the National Hospital, Sri Lanka, from 01.11.2022 to 15.11.2022. Participants were selected via simple random sampling based on clinic number order. Inclusion criteria were Sinhala as the first language; those with delirium, learning disabilities, or visual/hearing impairments were excluded. A minimum of 154 participants was targeted, considering a 10% non-response rate. The sample size followed the “10 subjects per variable” rule, requiring 140 participants for the 14-item questionnaire.

HADS-S was validated through a systematic, multi-phase process using both qualitative and quantitative methods to ensure linguistic accuracy, cultural appropriateness, and clinical relevance. The original English HADS was translated into Sinhala by a bilingual expert, then back translated into English by another expert unaware of the original. This process ensured semantic consistency. A multidisciplinary panel – including a psychiatrist, community physician, psychiatric nurse, occupational therapist, and social worker – reviewed both versions for clarity and cultural relevance, making necessary adjustments. A pilot study with 20 patients from another clinic assessed item acceptability, comprehensibility, and clarity. Feedback guided final semantic modifications.

Ethical standards were maintained with informed consent and voluntary participation. The final HADS-S version

was validated in the outpatient setting to evaluate its psychometric properties, including reliability and validity.

Construct validity was assessed using Exploratory Factor Analysis (EFA) to verify the two-factor structure (anxiety and depression). Convergent validity was tested by comparing HADS-S scores with established anxiety and depression measures, while discriminant validity was confirmed through weak correlations with unrelated constructs, supporting the scale’s specificity.

### Reliability assessment

The HADS-S scale’s reliability was evaluated using Cronbach’s alpha to measure internal consistency.

### Ethics approval

Ethical approval was granted by the National Hospital of Sri Lanka ethics committee. Informed consent was obtained, with participants made aware of the study’s purpose, procedures, risks, benefits, and their right to withdraw at any time without consequence.

## Results

### Demographic Information of the Participants

The study sample included participants aged between 61 and 70, representing 41.6% of the total sample (Figure 1). The mean age of the participants was 61.15 years (SD = 11.59). Regarding gender distribution, 64.9% of the participants were female, while 35.1% were male. The distribution of age groups across genders was balanced, with females being more prevalent in each age group.

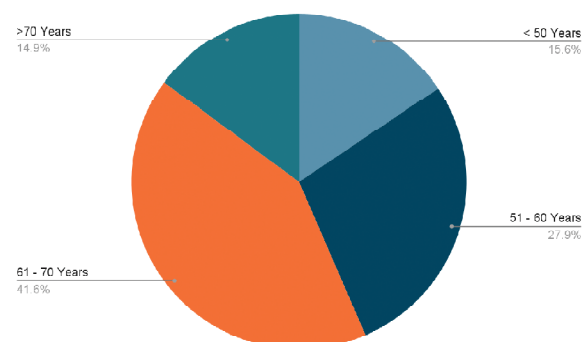


Figure 1. Distribution of the study population by age.

Regarding anxiety, 59.1% of the participants reported feeling tense, and 48.1% experienced intermittent feelings of fright. A majority of participants (40.3%) exhibited some level of anxiety when assessed using a simplified two-category classification of anxiety versus no anxiety. For depression, 39% of participants felt occasionally

slowed down, and 26.6% felt cheerful most of the time. Overall, 91.2% of the participants had depression scores indicating no depression or borderline depression, while only 8.4% scored in the clinical depression range.

In terms of health conditions, 57.8% of the participants were classified as having either anxiety or depression based on the HADS-S, while 42.2% were free from these conditions. A significant association was found between anxiety and depression ( $p=0.000$ ), indicating that individuals with depression were more likely to experience anxiety.

### Exploratory factor analysis (EFA)

Exploratory Factor Analysis (EFA) was performed using Principal Component Analysis with Varimax rotation and Kaiser Normalization. The Kaiser-Meyer-Olkin (KMO) value was 0.745, indicating adequate sampling, and Bartlett's Test of Sphericity was statistically significant ( $p=0.000$ ).

The analysis identified two primary factors:

Factor 1 (Anxiety) included items A1, A2, A3, A4, A5, and A6.

Factor 2 (Depression) included items D2, D3, D4, D5, D6, and D7.

However, items A7 (anxiety-related) and D1 (depression-related) did not load as expected, suggesting that these items might differentially align well with their respective factors.

Confirmatory factor analysis was not used as the study mainly aimed at the tool's clinical applicability, and the current analyses (EFA + reliability + ROC) adequately address practical validation goals.

