ORIGINAL ARTICLE

Validation and assessment of the psychometric properties of the Hospital Anxiety and Depression Scale (HADS) against the depressive and anxiety modules of the Composite International Diagnostic Interview (CIDI)

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ABSTRACT

Background: Psychiatric morbidity, particularly anxiety and depressive disorders, is common among caregivers of children living with chronic illnesses such as sickle cell disease (SCD). Early identification of psychological distress in caregivers is essential to improve overall caregiving outcomes and psychosocial functioning. The Hospital Anxiety and Depression Scale (HADS) is a widely used screening instrument for anxiety and depression; however, validation against structured diagnostic tools within Nigerian populations remains limited. **Objective:** This study aimed to assess the psychometric properties of the Hospital Anxiety and Depression Scale-Anxiety (HADS-A) and Hospital Anxiety and Depression Scale-Depression (HADS-D) against the anxiety and depressive modules of the Composite International Diagnostic Interview (CIDI) among caregivers of children living with SCD. **Methods:** A hospital-based cross-sectional validation study was conducted among 193 informal caregivers of children with SCD attending the paediatric sickle cell clinic at State Specialist Hospital Maiduguri, Nigeria. Participants were recruited using systematic random sampling. Data collection tools included a sociodemographic questionnaire, HADS-A, HADS-D, and the anxiety and depression modules of the CIDI. Data was analyzed using Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics summarized participant characteristics. Reliability was assessed using Cronbach's alpha. Validity was evaluated through sensitivity, specificity, predictive values, contingency analyses, and receiver operating characteristic (ROC) curves. **Results:** The prevalence of anxiety and depression using CIDI was 59.1% and 62.5%, respectively, while HADS identified anxiety in 63.2% and depression in 66.9% of participants. Internal consistency was satisfactory for HADS (Cronbach's alpha = 0.852), CIDI depression (0.981), and CIDI anxiety (0.891). HADS-A demonstrated optimal diagnostic performance at a cut-off score of ≥8 with sensitivity of 91%, specificity of 96%, positive predictive value of 97%, and area under the curve (AUC) of 0.982. HADS-D showed optimal performance at a cut-off score of ≥9 with sensitivity of 93%, specificity of 97%, positive predictive value of 94%, and AUC of 0.915. Conclusion: The findings indicate that HADS-A and HADS-D demonstrate strong psychometric properties when compared with CIDI diagnostic modules among caregivers of children with SCD. HADS-A at a cut-off score of ≥8 and HADS-D at a cut-off score of ≥9 may be useful screening thresholds for identifying anxiety and depressive disorders in this population.

Key words: Anxiety, Depression, Caregivers, Sickle Cell Disease, Hospital Anxiety and Depression Scale, Composite International Diagnostic Interview.

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Introduction

Psychiatric Morbidity is any clinically significant behavioural or psychological syndrome or pattern that occurs in an individual and is associated with present distress or disability.[1] This pattern of behaviour is not related to loss, a cultural response to an event, or any other malfunction or disease condition.[2] Among the most prevalent psychiatric morbidities are anxiety and depressive disorders, which are thought to be part of the larger group of internalizing disorders due to their strong comorbidity.[3] Several studies have shown a high incidence of anxiety and depression among caregivers of chronically ill patients. [4]

Zigmond and Snaith designed the Hospital Anxiety and Depression Scale (HADS) questionnaire in 1983 to measure anxiety and depression among patients in the general setting.[5] It is a simple, easy-to-use and fast tool which has been recommended by the National Institute for Health and Care Excellence (NICE) for the diagnosis of anxiety and depression.[6] It is a 14-item questionnaire with 7 questions each for anxiety (HADS-A) and depression (HADS-D). Each question is scored using a 4-point Likert scale from 0-3, it has a minimum score of 0 and a maximum of 21 for each of the modules. A score of less than 7 signifies no illness, 8-10 mild, 11-14 moderate and 15-21 severe. However, Anxiety and depression should be scored and interpreted separately.[6] It has been validated for use in Nigeria, the sensitivity and specificity of the anxiety sub-scale ranges from 85.0% to 92.9% and 86.5% to 90.6% respectively while for the depression sub-scale, it ranges from 89.5% to 92.1% and 86.6% to 91.1% respectively.[7] this study has adopted a cut off value of 8, where participants with a score of 8 and above on either HADS-D or HADS-A are considered to have depressive or anxiety disorders, as adapted from a study by Olaoluwa et al in South-eastern Nigeria.[8]

