Original Article

Psychometric properties of the Hospital Anxiety and Depression Scale (HADS) and associated factors of emotional distress among Moroccan cancer patients

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ABSTRACT

Psychological distress remains underdiagnosed in oncology settings across Low- and Middle-Income Countries, where transcultural validation of screening instruments and identification of treatment-specific predictors are critical for integrated psychosocial care. This cross-sectional study aimed to validate the Hospital Anxiety and Depression Scale (HADS) in a Moroccan oncological population and to examine the differential associations of anxiety and depression with sociodemographic, clinical, and treatment-related variables. Conducted at the Institut National d'Oncologie in Rabat, the study enrolled a consecutive non-probability sample of adult patients aged 18 to 60 years with histologically confirmed cancer. Psychological distress was assessed using the 14-item HADS, and the psychometric structure was explored via principal component analysis with Varimax rotation, while internal consistency was evaluated using Cronbach's alpha; bivariate associations were examined through Spearman's rank correlation, and multivariate associations with treatment type were modeled via multiple linear regression. The HADS demonstrated excellent sampling adequacy (Kaiser-Meyer-Olkin = 0.897) and a significant Bartlett's test of sphericity ($\chi^2 = 725.68$, $p < 0.001$), with principal component analysis confirming a robust two-factor structure accounting for 58.06% of total variance and excellent internal consistency (Cronbach's $\alpha = 0.919$). Although anxiety and depression were moderately-to-strongly correlated ($r = 0.509$, $p < 0.01$), only anxiety exhibited significant associations with diagnostic type ($r = 0.201$, $p < 0.05$) and treatment modality ($r = 0.284$, $p < 0.01$); multiple regression further identified anxiety as the sole significant predictor of treatment type ($\beta = 0.239$, $p = 0.037$), whereas depression showed no significant association ($\beta = –0.040$, $p = 0.727$). Additionally, female patients were significantly younger and had lower educational attainment, with education level positively correlated with insurance coverage ($r = 0.263$, $p < 0.01$), highlighting socioeconomic gradients in access to care. These findings establish the HADS as a valid and reliable instrument for screening psychological distress in Moroccan oncology patients and reveal a critical dissociation between anxiety and depression: anxiety emerges as a situational, treatment-sensitive marker responsive to therapeutic transitions, whereas depression appears more endogenous and independent of therapeutic modality. Consequently, the results support the implementation of differentiated, stepped-care psychosocial screening protocols that specifically target anxiety during treatment transitions, while underscoring the urgent need for equity-oriented policies addressing socioeconomic determinants of access to oncological care in resource-limited settings.

Keywords

Psycho-oncology; HADS; anxiety; depression; psychometric validation; cancer; Morocco.

INTRODUCTION

Malignant neoplasms currently rank among the most formidable threats to global public health, extending far beyond their biological burden to exert a profound toll on patients' psychological equilibrium[1]. The oncological trajectory, from diagnosis through multimodal therapy, frequently precipitates considerable emotional perturbation, with anxiety and depressive disorders representing the most prevalent psychiatric comorbidities in this population. Epidemiological investigations indicate that these conditions affect approximately one-fifth to two-fifths of cancer patients, although reported frequencies vary substantially depending on the tumor site, disease stage, and psychometric criteria applied[2]. Crucially, the co-occurrence of mood disturbances with oncological illness has been consistently linked to a deteriorated health-related quality of life, suboptimal therapeutic adherence, and, in certain cohorts, diminished survival prospects[3,4].

For the systematic identification of affective disorders in medical settings, the Hospital

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Anxiety and Depression Scale (HADS) remains the instrument of reference. Conceived by Zigmond and Snaith in 1983[5], this self-administered questionnaire was methodologically designed to disentangle core affective symptoms from somatic complaints, such as fatigue, pain, or appetite loss, that might otherwise confound psychological assessment in physically ill respondents. This deliberate exclusion of somatic items confers a decisive advantage in oncological populations, where bodily symptoms may stem from either the malignancy itself or cytotoxic treatments. Decades of cross-cultural validation have consolidated its psychometric credentials across diverse clinical contexts, with oncology being one of the most extensively documented fields of application[6].