### Convergent validity and discriminant validity

The moderate positive correlation ( $r = 0.402$ ) between anxiety and depression scores supported convergent validity. This correlation was statistically significant ( $p = 0.000$ ), further validating the relationship between the two variables. While anxiety and depression are related, they are distinct constructs.

The separate factor loadings for anxiety and depression in the EFA suggested discriminant validity.

### Reliability

The reliability of the scales was assessed using Cronbach's Alpha values (Table 1). For the Anxiety domain, the Cronbach's Alpha was 0.803, indicating good internal consistency. Item-total correlations for most items were moderate to strong, except for item A7, which showed a weak correlation with the overall anxiety scale. The Cronbach's Alpha for the Depression domain was 0.563, indicating poor internal consistency. Item D1, had very weak item-total correlation.

The overall HADS S scale demonstrated good reliability, with a Cronbach's Alpha 0.775. This suggests that the combined anxiety and depression scales performed reliably across the sample.

Table 1. Inter Item Correlation and Cronbach's Alpha for Anxiety

|    | A1    | A2    | A3    | A4    | A5    | A6    | A7    |
|----|-------|-------|-------|-------|-------|-------|-------|
| A1 | 1.000 | 0.284 | 0.537 | 0.454 | 0.549 | 0.589 | 0.031 |
| A2 | .284  | 1.000 | 0.394 | 0.290 | 0.329 | 0.379 | 0.097 |
| A3 | .537  | .394  | 1.000 | 0.329 | 0.466 | 0.589 | 0.179 |
| A4 | .454  | .290  | .329  | 1.000 | 0.392 | 0.553 | 0.205 |
| A5 | .549  | .329  | .466  | .392  | 1.000 | 0.615 | 0.163 |
| A6 | .589  | .379  | .589  | .553  | .615  | 1.000 | 0.186 |
| A7 | .031  | .097  | .179  | .205  | .163  | .186  | 1.000 |

Table 2. Inter Item Correlation and Cronbach's Alpha for Depression

|    | D1    | D2    | D3    | D4    | D5    | D6    | D7     |
|----|-------|-------|-------|-------|-------|-------|--------|
| D1 | 1.000 | 0.023 | 0.424 | 0.183 | 0.017 | 0.243 | -0.123 |
| D2 | .023  | 1.000 | 0.030 | 0.318 | 0.192 | 0.063 | 0.211  |
| D3 | .424  | .030  | 1.000 | 0.071 | 0.156 | 0.313 | 0.052  |
| D4 | .183  | .318  | .071  | 1.000 | 0.100 | 0.138 | 0.415  |
| D5 | .017  | .192  | .156  | .100  | 1.000 | 0.225 | 0.137  |
| D6 | .243  | .063  | .313  | .138  | .225  | 1.000 | 0.235  |
| D7 | -.123 | .211  | .052  | .415  | .137  | .235  | 1.000  |

### Sensitivity and specificity

The sensitivity and specificity of the HADS-S were evaluated by comparing the scale results to clinical judgment (the gold standard). For Anxiety, the sensitivity was 94.1%, and the specificity was 86.4%. The false negative rate was 5.9%, while the false positive rate was 13.6%. The Kappa value, indicating the level of agreement between the two methods, was 0.764, suggesting good agreement.

For Depression, the sensitivity was 82.9%, and the specificity was 74.3%. The false negative rate was 17.1%, and the false positive rate was 25.7%. The Kappa value

for the agreement between the HADS and clinical judgment for depression was 0.489, indicating moderate agreement.

### ROC curve analysis

The ROC curve analysis demonstrated that the HADS-S can distinguish between different levels of anxiety and depression (Figures 2 and 3). The Area Under the Curve (AUC) for anxiety was 0.973, indicating excellent discriminatory ability, while the AUC for depression was 0.930, reflecting strong performance in distinguishing between individuals with and without depression.

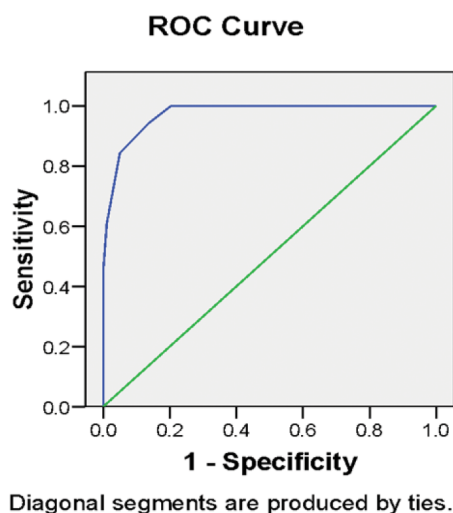


Figure 2. ROC curve for Anxiety.