The World Health Organization (WHO) first created the Anxiety and Depressive Disorder Modules of the Composite International Diagnostic Interview. It is a structured questionnaire that was standardized in 1990. It is made to evaluate a variety of mental health issues.[9] It offers the ability to base diagnoses on both the Diagnostic and Statistical Manual IV (DSM IV) and the 10th edition of the International Classification of Diseases (ICD 10). The CIDI has a number of modules, and the interviewer has the option of choosing one of those modules only, excluding the others. Independent studies comparing the depressive module of the CIDI with DSM IV and ICD 10 criteria demonstrated consistently acceptable levels of concordance with kappa values (K) ranging from 0.71 to 0.93 across various samples. This makes it valid for the diagnosis of depression in both clinical and non-clinical samples.[9] It has a Cronbach's alpha of 0.97, specificity of 72.2% and a sensitivity of 51.0%.[10] This instrument was used in the 2004 global survey on mental health conducted in Nigeria. Three of the investigators were trained at the Ibadan centre of the World Health Organization's (WHO) African Regional Office (AFRO), which also approved its usage.[9]

This study aims to assess the psychometric properties of HADS A and HADS D against the anxiety and depressive modules of CIDI.

METHODS

The study was conducted at the SCD clinic of the paediatric outpatient unit of the State Specialist Hospital, Maiduguri (SSHM). Maiduguri is the capital of Borno state in the North-eastern part of Nigeria. It has a cross-sectional design comparing the psychometric properties of HADS-A against the anxiety module of CIDI and HADS-D against the depressive module of CIDI. The study population consisted of informal caregivers of children living with SCD attending the sickle cell clinic at State Specialist Hospital, Maiduguri for at least 1year. The inclusion criteria include: Direct adult Caregivers of children diagnosed with SCD (parent/guardian) and have been attending the sickle cell clinic for at least 1year and those who gave informed consent. The exclusion criteria include caregivers of children with SCD who have a diagnosis of a chronic physical and/or mental illness and are on medication, and Caregivers caring for others with chronic illness. An informal caregiver is any adult family member taking care of a child with SCD. A sample size of 212 was obtained after correction for attrition. The instruments used include the sociodemographic tool, HADS-A, HADS-D, and the anxiety and depressive modules of CIDI. The participants were recruited using the systematic random sampling method with a sampling interval of 8 as calculated using the standard formula. About 30 participants were seen on each clinic day, where they were administered the HADS-A, HADS-D, and the anxiety and depressive modules of CIDI. The sample collection lasted for about 4 weeks. The Kobo tool was used to administer the questionnaires.

Data Analysis

The data collected from the Kobo tool was converted into Microsoft Excel, cleaned, and entered into Statistical Package for Social Sciences, version 25.0 Software (SPSS 25.0), which was also used for data analyses. The sociodemographic characteristics of caregivers were assessed using descriptive analysis, where the mean and standard deviation of some variables were calculated. A two-tailed Pearson correlation coefficient was used for the inter-item correlation of the individual items to assess the validity. Cronbach's alpha and internal consistency for the variables were calculated. A receiver operator characteristic curve (ROC) was drawn. Positive and negative predictive values were calculated.

Ethical Consideration

Ethical clearance was obtained from the health research and ethics review committee of the Federal Neuropsychiatric Hospital, Maiduguri (FNPHM), and permission was also obtained from the management of the state specialist hospital, Maiduguri (SSHM). Participants were provided with information about the study, and an informed consent form was given for them to sign or thumbprint. For those who could not read, the consent form was read and interpreted in Hausa before thumb printing. Participants found to have depression and anxiety were referred to FNPHM for further management.

RESULTS

A total of 193 participants completed the study. The results are reported under the following:

1. Sociodemographic characteristics of the participants
2. The prevalence of anxiety and depression
3. Psychometric properties of HADS against CIDI

1. Sociodemographic Characteristics Of The Participants

Table 1a shows the sociodemographic variables for the entire population, including the measures of central tendency (mean and standard deviation) for the continuous variables. The mean age of the participants was 32.5 with a range of 20 to 62 years. Most of the caregivers were female (93.8%), most of whom are mothers (88.1%). Most of the caregivers had low income with a mean of 14236 $\pm$ (2461) naira. The mean age of the children was 10.6 years with a range of 2 to18years, and the majority were male (54.5%).

