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Turkish Version of the Cardiac Distress Inventory and Cardiac Distress Inventory Short Form: A Validity and Reliability Study

Kardiyak Distres Envanteri ve Kardiyak Distres Envanteri Kısa Formunun Türkçe Versiyonu: Bir Geçerlilik ve Güvenilirlik Çalışması

ORIGINAL ARTICLE
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ABSTRACT

Objective: Increased negative moods such as anxiety, depression and fear of recurrence of cardiac events after a cardiac event, make it difficult to comply with lifestyle recommendations and drug therapy. Conducting screenings for cardiac distress and ensuring appropriate referrals are made constitute a crucial aspect of maintaining a healthy lifestyle post-illness. The Cardiac Distress Inventory has made it possible to assess cardiac patients psychologically and emotionally. The objective of this study was to provide a validity and reliability assessment of the original form Cardiac Distress Inventory (CDI) and short form (CDI-SF), in Turkish.

Method: The inventory was administered face to face to a total of 417 participants (336 CDI/81 CDI-SF) who were hospitalized with the diagnosis of acute coronary syndrome and volunteered to participate in the study. Validity data was assessed using Exploratory Factor Analysis (EFA), Rasch, Confirmatory Factor Analysis (CFA), reliability by McDonald's Omega (ω), Pearson correlation coefficient and discriminability by Receiver operating characteristic (ROC) analysis.

Results: The two CDI were a high level of reliability. The factor structure and factor loadings of the CDI were not compatible with the original. The goodness of fit estimated by validity (CFA-EFA) was also not confirmed. The values of RMSEA, χ^2/df and CFI indices suggest that it is not suitable for Türkiye. However, in the cross-cultural adaptation, validity and reliability study of the CDI-SF, it was concluded that the construct validity and internal consistency were high and could be used as a unidimensional scale. The inventory will be made freely available to clinicians and researchers.

Conclusion: CDI-SF provides a specific, pragmatic and reliable measurement of cardiac distress, adapted to common heart diseases. It serves as an effective screening tool in cardiac clinical management by demonstrating strong psychometric properties.

Keywords: Acute coronary syndrome, cardiac distress inventory, cardiac clinical management

ÖZET

Amaç: Kardiyak bir olaydan sonra psikososyal alanda artmış olumsuz duygusal durumlar, yaşam tarzı önerilerine ve ilaç tedavisine uyumu zorlaştırmaktadır. Kardiyovasküler olay sonrası kardiyak sıkıntının taranması ve uygun yönlendirmenin yapılması hastalık sonrası sağlıklı yaşam sürecinin ilk adımıdır. Kardiyak Sıkıntı Envanteri, kardiyak hastaları psikolojik ve duygusal olarak değerlendirmeyi mümkün kılmıştır. Bu makalenin amacı, orijinal form Kardiyak Sıkıntı Envanteri'nin (CDI) ve kısa formunun (CDI-SF) Türkçe geçerlilik ve güvenilirlik değerlendirmesini yapmaktır.

Yöntem: Envanter, akut koroner sendrom tanısıyla hastaneye yatırılan ve çalışmaya katılmak için gönüllü olan toplam 417 katılımcıya (336 CDI/81 CDI-SF) yüz yüze uygulandı. Geçerlilik Keşfedici Faktör Analizi (EFA), Rasch, Doğrulayıcı Faktör Analizi (CFA), güvenilirlik McDonald's Omega (ω), ilişki Pearson korelasyon katsayısı ve ayırt edilebilirlik Alıcı işletim karakteristiği (ROC) analizi ile değerlendirildi.

Bulgular: İki CDI yüksek düzeyde güvenilirliğe sahipti. CDI'nın faktör yapısı ve faktör yüklemeleri orijinaliyle uyumlu değildi. Geçerlilik ile tahmin edilen uyum iyiliği (CFA-EFA) da doğrulanmadı. RMSEA, χ^2/df ve CFI indekslerinin değerleri Türkiye için uygun olmadığını göstermektedir. Ancak CDI-SF'nin kültürler arası uyarlama, geçerlilik ve güvenilirlik çalışmasında yapı geçerliliğinin ve iç tutarlılığının yüksek olduğu ve tek boyutlu bir ölçek olarak kullanılabileceği sonucuna varıldı. Envanter klinisyenler ve araştırmacılar için ücretsiz olarak sunulacaktır.