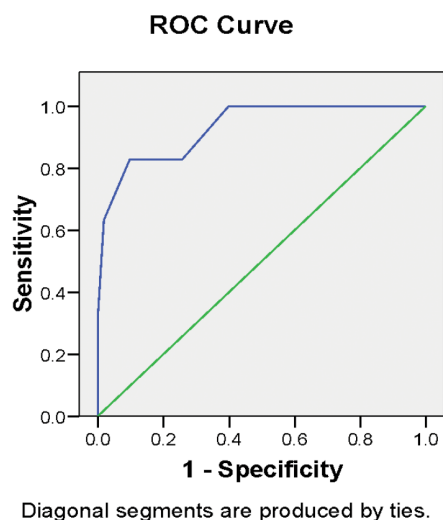


Figure 3. ROC curve for Depression.

## Discussion

### Socio-demographic characteristics

The study, conducted at the National Hospital of Sri Lanka, primarily involved older adults aged 61-70, with a mean age of 61.15. The sample had a higher proportion of females (64.9%) compared to males (35.1%), reflecting typical healthcare trends, in which women seek medical help more frequently (5). Despite the gender imbalance, psychological conditions did not significantly vary by age or gender.

### Anxiety and depression domain reliability

The reliability analysis shows the HADS-S Anxiety domain has good internal consistency (Cronbach's  $\alpha = 0.803$ ), effectively capturing symptoms like tension and worry. In contrast, the Depression domain shows lower consistency ( $\alpha = 0.563$ ), possibly due to poorly aligned items or varied interpretation. Overall, the HADS-S demonstrates acceptable reliability ( $\alpha = 0.775$ ). Globally, anxiety symptoms tend to show stronger consistency due to their universal nature (5).

In contrast, the Depression domain often shows lower  $\alpha$  values, especially in certain cultural contexts, due to the heterogeneity of depressive symptoms, which is expressed differently across cultures. In the Chinese validation, the Anxiety domain yielded a Cronbach's  $\alpha$  of 0.82, and the Depression domain was reported at 0.83, which suggests a relatively high degree of internal consistency for both (6). Similarly, in the Spanish validation, the Anxiety domain had an  $\alpha$  of 0.83, while the Depression domain was 0.84 (7). However, several other Asian studies have reported lower  $\alpha$  values for depression, typically around 0.5-0.6 (8,9). The reported lower reliability values in the depression domain for Sinhala-speaking populations may be due to cultural differences in how depressive symptoms are expressed. For instance, somatic symptoms like fatigue or pain are more prominent in these contexts, which might not align with the psychological focus of the HADS Depression items (10). Additionally, since the study sample consists of follow-up patients from an internal medicine clinic, the unclear definition of cutoffs for general medical populations and general medical illnesses not explicitly linked to mood disorders may also help explain the lower reliability observed. However, overall, HADS-S Cronbach's  $\alpha$  of 0.775 indicates its reliability as a whole.

### Correlation between anxiety and depression

A moderate positive correlation ( $r = 0.402$ ,  $p=0.000$ ) between anxiety and depression suggests comorbidity and symptom overlap yet highlights their clinical distinction. This aligns with findings from similar studies (11), indicating a consistent association while allowing for independent variation between the two conditions.

### Factor analysis

Factor analysis of the HADS-S tool shows it effectively captures anxiety and depression constructs, supported by a KMO value of 0.745 and a significant Bartlett's Test of Sphericity ( $p=0.000$ ). Most items align well with their respective domains, with anxiety-related items loading on the Anxiety component and depression-related items on the Depression component. However, items A7 and D1 showed poor loadings, indicating they may not contribute meaningfully to measuring anxiety and depression. Similar findings across Sinhala, Korean, and European validations suggest these items consistently underperform (11-13).

The clinical judgment validation of the HADS highlights its effectiveness as a screening tool for anxiety and depression. Strong statistical associations were found, with 96.7% of those identified as having no anxiety also confirmed by clinical judgment, and 77.4% of anxious individuals validated similarly. For depression, while 92.3% of those with no depression were correctly classified, 46.0% of those identified as depressed were misclassified, indicating some limitations in detecting depression.

Performance metrics show that HADS-S has high sensitivity for anxiety (94.1%) and respectable sensitivity for depression (82.9%), but the latter has a higher false negative rate (17.1%) and lower specificity (74.3%). Agreement analysis reveals good agreement for anxiety ( $\text{Kappa} = 0.764$ ) but only moderate agreement for depression ( $\text{Kappa} = 0.489$ ), suggesting discrepancies may arise from symptom overlap and varying clinical judgments. Overall, the ROC curve analysis (Figure 2, Figure 3) supports the tool's capability in differentiating anxiety and depression levels, confirming HADS as a robust instrument for identifying psychological distress despite some internal consistency issues.