Table 1a Sociodemographic characteristics of all participants

Variables	N = 193 Frequency	Percentage (%)
Gender		
Male	12	6.2
Female	181	93.8
Age (Mean ± SD) 41±2.61		
< 40	135	70.0
$\geq$ 40	58	30.0
Education attainment		
Non-Formal	106	55.0
Formal (years)		
<6years	26	13.5
6-12years	46	23.8
>12years	15	7.7
Marital Status		
Married	165	85.5
Unmarried	11	5.7
Widow	8	4.1
Divorce	9	4.7
Marital consanguinity		

Yes	27	14.0
No	166	86.0
Employment Status		
Unemployed	80	41.5
Employed	113	58.5
Relationship with Child		
First Degree	182	94.3
Second Degree	11	5.7
No of Children with SCD		
1	102	52.8
>2	91	47.2
Estimated Monthly Income	**Mean ± SD**	**14236 ± (2461)**
<350000	165	85.5
>35000	28	14.5

2. Prevalence of Anxiety and Depression

The prevalence of anxiety and depression is reported below. Table 2a shows the prevalence of anxiety and depression using the CIDI anxiety and depression modules. It found that 59.1 % of the participants had anxiety, and 62.5% of the participants had depression. Table 2b shows the prevalence of anxiety and depression at baseline using the HADS, where values above 8 are considered to have anxiety/depression. About 63% of the participants had anxiety, while 66.9% had depression.

Table 2a Prevalence of anxiety and depression among caregivers of children living with SCD at baseline using the anxiety and depressive modules of CIDI.

Characteristics	Instrument used	Frequency N=193	Percentage (%)
Anxiety	CIDI Anxiety		
Yes		114	59.1
No		79	40.9
Total		193	100
Depression	CIDI Depression		
Yes		120	62.5
No		73	37.5
Total		193	100

Table 2b Prevalence of anxiety and depression among caregivers of children living with SCD at baseline using HADS-A and HADS-D

Characteristics	HADS Score (0 – 21)	Frequency N=193	Percentage (%)
Anxiety	HADS-A		
Yes	>8	122	63.2
No	0 - 8	71	36.8
Total		193	100
Depression	HADS-D		
Yes	>8	129	66.9
No	0 - 8	64	33.1
Total		193	100

3. **Psychometric Properties of HADS against CIDI**

Table 7a demonstrates satisfactory internal consistency reliability, with Cronbach's Alpha values that are generally considered strong. High Cronbach's Alpha values (close to 1.0) suggest that the items within each instrument are highly correlated, which is important for ensuring that they effectively measure the constructs they are intended to assess.

Table 7b is a result of the validity coefficients of HADS-A from scores of 5-11, which shows significant values of sensitivity, specificity, positive and negative predictive values at HADS-A-8. Table 7c is a result of the validity coefficients of HADS-D from scores of 5-11, which shows significant values of sensitivity, specificity, positive and negative predictive values at HADS-D-9. Table 7d is a result of contingency comparing HADS-A to CIDI-Anxiety as criterion, and it shows that there is significant similarity in the diagnostic ability of HADS-A against CIDI-Anxiety. Table 7e shows a contingency comparing HADS-D to CIDI-Depression as a criterion, showing similarities in their diagnostic properties. Figure 8 is a receiver operating characteristics (ROC) curve of HADS-A scores from 6-10, the curve has a significant area under the curve at HADS-A-8 was 0.98. Figure 9 is an ROC curve for HADS-D scores from 6-10; the area under the curve was highest at HADS-D-9 with a score of 0.915.

Table 3a Psychometric Properties of HADS against the Depressive and Anxiety Module of CIDI (Internal Consistency Reliability)

Instruments	Cronbach's Alpha	Number of Items	Remark
Hospital Anxiety and Depression Scale (HADS)	0.852	14	Satisfactory Internal Consistency
CIDI Depression	0.981	149	Satisfactory Internal Consistency
CIDI Anxiety	0.891	79	Satisfactory Internal Consistency

Table 3b: validity coefficient of HADS-A at cut-off scores of 5-11 for the caregivers of children living with SCD.

Threshold	5	6	7	8	9	10	11
Sensitivity	0.65	0.74	0.86	0.91	0.85	0.82	0.76
Specificity	0.72	0.79	0.84	0.96	0.83	0.89	0.71
Negative predictive value	0.83	0.85	0.89	0.94	0.82	0.87	0.69
Positive predictive value	0.76	0.86	0.92	0.97	0.76	0.73	0.61
False positive rate	0.34	0.26	0.19	0.01	0.23	0.14	0.47
Misclassification rate	0.15	0.12	0.16	0.03	0.21	0.28	0.35

Table 3c: validity coefficient of HADS-D at cut-off scores of 5-11 for the caregivers of children living with SCD.