Sonuç: CDI-SF, yaygın kalp hastalıklarına uyarlanmış kardiyak sıkıntının özgül, pragmatik ve güvenilir bir ölçümünü sağlar ve güçlü psikometrik özellikler göstererek kardiyak klinik yönetiminde etkili bir tarama aracıdır.

Anahtar Kelimeler: Akut koroner sendrom, kardiyak sıkıntı envanteri, kardiyak klinik yönetim

Ischemic heart disease is one of the cardiovascular diseases that remains a global health concern worldwide. Since 2000, the most significant rise in mortality rates has been observed in ischemic heart disease, which surged by over two million deaths to reach some 8.9 million fatalities in 2019.[1] The ageing of societies, the increasing life expectancy and rise in the number and burden of cardiovascular diseases in developed countries, indicate that cardiovascular diseases will remain the leading cause of death worldwide for the predictable future.[2] Psychological distress is a common and significant pattern of management in persons with cardiovascular disease (CVD) and is associated with an increase in future cardiac events.[3] In recent years, epidemiological studies have focused mainly on depression and anxiety and on whether an increased inflammatory response to stress in heart disease is associated with a greater risk of cardiovascular events. Nevertheless, cardiac distress is currently acknowledged as a persistent negative emotional state rather than a transient condition; it encompasses various psychosocial domains, posing challenges to patients in coping with the realities of living with heart disease, its treatment and the ensuing alterations in daily life; furthermore, it presents challenges to an individual's sense of self and future orientation.[4] Assessing the effect of controlling psychosocial stress on coronary events is challenging because this specific form of stress has been difficult to measure. Preventive heart health guidelines state that simply estimating risk does not change outcomes, but that changing positive lifestyle behaviours does change outcomes.[5] Increased psychosocial distress after a cardiac event makes it difficult to adhere to lifestyle recommendations and medication.[6] Screening for cardiac distress after cardiovascular disease and making appropriate referrals is an important step in the process of healthy living after the disease.[5–7] For this purpose, Jackson et al.[7–9] developed the Cardiac Distress Inventory (CDI) in 2020, which consists of fifty-five items grouped into eight factors including fear and uncertainty, disconnection and hopelessness, changes in roles and relationships, depression and exhaustion, cognitive difficulties, physical difficulties, health system difficulties and fear of death. The CDI was designed to be used as an assessment tool in a clinical setting to assist in more precise targeting of post-cardiac event psychological support. In 2023 the same team developed a 12-item single-factor short form of the inventory (CDI-SF) to be used as a screening tool in settings such as cardiac rehabilitation, to identify patients who may benefit from referral to a specialized psychological.[10] The aim of this study was to evaluate the Turkish validity and reliability of the Cardiac Distress Inventory original (CDI) and short form (CDI SF), to define the assessment of psychological and emotional state after a cardiac event and to contribute to the patient's ability to maintain a healthy lifestyle.

ABBREVIATIONS

CDI	Cardiac Distress Inventory
CDI-SF	Single-Factor Short Form of The Inventory
CFA	Confirmatory Factor Analysis
CVD	Cardiovascular Disease
EFA	Exploratory Factor Analysis
KMO	Kaiser Meyer Olkin
PSS-10	The Ten-Item Perceived Stress Scale
ROC	Receiver Operating Characteristic
RSM	Rating Scale Model

Methods

Ethics Statement

This study involving participants was conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments, or comparable ethical standards (Başakşehir Çam & Sakura City Hospital Ethics Committee, Approval Number: KAEK/2023.06.279, Date: 21.06.2023). In the preparation of this study, AI or AI-supported technologies (such as Large Language Models, chatbots or image creators) have not been used.

Participants

A total of 336 patients diagnosed with acute coronary syndrome who voluntarily participated, were included in the administration of the original version of the Cardiac Distress Inventory (CDI), while 81 patients were involved in the testing of the abbreviated version, known as the Cardiac Distress Inventory-Short Form (CDI-SF), all within a research and teaching hospital setting. Inventories using face-to-face interviews. Participants with Turkish language proficiency to understand the "patient information and consent form" and inventory, were included in the study. The original version was administered in March 2023 and the short version in December 2023.

The mean age of the 336 cardiac patients who completed the original version was 58.45±14.87 years, 67.36% were male, 73.29% were married with children, 46.88% were high school graduates, 69.14% had income equal to or higher than expenses and 71.81% were employed. The mean BMI was 27.31±4.75. A total of 37.69% of the participants smoked cigarettes and 5.93% drank alcohol. The 81 cardiac patients who participated in the 12-item CDI-SF were aged a mean of 59.77±14.83 years old and 55.56% were male.