A recent validation of the HADS Sinhala version among IHD patients in Sri Lanka showed high reliability, with Cronbach's  $\alpha$  values of 0.86 for depression and 0.83 for anxiety (4). In comparison, our study with a more diverse medical population reported lower values 0.563 for depression and 0.803 for anxiety, likely reflecting greater variability in responses than in the more homogeneous IHD patient group.

### Strengths of the study and findings

This study's methodology is strong. It uses a culturally HADS-S that was carefully translated, validated, and pre-tested, ensuring its relevance to Sinhala-speaking individuals. Using the HADS-S and clinical judgment as a gold standard enhances the validity of study findings. The findings report the tool's effectiveness, with high sensitivity and specificity for anxiety (94.1% and 86.4%, respectively) and good sensitivity (82.9%) and specificity (74.3%) for depression with the tool demonstrating

minimal false positives and negatives. The significant association between anxiety and depression and the strong agreement with clinical judgment further confirm the reliability of the HADS-S. Factor analysis also adds to the scale's validity, making it a relevant tool for assessing mental health in this population.

## Limitations of the study

In this study, the items A7 (“ug ;ek1 myiqfjka ys| úfōlSj isáh ye1sh.”) and D1 (“udf.a jev lrk fō.h wvq ù we;ehs ug yefōa”) did not load effectively on their intended domains during factor analysis, indicating a misalignment with the anxiety and depression constructs they were designed to measure in the HADS-S.

The translation and cultural adaptation process for the HADS-S tool might not have fully preserved the meaning of items A7 and D1. Subtle differences in language and cultural context could have affected how respondents interpret and respond to the tool prompts (14). In addition, these items may not be as relevant or meaningful in the cultural context of the Sinhala-speaking population, where cultural nuances in expressing or experiencing anxiety and depression can impact the effectiveness of particular items (15). The psychometric properties of these items may not be robust across diverse populations, as previous studies have shown that some items in validated tools perform differently when adapted to new cultural contexts (16).

Despite the suboptimal performance of items A7 and D1, retaining the HADS-S tool without removing these items is justified for several reasons. Many previous validations across different cultural settings have encountered similar issues, where particular items were less effective but the overall tool remained valid. Studies in various languages and cultural contexts have reported suboptimal individual item performance while preserving the core HADS structure (17). The overall Cronbach's alpha of 0.775 indicates good internal consistency. Additionally, the tool's high sensitivity and specificity support its clinical utility, showing strong alignment with clinical judgment in assessing anxiety and depression. Cultural adaptation is complex, but minor issues with individual items don't invalidate the HADS-S. Targeted revisions can be aimed in future studies based on current feedback (8). Retaining the tool allows for immediate clinical use and comparison with existing data, avoiding the need for resource-intensive redesign. This pragmatic, iterative refinement approach aligns with standard cross-cultural validation practices, where early studies guide future improvements over time (18).

The study was conducted during Sri Lanka's severe economic crisis ultimately ended in financial bankruptcy. This likely affected accessibility to health services, especially for marginalized populations, due to transportation issues and increased financial burdens, potentially confounding the findings.

## Prospects for research

The HADS-S is a valuable tool for detecting psychological distress in Sinhala speakers, despite some underperforming items. Its effectiveness in identifying anxiety and depression supports its clinical utility. Retaining the tool ensures continuity with existing research while accommodating future refinements. Research should prioritize improving the Depression domain through cultural adaptation and validation. Ongoing feedback from clinicians will be crucial for enhancing reliability and guiding updates to ensure its continued relevance and accuracy in clinical settings.

## Conclusions

The HADS-S has undergone thorough adequate cultural validation and demonstrates strong reliability and validity for assessing anxiety and depression in Sinhala-speaking individuals with physical health conditions. Its high sensitivity, specificity, and effective construct measurement support its continued use in both clinical and research settings.

## Statement of contribution

L.Y. Akuratiyage led the study, overseeing conception, design, data collection, analysis, and manuscript development.

P. De Silva contributed to study design and manuscript preparation.

U. Dissanayake assisted with clinical validation and patient recruitment.

S. Manjika and P.U. Chulasiri supported study design, methodology, and statistical analysis.

C.U. Suraweera provided psychiatric expertise and contributed to validation and manuscript revisions, analysis, methodology.

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