Threshold	5	6	7	8	9	10	11
Sensitivity	0.68	0.73	0.87	0.84	0.93	0.80	0.72
Specificity	0.75	0.77	0.80	0.81	0.97	0.85	0.70
Negative predictive value	0.82	0.85	0.88	0.84	0.96	0.86	0.68
Positive predictive value	0.73	0.81	0.90	0.85	0.94	0.78	0.64
False positive rate	0.35	0.31	0.29	0.25	0.04	0.18	0.47
Misclassification rate	0.14	0.11	0.15	0.27	0.01	0.32	0.39

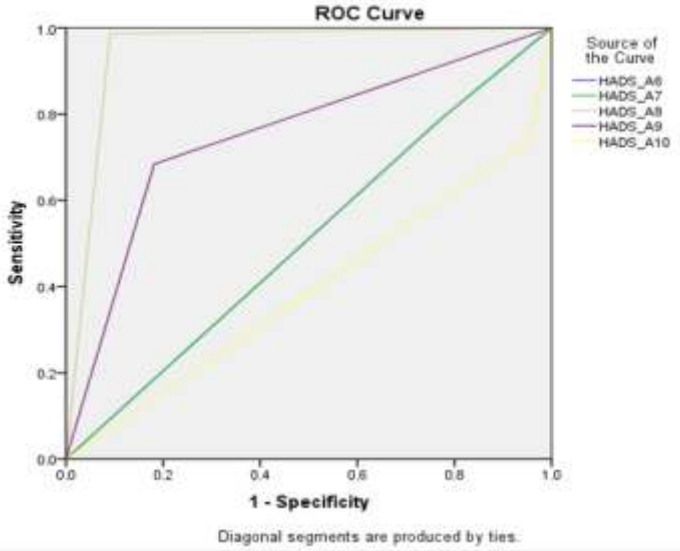
Table 3d Contingency table comparing HADS-A to CIDI-Anxiety as criterion

Instruments	CIDI diagnosis Anxiety	CIDI diagnosis No Anxiety	Total
HADS-A diagnosis Anxiety	55	46	101
HADS-A diagnosis No Anxiety	48	44	92
Total	103	90	193

Table 3e Contingency table comparing HADS-D to CIDI-Depression as criterion

Instruments	CIDI diagnosis Depression	CIDI diagnosis No Depression	Total
HADS-D diagnosis Depression	62	40	102
HADS-D diagnosis No Depression	41	50	91
Total	103	90	193

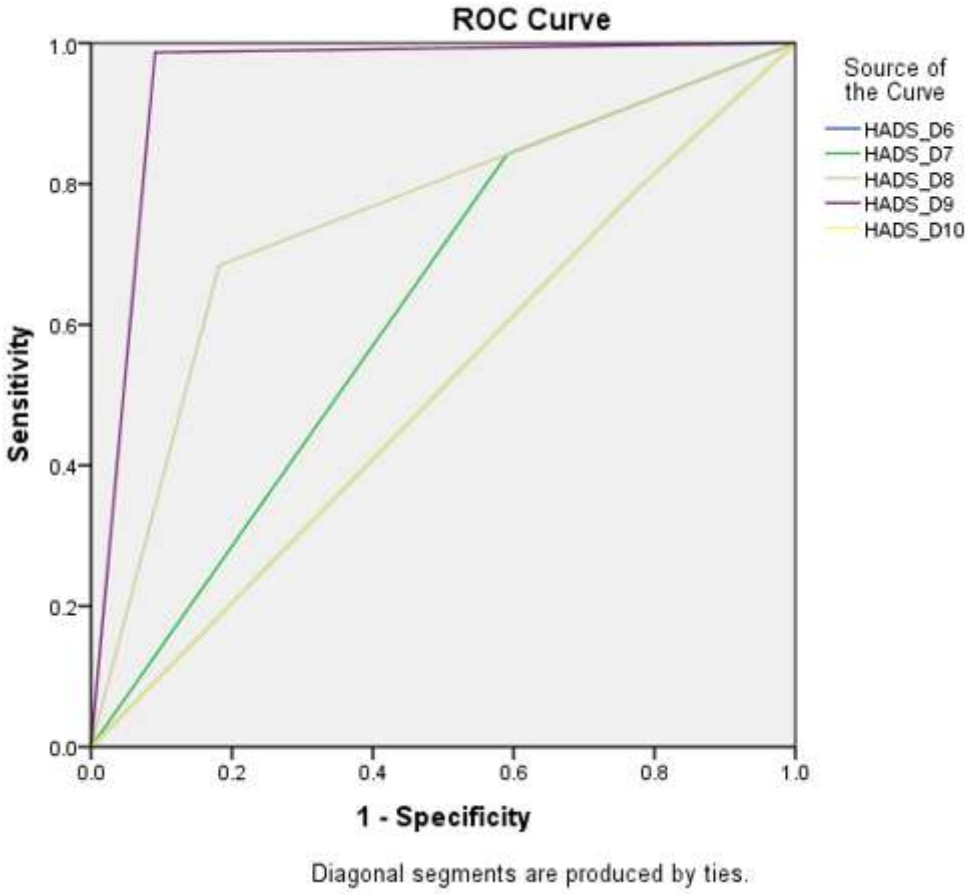
Figure 1: ROC Curve 1 (Anxiety)