Measures

Cardiac Distress Inventory

The CDI is a 55-item scale consisting of eight subscales or domains with the number of items varying according to the subscale. The subscales include fear and uncertainty (8 items, e.g. 'being unable to plan for the future'), disconnection and hopelessness (8 items, e.g. 'being isolated from+ friends and family'), changes in roles and relationships (11 items, e.g. 'becoming a burden to my family'), overwhelm and depletion (7 items, e.g. 'being tearful more easily than before'), cognitive challenges (4 items, e.g. 'having difficulty making decisions'), physical challenges (8 items, e.g. 'not sleeping well'), health system challenges (5 items, e.g. 'not having access to the healthcare I need') and death concerns (4 items, e.g. 'being afraid of dying'). The inventory uses a two-stage response scale: first, items are endorsed as 'present' or 'absent'; second, for items endorsed as 'present', the severity of distress is rated on a Likert type (4 point) scale ranging from no distress = 0, slight distress = 1, moderate distress = 2, severe distress = 3.7 9 The CDI was developed as a clinical assessment tool to be used, if possible, in the context of a clinical interview.

After examining the factor structure and loadings of the CDI, a 12-item short form, the CDI SF, was developed as a screening measure that could fully represent the multifactorial nature of cardiac distress.[10] The ten-item Perceived Stress Scale (PSS-10) was administered to the participants to validate the CDI-SF and to establish criterion validity. The aim was to examine the discriminative ability of the CDI-SF with the established cut-off score of the scale. The PSS-10 consists of ten items assessing general psychological distress. Items are scored on a Likert type (5 point) ranging from 1 'never' to 5 'very often' and summed to give a total psychological state score.[11] A median value cut-off score of 17 was used to detect the likelihood of psychological distress. The PSS-10 has good psychometric properties, including good internal reliability (McDonald's Omega ω coefficient=0.92) and has been used in cardiac populations.[12]

Data Analysis

After receiving authorization from the inventory's author, the translation process proceeded as follows: adhering to the World Health Organization (WHO) guidelines for scale translation and adaptation, three translators proficient in both English and Turkish conducted linguistic validation independently. Turkish language and literature experts reviewed the wording and spelling for clarity. Subsequent to the individual translations, a collaborative session was convened to synthesize a standardized version. A separate translator then performed a backward translation of this version, confirming a close likeness to the original inventory. Final revisions concluded the translation phase of the scale.

Statistical power calculations were made for the original version of the CDI consisting of 55 items; when the error 0.05, effect size 0.15, power level 0.90 and the sample size was calculated to be 382. For the twelve-item short version of the CDI, a sample size of 72 was calculated with an power of 0.85 error of 0.05 and effect size of 0.5. In addition, the sample (55x5=275; 12x5=60) was within the range recommended by multiplying the number of items by five.[13]

Statistical Analysis

The scales and studies data was analyzed using the SPSS version 25.0 (v.10.2.0.25; IBM SPSS Inc, Chicago, IL, USA), LISREL version 8.7 (v.8.70; Scientific Software International Inc, Chapel Hill, NC, USA), RStudio version 4.3.3 (v.2023.09.1.494; POSIT, Boston, MA, USA) and GPower version 3 (v.3.1.9.4, Heinrich-Heine-Universität, Düsseldorf, Germany) software. Validity data was assessed using exploratory factor analysis (EFA) followed by Rasch (TAM, WrightMap, Tidyverse, Here, Psych) and confirmatory factor analysis (CFA). Rasch techniques also provide researchers with the ability to implement essential adjustments when working with raw test scores or survey data. In particular, Rasch techniques enable the conversion of nonlinear raw data to a linear scale, which can then be evaluated using parametric statistical tests. In addition, Rasch steps that can be used for step order/step disorder, item reliability, person reliability, differential item function and differential test function examine other important instrumentation issues.[14] Data suitability for factor analysis was assessed by Kaiser Meyer Olkin (KMO) and Bartlett's test, reliability by McDonald's Omega (ω), Pearson correlation coefficient (r) and discriminability by Receiver Operating Characteristic (ROC) curve analysis. Descriptive statistics included frequencies, percentages, means, standard deviations, medians and percentiles. The level of significance was accepted P<0.05 and relevant confidence intervals.

Results

Reliability Analysis

McDonald's ω coefficient was 0.97 for 55 items that CDI, indicating acceptable reliability of the scale. The McDonald's ω coefficient result for evaluating the reliability of the twelve-items of the CDI-SF was 0.95, indicating acceptable reliability of the scale.