Despite the established utility of the HADS, the etiological pathways linking therapeutic modalities to psychological distress remain insufficiently elucidated and continue to be debated[7]. Evidence suggests that intensive antineoplastic regimens, particularly systemic chemotherapy, may amplify depressive symptoms through direct neurotoxic effects, iatrogenic physical incapacitation, and the symbolic burden of aggressive intervention. Conversely, an equally compelling literature emphasizes that the magnitude of anxiety responses appears more tightly regulated by psychosocial variables, including perceived social support, illness cognitions, and pre-morbid vulnerability than by the objective intensity of medical treatment[8]. Therefore, disentangling these biomedical and psychological contributions is essential for constructing integrative models of patient experiences that transcend purely somatic narratives.

Grounded in this theoretical framework, the present study pursues two objectives. First, it sought to examine the factorial structure and psychometric behavior of the HADS within an oncological sample, thereby verifying its cross-cultural stability. Second, it aimed to investigate how sociodemographic attributes and clinical parameters, including treatment type and disease characteristics, differentially predicted anxiety and depression scores. By isolating the specific determinants of each affective dimension, this analytical approach intends to advance a nuanced understanding of emotional distress in cancer care and inform the development of targeted, evidence-based psychosocial interventions tailored to distinct risk profiles.

II. Materials and Methods

II.1 Study Setting and Overall Design

II.1.1 Institutional Setting

The present study was conducted at the Institut National d'Oncologie (INO) Sidi Mohammed Ben Abdellah in Rabat, a national reference institution for oncology in Morocco affiliated with the Ibn Sina University Hospital Center. The INO constitutes the main center for diagnostic and therapeutic management of cancer at the national level, receiving annually several thousand new incident cases from all regions of the Kingdom. This institutional choice is justified by the diversity of oncological profiles and therapeutic modalities available within the same structure, thereby enabling the constitution of a representative sample of the different therapeutic trajectories and their impacts on quality of life and sexual function in surviving patients.

II.1.2 Study Population and Sampling Procedure

II.1.2.1 Target Population

The target population comprised all adult patients of all genders with a histologically confirmed cancer diagnosis and receiving active oncological follow-up or in remission at the INO in Rabat during the inclusion period defined by the research protocol.

II.1.2.2 Eligibility Criteria

- **Inclusion criteria**
  - Age between 18 and 60 years at the time of enrollment
  - Histologically confirmed cancer diagnosis, regardless of tumor type, stage, or line of treatment
  - All genders (men, women)
  - Ability to understand and complete questionnaires in Moroccan dialectal Arabic (Darija) or French
  - Written informed consent obtained
  - Oncological follow-up at the INO for at least three months
- **Exclusion criteria**
  - Unstabilized severe psychiatric disorders (psychosis, bipolar disorder in acute phase), likely to compromise the validity of self-assessments

- Pregnancy at the time of enrollment
- Refusal to participate or withdrawal of consent
- Inability to complete the measurement instruments (functional illiteracy, severe cognitive impairment)

II.1.3 Sampling Procedure

A consecutive non-probability sampling approach was adopted, including every patient meeting the eligibility criteria and presenting for outpatient consultation or hospitalization at the INO during the inclusion period. This approach, commonly applied in quality-of-life studies in oncology[9]. optimizes clinical representativeness while preserving the logistical feasibility inherent to the Moroccan institutional context. The minimum sample size was calculated according to the formula of Hasan and Kumar[10], based on statistics published by our team[11], yielding a minimum target sample size of $n = 385$ participants.

II.2 Measurement Instruments

II.2.1 Hospital Anxiety and Depression Scale

The Hospital Anxiety and Depression Scale (HADS) is a 14-item screening instrument[5] (7 items for anxiety, odd-numbered items; 7 items for depression, even-numbered items), rated on 4-point Likert scales (0–3) with verbal anchors specific to each item. The instrument deliberately excludes somatic symptoms to avoid confusion with the side effects of oncological treatments.