Area Under the Curve (AUC)

Variable(s)	Area
HADSAsum6	0.478
HADSAsum7	0.613
HADSAsum8	0.982
HADSAsum9	0.726
HADSAsum10	0.693

Figure 2: ROC Curve 2 (Depression)



Area Under the Curve (AUC)

Variable(s)	Area
HADSDsum6	0.273
HADSDsum7	0.741
HADSDsum8	0.826
HADSDsum9	0.915
HADSDsum10	0.647

Discussion

The study compared the results of depression obtained from the depressive component of HADS and the depressive module of CIDI. Inter-Item Correlation matrix provides valuable information about how each item in the HADS relates to one another and to the overall total score. It can help researchers and clinicians understand the internal structure and validity of the scale, as well as identify which items are particularly relevant for assessing symptoms of anxiety and depression. It was found that the Inter-Item Correlation matrix provides insights into the relationships between individual items and the total score of the GAD measure. The significant correlations between items and the total score indicate that the items effectively measure generalized anxiety disorder symptoms, and the correlations between individual items suggest patterns of symptom co-occurrence and relationships that can be valuable for understanding the structure of GAD symptoms. The strong correlations between the total score and individual items indicate that these items collectively contribute to a reliable assessment of GAD symptoms.

The Inter-Item Correlation matrix provides insights into the relationships between individual items and the total score of the depression measure. The significant correlations between items and the total score indicate that the items are effectively measuring depression symptoms, while correlations between individual items suggest patterns of symptom co-occurrence and relationships that can be valuable for understanding the structure of depressive symptoms. The positive and negative predictive values were calculated, and the ROC curves were drawn for the two.

The result of the validity coefficients of HADS-A from scores of 5-11, which shows significant values of sensitivity, specificity, positive and negative predictive values at HADS-A-8. The result of the validity coefficients of HADS-D from scores of 5-11, which shows significant values of sensitivity, specificity, positive and negative predictive values at HADS-D-9. The contingency comparing HADS-A to CIDI-Anxiety as criterion and it shows that there is significant similarity in the diagnostic ability of HADS-A against CIDI-Anxiety, while the contingency comparing HADS-D to CIDI-Depression as criterion shows similarities in their diagnostic properties. The receiver operating characteristics (ROC) curve of HADS-A scores from 6-10, the curve significant area under the curve at HADS-A-8 was 0.98. While the ROC curve for HADS-D scores from 6-10, the area under the curve was highest at HADS-D-9 with a score of 0.915. This means that a HADS-A score cut-off of >/=8 is effective in diagnosing anxiety using the standardised instrument (CIDI) while a HADS-D cut-off score of >/=9 is effective in diagnosing depression. The anxiety component with a score of 8 is similar to the cut-off used in a study by Agbaje et al in 2019; however, different from the depressive component, for which they used a score of 8, and this validation yielded a score of 9 on HADS-D to best diagnose depression. This result could be because both studies were conducted in Nigeria, even though the characteristics of the study

Conclusion

The study finds that the psychometric properties of HADS-A against the Anxiety module of CIDI are similar, and also that of HADS-D against the depressive module of CIDI are similar and hence can

be used to diagnose anxiety and depression. The findings indicate that HADS-A and HADS-D demonstrate strong psychometric properties when compared with CIDI diagnostic modules among caregivers of children with SCD. HADS-A at a cut-off score of ≥8 and HADS-D at a cut-off score of ≥9 may be useful screening thresholds for identifying anxiety and depressive disorders in this population.

Limitations

This is a hospital-based study, and hence, results cannot be generalized.

Recommendation

A similar study on a larger group is recommended for generalizations of the findings. Public awareness campaigns should be launched to raise awareness of the challenges faced by caregivers of children with SCD. Healthcare institutions should adopt a family-centered care approach, recognizing that the well-being of caregivers directly impacts the quality of care provided to children with SCD. In this model, caregivers are regarded as essential partners in the care team, and their emotional and psychological needs are addressed alongside those of the children.

Conflict Of Interest

There was no conflict of interest.

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