Discriminant Validity

The total score of the CDI-SF was significantly correlated with the total score of the PSS-10 (r=0.495; P<0.001). As a further test of discriminant validity, we analyzed the correlations between the total score on the CDI-SF and the ten individual items on the PSS-10. All correlations were significant except for 'In the past month, how often were you able to control irritations in your life?' and 'In the past month, how often did you feel that you were in control of things?', which assesses the presence of delusions (r=0.283 - 0.585; P<0.05).

Rasch Analysis

This analysis is a method that examines the extent to which the data set obtained through the use of the inventory meets the criteria required for successful measurement. The Rating Scale Model (RSM) was used for the analysis as all item responses had the same format (0,1,2,3,4). A standard deviation of less than 1.5 indicated that each scale had adequate individual and aggregate item agreement. The suitability of the observed data for Rasch analysis was calculated using Wright's unidimensionality index. Multidimensionality is indicated by a value of ≤ 0.5, whereas unidimensionality is indicated by a value ≥ 0.9.

The first Rasch analysis applied to the CDI overall and subscales identified problems with a lack of item monotonicity and irregular category thresholds. The analysis was reapplied by narrowing the 0 and 1 categories (the rating scale was coded as 1,2,3,4). As a result of the second Rasch analysis, since the issue of irregular category thresholds continued, the 3 and 4 rating points were narrowed and the scale was coded as 1,2,3 and the analysis was repeated. The result was that the CDI was not suitable for analysis and did not meet the criteria for successful measurement.

When the CDI-SF was applied, the data set obtained was found to be compatible with the Rasch model (mean = 0.26; standard deviation = 1.02). The rating score was determined as 0,1,2,3,4. All items were collapsed into a single factor, with Wright's unidimensionality showing positive point measure correlations (WLE reliability = 0.90).

Exploratory Factor Analysis - EFA

EFA was conducted on fifty-five items to determine the factor structure of the CDI. The KMO sampling adequacy value was 0.74 and Bartlett's test of sphericity showed a significant difference (χ^2 (df) = 30737.21 (1485), P < 0.001). The cumulative variance contribution of the eight-factor scale is 77.27%. Items with loadings below 0.30 and items with a difference between components below 0.10 were removed and the analysis was repeated.9 As a result of the analysis, a total

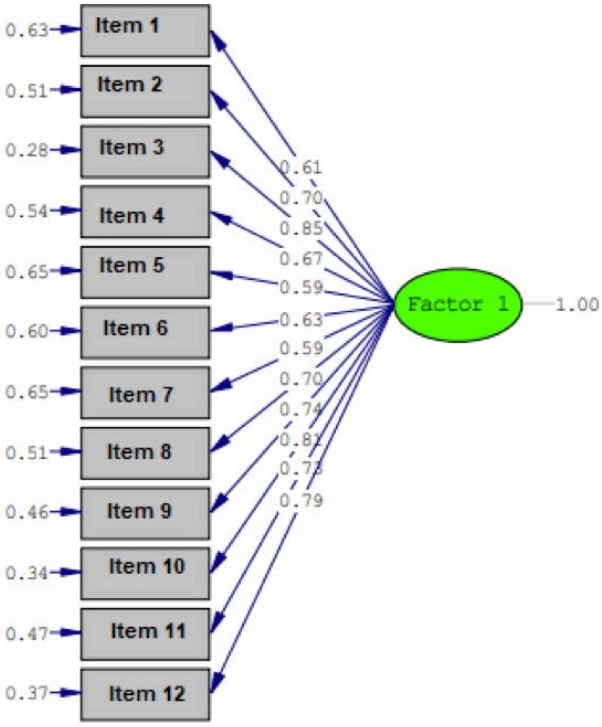

Figure 1. Confirmatory Factor Analysis of CDI-SF.