Scoring procedure:

1. Anxiety Score (HADS-A) = sum of items 1, 3, 5, 7, 9, 11, 13; range 0–21.
2. Depression Score (HADS-D) = sum of items 2, 4, 6, 8, 10, 12, 14; range 0–21.
3. Interpretation by cut-off thresholds: 0–7 = non-case; 8–10 = borderline case; ≥ 11 = probable case[12].

II.2.2 Conduct of Semi-Structured Interviews

Individual semi-structured interviews were conducted with a purposive subsample of patients who, with their agreement, were selected using maximum variation sampling based on gender, cancer type, and treatment modality. The interviews were recorded with consent, transcribed verbatim, and analyzed according to the reflexive thematic analysis method of O'Neill et al.[13], with triangulation by two independent coders.

II.3 Statistical Methods

Statistical data analysis was performed using a descriptive and inferential approach adapted to the nature of the variables studied. First, descriptive statistics were used to characterize the study population and summarize the distribution of sociodemographic and clinical variables (frequencies, percentages). Anxiety and depression scores were assessed using the Hospital Anxiety and Depression Scale (HADS), then categorized according to conventional cut-off thresholds (normal, borderline, clinical case), enabling a qualitative analysis of psychological distress levels.

Second, a correlation (Spearman) analysis was conducted to examine relationships between quantitative and ordinal variables, particularly between anxious and depressive dimensions and sociodemographic and clinical characteristics. Correlation coefficients were used to evaluate the strength and direction of associations, highlighting potential links between psychological dimensions and the factors studied. The psychometric structure of the scale was explored using principal component analysis (PCA)[14]. The suitability of the sample for this analysis was verified using the Kaiser-Meyer-Olkin (KMO) index and Bartlett's test of sphericity. Components were retained according to Kaiser's criterion (eigenvalues greater than 1), and an orthogonal Varimax rotation was applied to improve factor interpretability. This analysis identified the underlying dimensions of the scale and evaluated the distribution of items across factors. The internal consistency of the scale was evaluated using Cronbach's alpha coefficient, enabling estimation of inter-item consistency and the stability of the construct being measured. A high value for this index was interpreted as an indicator of good internal homogeneity of the instrument.

II.4 Ethical Considerations

The study was conducted in strict compliance with the ethical principles of the Declaration of Helsinki and national guidelines regarding health data protection. No nominative information was used. The conduct of the present study was authorized by the medical management of the INO following the decision of the biomedical research ethics committee under reference CERB 133-25[11].

III. Results and Discussion

III.1 Questionnaire Validation

III.1.1 KMO Index

The principal component analysis (PCA) applied to the Hospital Anxiety and Depression Scale (HADS) first reveals an excellent suitability of the data for this type of factor analysis. The Kaiser-Meyer-Olkin (KMO) index reaches 0.897, corresponding to a level judged as "very good" according to Kaiser's criteria, indicating that partial correlations between items are low and that the latent structure is well defined. Furthermore, Bartlett's test of sphericity is highly significant ($\chi^2 = 725.68$; df = 91; $p < 0.001$), confirming that the correlation matrix differs significantly from an identity matrix. This indicates that the HADS items are sufficiently intercorrelated to justify dimensional reduction. These findings align with established psychometric investigations of the HADS, wherein elevated Kaiser-Meyer-Olkin values and robust sampling adequacy are routinely documented[15] (Table 1).