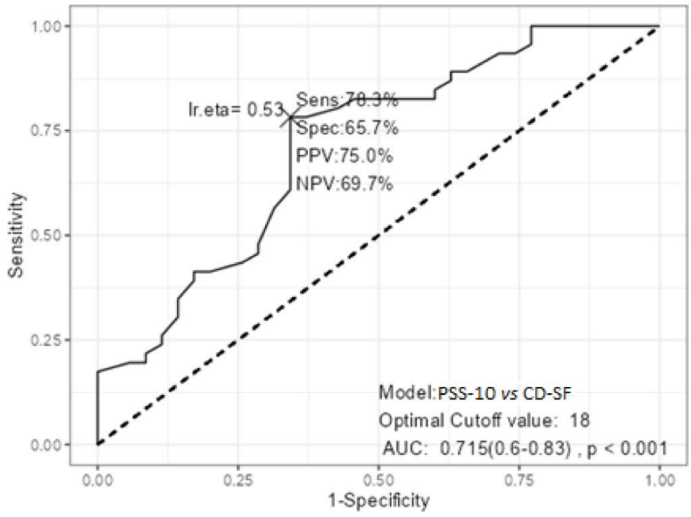

Figure 2. Diagnostic characteristics of the CDI-SF score in predicting distress.

of nineteen items were removed and the remaining thirty-six items were evaluated under five headings (KMO = 0.71; Bartlett's test of sphericity (χ^2 (df) = 14013.35(630), P < 0.001). The total variance explained for measuring this construct on a five-factor scale was found to be 65.53%.

The comparison of the Turkish version of the CDI with thirty-six items and five factors with the original version with eight factors is shown in Table 1. Five main topics were evaluated as Factor 1: Changes to roles and relationships, Factor 2: Physical challenges, Factor 3: Cognitive challenges, Factor 4: Death concern and Factor 5: Health system challenges. This table shows how culturally different the Turkish version of the analysis is from the eight-factor version (Table 1).

An EFA was performed on twelve items to determine the factor structure of the CDI-SF. In the 36-item Turkish CDI, it was seen that there were twelve items of short version items. The KMO sampling adequacy value was 0.88 and the result of Bartlett's sphericity test showed a statistically significant difference (χ^2 (df) = 800.37 (66), P < 0.001), indicating that the sample was suitable for factor analysis. The total variance explained for measuring this construct on a one-factor scale was found to be 64.10% (Table 2).

Confirmatory Factor Analysis - CFA

As a result of the CFA applied to confirm the validity of the CDI, the five-scale structure with thirty-six items did not show a good fit (χ^2 / df = 15.34, comparative fit index [CFI] = 0.73, goodness of fit index [GFI] = 0.48, adjusted goodness of fit index [AGFI] = 0.40, root mean square error of approximation [RMSEA] = 0.18, standardized root mean square residual [SRMR] = 0.12). CDI-Original Version' s outcome revealed that the scale was incompatible.[15]

The analysis used to confirm the validity of the CDI-SF showed a good fit when all 12 items loaded on a single factor (χ^2 / df = 1.34, CFI = 0.98, GFI = 0.88, AGFI = 0.91, RMSEA = 0.06, SRMR = 0.06; Table 2; see Figure 1).

Item Analysis

The total score of each participant was calculated to evaluate the discrimination of the twelve items that make up the CDI-SF. The participants were then ranked from high to low according to their scores and the difference between the 27% with the highest score and the 27% with the lowest score, was statistically significant (t= -24.70, P < 0.001). To evaluate the homogeneity of the scale items, the relationship between each item and the total score was examined and found to be significant (r = 0.71 - 0.87, P < 0.001).

Parallel Form Analysis

PSS-10 was applied as a parallel form analysis for test-retest testing. The scale was found to be reliable and suitable for factor analysis (McDonald's ω = 0.92; KMO = 0.89; Bartlett's test of sphericity (χ^2 (df) = 500(45), P < 0.001; χ^2 / df = 3.22). There is a statistically significant relationship between PSS-10 and CDI-SF scales and it passed the test-retest test (r = 0.516; P < 0.05).

Screening Utility and Discriminant Ability of the CDI-SF

The CDI-SF performed well in terms of diagnostic predictability using a PSS-10 score of ≥ 17 as the reference variable (Figure 2). The area under the ROC curve for CDI-SF is 71.5%, which is considered satisfactory (Area Under the Curve = 0.715 [95% CI: 0.60-0.83]; P < 0.05). The cut-off point was found to be ≥18, with a sensitivity of 78.3% and a specificity of 65.7%.

Analysis of Scales

The overall mean of the fifty-five items of the CDI was 1.18±0.79 and the mean of the single factor structure of the twelve-item CDI-SF was 1.77±1.88. The mean of the single factor structure of the 10-item Perceived Stress Scale was 2.65±0.78 (Table 3).