Table 1. Kaiser–Meyer–Olkin Measure and Bartlett's Test of Sphericity

KMO of Sampling Adequacy		0,897
Bartlett's Test of Sphericity	Approx. Chi-Square	725,68
	df	91
	Sig.	0,00

III.1.2 Principal Component Analysis Results

Examination of the eigenvalues reveals a factor structure dominated by two principal components. The first component exhibits an eigenvalue of 6.959 and alone explains 49.7% of the total variance, which is particularly high for a multidimensional psychometric instrument. The second component has an eigenvalue of 1.17 and explains 8.36% of the variance. Together, these two factors cumulatively account for 58.06% of the total variance, substantially exceeding the generally accepted threshold in the social sciences (50%) for considering a factor structure satisfactory. The remaining components display eigenvalues below 1, which, according to Kaiser's criterion, justifies their exclusion (Table 2). These factorial findings validate the dual-component configuration of the instrument, mirroring the foundational theoretical postulate that discriminates between anxious and depressive symptomatology as separate principal domains[16].

However, the analysis following rotation (presumably of the Varimax type) provides a more nuanced insight into the distribution of variance between the two factors. After rotation, the variance explained by the first factor decreases to 29.8%, while that of the second reaches 28.3%, reflecting a considerably more balanced distribution between the two dimensions. This redistribution is essential because it indicates that, without rotation, the first component captures a large proportion of the common variance (general distress factor effect), whereas after rotation, the two factors become more distinct and interpretable. This pattern is widely replicated in the psychometric literature, where the HADS is characterized by a hierarchical structure comprising a global dimension of non-specific emotional distress alongside two lower-order factors representing anxiety and depression[17].

The initial predominance of the first factor (nearly 50% of explained variance) strongly suggests the existence of a global psychological distress factor. This phenomenon is well documented in psycho-oncology, where anxiety and depression are often highly correlated and share common determinants such as uncertainty regarding the illness, perception of prognosis, and impact of treatments. Thus, the PCA reveals an implicit hierarchical structure: a dominant general factor underpinned by two specific dimensions[18].

The retention of two factors after rotation is particularly consistent with cross-cultural validations of the HADS. Numerous studies have confirmed this bidimensional structure in diverse clinical contexts, including oncology, although some have also suggested alternative models (single-factor or three-factor structures). Nevertheless, the two-factor solution remains the most robust and the most clinically interpretable[19].

Finally, the cumulative explained variance (58.06%) indicates that, although substantial, a non-negligible proportion of the variance (approximately 42%) remains unexplained by these two factors. This may reflect the complexity of patients' emotional responses, as well as the presence of individual variability not captured by the principal dimensions. This observation is classic in psychometric instruments assessing affective constructs, which are by nature multidimensional and influenced by contextual and subjective factors.

Table 2: Factor Structure and Explained Variance of the HADS

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6,959	49,705	49,705	6,959	49,705	49,705	4,171	29,795	29,795
2	**1,17**	**8,356**	**58,061**	**1,17**	**8,356**	**58,061**	**3,957**	**28,266**	**58,061**
3	0,855	6,11	64,172						
4	0,788	5,626	69,797						
5	0,729	5,21	75,007						
6	0,591	4,222	79,229						
7	0,541	3,867	83,096						
8	0,506	3,615	86,711						
9	0,463	3,307	90,018						
10	0,404	2,888	92,907						
11	0,314	2,246	95,152						
12	0,272	1,94	97,092						
13	0,221	1,58	98,672						
14	0,186	1,328	100						

III.1.3 Distribution of Items After Varimax Rotation

Figure 1, depicting the components in the rotated factor space derived from the principal component analysis (PCA) of the Hospital Anxiety and Depression Scale (HADS), enables an interpretation of the latent item structure by highlighting their relative positioning across the two principal dimensions.

From a global perspective, all items are located in the positive quadrant (Component 1 > 0; Component 2 > 0), indicating that all items contribute positively to the two extracted factors. This reflects the existence of a common core of psychological distress, consistent with the high eigenvalue of the first factor before rotation and the elevated Cronbach's alpha observed. These findings intimate that the items, while theoretically allocated to separate affective domains, nevertheless draw upon a common emotional foundation, typically denominated a general distress factor[20].

However, the factor rotation allows the identification of two relatively differentiated groupings. The anxiety items (HA) and depression items (HD) tend to cluster into distinct groups, albeit with partial overlap. Certain items, such as HA6, HA7, or HD5, HD7, display higher loadings on Component 1, indicating a more marked contribution to this dimension, which may be interpreted as the principal factor of emotional distress. Conversely, other items (notably HA1, HD1, HD2, HA2, HA3) are positioned higher on Component 2, suggesting a more specific differentiation, probably related to a more "cognitive" or "tension-related" dimension of anxiety and depression.

Observation of the scatterplot also reveals a partial overlap between anxiety and depression items, which constitutes a central finding. Unlike a perfectly orthogonal structure in which the two subscales would be completely separated, here the items from both dimensions occupy a common space, with inter-dimensional proximities. This overlap is extensively documented in the literature: the HADS frequently presents a bidimensional structure that is imperfectly distinct, with substantial correlations between the two factors[15]. This reflects the clinical reality in which anxiety and depression frequently coexist in patients, particularly in oncology.

Another important element is the relatively

homogeneous dispersion of items around the axes, with no strongly isolated or aberrant items present. This indicates good structural coherence of the scale, with no problematic item exhibiting atypical factorial behavior. This homogeneity supports the internal validity of the instrument and confirms that each item contributes relevantly to the measurement of the overall construct.

Finally, the distribution of items along Component 1, which appears as the principal axis, confirms its dominant role in the structuring of responses. Component 2 functions more as a secondary differentiation axis enabling the discrimination of nuances between anxiety and depression. This pattern is consistent with hierarchical models of the HADS, in which a general distress factor is superimposed by two correlated specific factors[21].

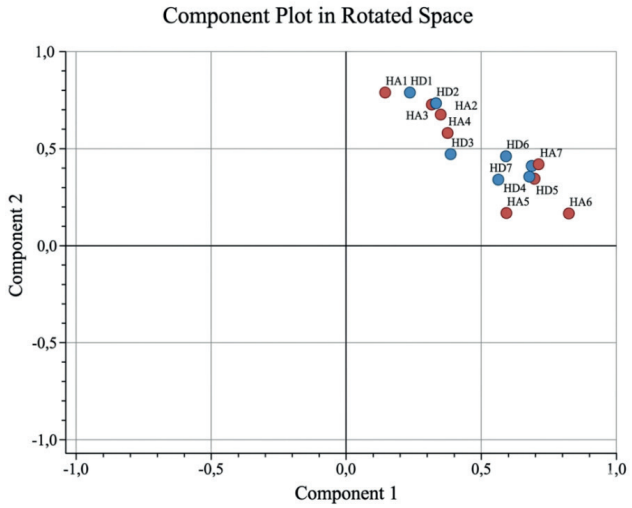

Figure 1: Projection of HADS Items After Varimax Rotation

III.1.4 Internal Consistency of the HADS

The Cronbach's alpha coefficient obtained (α = 0.919) for the 14 items of the Hospital Anxiety and Depression Scale (HADS) indicates excellent internal consistency. In the classical interpretation of reliability indices, an alpha value exceeding 0.90 is generally regarded as very high, reflecting strong item homogeneity and remarkable internal coherence of the measured construct. In other words, the HADS items in this sample exhibit a high inter-item correlation and converge in measuring a common core of psychological distress (Table 3).

From a psychometric standpoint, such a high alpha value suggests that the items share a substantial proportion of common variance, which is consistent with the PCA results demonstrating the presence of a dominant general factor accounting for nearly 50% of the variance. This convergence between high internal reliability and a pronounced factorial structure reinforces the notion that the HADS effectively captures a global construct of emotional distress, encompassing both the anxiety and depression dimensions. Validation studies have shown that elevated alpha coefficients for the HADS are frequently observed in clinical populations, particularly in oncology, where anxious and depressive manifestations tend to be strongly intertwined[22].

Table 3. Internal Reliability of the HADS

Alpha Cronbach	Alpha de Cronbach basé sur des éléments normalisés	N d'Items
0,919	0,935	14

III.2 Relationships Between Sociodemographic, Clinical Characteristics and HADS Scores

The Spearman correlation matrix revealed a dense network of associations linking sociodemographic attributes, disease-related parameters, and psychological distress within this cohort treated at the National Oncology Institute. A moderate inverse correlation between biological sex and age ($r = –0.228$; $p < 0.05$) indicated that women in the sample were significantly younger at presentation than their male counterparts. This demographic pattern mirrors Moroccan national epidemiological profiles, wherein the median age at cancer diagnosis is 54 years for women versus 61 years for men, a disparity primarily attributable to the preponderance of early onset gynecological and breast malignancies in the female population[23].

This gender-based age differential is further compounded by socioeconomic stratification. Educational attainment was negatively associated with female sex ($r = –0.263$; $p < 0.01$), indicating lower schooling levels among women, and positively associated with insurance category ($r = 0.263$; $p < 0.01$). The correspondence between educational capital and health coverage aligns with international evidence demonstrating that populations characterized by restricted socioeconomic resources—and concomitantly diminished educational achievement—encounter systemic barriers to oncological care, including insurance access and surgical management[24,25].

The most pronounced association within the matrix was between sex and cancer type (r = –0.591; p < 0.01), underscoring the marked sex-specific distribution of malignancies in this sample. Such a high coefficient is anticipated within the Moroccan context, where female-dominated cancers—encompassing breast, cervical, and ovarian neoplasms—constitute the majority of medical oncology caseloads, yielding a female-to-male ratio of 1.58 in the Marrakech cancer registry[26]. Additionally, chronological age at diagnosis was positively correlated with the diagnostic variable (r = 0.204; p < 0.05), suggesting that certain histological subtypes or prolonged diagnostic intervals are concentrated among older patients. In turn, diagnostic classification significantly shapes therapeutic allocation (r = 0.259; p < 0.01), reflecting standardized oncological protocols in which tumor topography and histopathological features dictate the selection of surgical, cytotoxic, or radiation-based interventions[27].

From a psychological perspective, the data document substantial anxiety-depression comorbidity, evidenced by a robust positive correlation between HADS anxiety and HADS depression scores (r = 0.509; p < 0.01). This moderate-to-strong association converges with oncological literature reporting Spearman coefficients ranging from 0.648 to 0.756 between these affective dimensions in patients undergoing radiotherapy, thereby confirming that anxiety and depression frequently co-occur in the cancer setting despite their theoretical distinctiveness. Nevertheless, the analysis uncovers a critical dissociation in their clinical correlates: anxiety alone manifests significant associations with diagnostic category (r = 0.201; p < 0.05) and treatment modality (r = 0.284; p < 0.01), whereas depression fails to reach significance with any sociodemographic or clinical indicator. This preferential linkage of anxiety with medical variables reflects its reactive and anticipatory phenomenology in response to therapeutic milestones. Chemotherapy and radiotherapy, in particular, elicit considerable anxiety stemming from prognostic uncertainty, foreseen toxicities, and transitions between treatment phases. In contrast, depression emerges in this cohort as a predominantly endogenous and trait-like dimension, largely independent of immediate tumor characteristics or therapeutic regimens, a pattern consistent with the observations of Pandey et al.[27] regarding the prevalence of depression irrespective of cytotoxic treatment type.

The lack of a significant correlation between depression scores and clinical parameters (p > 0.05 across all comparisons) constitutes a salient finding. The near-null coefficient for treatment modality (r = 0.115) implies that HADS-assessed depression does not fluctuate linearly with therapeutic intensity in this population. This relative autonomy of depression from treatment-related factors has been previously documented in large-scale cross-sectional investigations employing the HADS, wherein depressive symptomatology was principally tied to psychiatric history and sociodemographic determinants rather than cancer histology or therapeutic approach. Conversely, anxiety functioned as a sensitive barometer of care pathway complexity, displaying a significant positive association with treatment modifications or multimodal protocols (r = 0.284). This relationship likely captures the psychological toll of therapeutic transitions, such as the shift from neoadjuvant to adjuvant protocols or the sequential addition of radiotherapy to chemotherapy, which are periods of heightened anxious vulnerability that have been documented in radiotherapy cohorts[28,29].

These findings suggest that anxiety and depression, although intercorrelated, obey divergent etiological logics within the oncological context. Anxiety appears to operate as a situationally contingent reaction to care pathway stages and therapeutic indeterminacy, whereas depression seems more anchored in constitutional factors and global illness adjustment. Clinically, these observations support differentiated surveillance strategies: monitoring HADS anxiety scores could serve as an early warning signal for maladaptive responses during treatment modifications, warranting targeted psychosocial interventions at critical care transitions. Finally, the correlation between educational level and insurance status highlights the pivotal role of social determinants in shaping access to oncological services in Morocco. Policies aimed at reducing health inequities must integrate these structural dimensions to ensure equitable care delivery, in accordance with the recommendations of recent systematic reviews addressing socioeconomic disparities in oncology.

Table 4: Correlations Between Sociodemographic, Clinical Characteristics and Anxiety/Depression Scores

	Age	Sex	Level of education	Cancer type	Anticancer type	Depression
Sex	-0,211					
Level of education	-0,16	-0,249				
Cancer type	-0,03	-0,5	0,171			
Anticancer type	-0,034	-0,062	-0,085	0,018		
Depression	-0,146	0,047	-0,195	-0,12	0,076	
Anxiety	0,035	-0,045	-0,081	-0,073	0,219	0,484

CONCLUSION

The findings of this study provide a substantial contribution to the cross-cultural validation of the HADS in an oncological context, confirming the robustness of its bidimensional structure while highlighting the existence of a dominant general factor of emotional distress. This hierarchical organization faithfully reflects the complexity of psychological responses to cancer, wherein the anxious and depressive dimensions, although distinct, remain closely intertwined at both the clinical and psychometric levels.

The absence of a significant association between anxiety and therapeutic variables, contrasting with the marked sensitivity of depression to treatment intensity, underscores a major functional differentiation between these two dimensions. Anxiety appears as a transversal response, primarily linked to uncertainty and perceived threat, whereas depression seems more deeply anchored in the concrete experience of the illness and its treatments, particularly their somatic and functional consequences. This dissociation carries important clinical implications, suggesting the need for differentiated assessment and intervention approaches tailored to the nature of the symptoms.

Furthermore, the strong co-occurrence of clinical forms of anxiety and depression reveals a high level of psychological distress within the studied population, justifying the systematic integration of psychological screening into oncological care pathways. These findings argue in favor of a multidimensional management approach, incorporating targeted psychosocial interventions adapted to therapeutic phases, in order to optimize patients' quality of life and clinical outcomes.

Finally, despite certain limitations related to sample size distribution in categorical analyses, the convergence of psychometric and statistical findings strengthens the validity of the conclusions. Future research could further elucidate these results by employing confirmatory factor models and longitudinal approaches, in order to better understand the dynamic evolution of emotional distress throughout the oncological trajectory and to identify early and personalized intervention levers.

Competing Interests

The Authors declare no conflicts of interest.

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Authors' contributions

Bouchra Guerouaoui, Badreddine Dahou and Asmae Ouissaden participated in the conceptualization of the questionnaire. Sara ennaceri, Salma najem, Hanane inghaoun, Siham khoyaali and Ibrahim El Ghissassi participated in the collection of the data. Hanane Inrhaoun, Hassan Errihani and Asmae Ouissaden designed the study, realized the data analysis, wrote the paper, and decided on the submission of the manuscript. Hanane Inrhaoun and Hassan Errihani, Badreddine Dahou and Asmae Ouissaden supervised the writing of the paper. All authors contributed to the article and approved it for submission and publication.

Data statement

All data are available with a reasonable request to the author, due to the ethical condition to ensure confidentiality of the patients' data.

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