Table 1. Original form, short form and Turkish form of CDI factor distribution

TF	OF	Sub-scales	Description	SF
	1	Fear and uncertainty	Thinking that I am not the person that I used to be	
2	1	Fear and uncertainty	Thinking I will never be the same again	1
3	1	Fear and uncertainty	Thinking my condition might get worse	
	1	Fear and uncertainty	Avoiding activities that make my heart beat faster	
2	1	Fear and uncertainty	Not knowing what the future holds for me	1
	1	Fear and uncertainty	Being in places and situations that remind me of my heart event	
	1	Fear and uncertainty	Being unable to plan for the future	
	1	Fear and uncertainty	Dwelling on my heart condition	
	2	Disconnection and hopelessness	Thinking my friends or family don't understand how difficult it is living with heart disease	
	2	Disconnection and hopelessness	Believing that others don't have the same confidence in me as they did before my heart problem	
3	2	Disconnection and hopelessness	Being unable to accept help from others	
	2	Disconnection and hopelessness	Being isolated from friends and family	
1	2	Disconnection and hopelessness	Not being supported by my friends and family in my efforts to manage my heart condition	
1	2	Disconnection and hopelessness	Feeling lonely	1
1	2	Disconnection and hopelessness	Withdrawing from people	1
	2	Disconnection and hopelessness	Being disconnected from people in my community	
2	3	Changes to roles and relationships	Being unable to take care of family responsibilities	
	3	Changes to roles and relationships	Not be able to return to work or continue working	
	3	Changes to roles and relationships	Thinking that my heart condition controls my life	
5	3	Changes to roles and relationships	Thinking that my family is being overprotective of me	
2	3	Changes to roles and relationships	Not being able to go too far from home	
1	3	Changes to roles and relationships	Becoming a burden to my family	
3	3	Changes to roles and relationships	Having changes in my usual roles	1
1	3	Changes to roles and relationships	Being concerned about my capacity for sexual activity	
1	3	Changes to roles and relationships	Being unavailable to my family and friends	
1	3	Changes to roles and relationships	Being too dependent on others	
1	3	Changes to roles and relationships	Lacking purpose or meaning in life	1
	4	Overwhelm and depletion	Being irritated by little things	
	4	Overwhelm and depletion	Not being able to sustain the lifestyle changes I need to make	
2	4	Overwhelm and depletion	Being tearful more easily than before	
3	4	Overwhelm and depletion	Being unable to deal with stress	1
3	4	Overwhelm and depletion	Lacking energy	
2	4	Overwhelm and depletion	Avoiding situations and activities	
2	4	Overwhelm and depletion	Being emotionally exhausted	1
	5	Cognitive challenges	Forgetting things more than before	
2	5	Cognitive challenges	Having difficulty making decisions	
3	5	Cognitive challenges	Having difficulty concentrating	1
2	5	Cognitive challenges	Having difficulty remembering things	
4	6	Physical challenges	Being physically restricted	1
2	6	Physical challenges	Being woken up at night by my racing heart	
1	6	Physical challenges	Having more pain than I can deal with	
	6	Physical challenges	Having chest discomfort	
	6	Physical challenges	Being overly aware of my heart in my chest	
	6	Physical challenges	Not sleeping well	
	6	Physical challenges	Having bad dreams or nightmares	
2	6	Physical challenges	Being short of breath	
3	7	Health system challenges	Not getting clear directions from my health practitioner on how to manage my heart condition	1
5	7	Health system challenges	Not having my concerns taken seriously by my health practitioner	
4	7	Health system challenges	Not having access to the healthcare I need	
	7	Health system challenges	Having difficulty getting to appointments that I need to attend	
5	7	Health system challenges	Not being able to get as much information as I want about my heart condition	
4	8	Death concern	Thinking about dying	1
4	8	Death concern	Not knowing how my family will cope if something should happen to me	
4	8	Death concern	Being afraid of dying	
3	8	Death concern	Not knowing what will happen to other people if I die	

TF, Turkish Form (Subfactors: 1: Changes to roles and relationships [Factor1], 2: Physical challenges [Factor2], 3: Cognitive challenges [Factor3], 4: Death concern [Factor4], 5: Health system challenges [Factor5]), OF, Original Form; SF, Short Form (1: Factor 1–Cardiac Distress Inventory).

Table 2. CDI-SF validity and reliability analysis

	EFA	CFA – Factor	CFA – Good Fit		ω
Item1	0.700	0.610	$\chi 2$ / df	65.780 / 49 = 1.342*	0.948
Item2	0.742	0.700	GFI	0.88**	0.947
Item3	0.790	0.850	AGFI	0.91*	0.945
Item4	0.756	0.670	IFI	0.98*	0.946
Item5	0.816	0.590	NNFI	0.97*	0.944
Item6	0.823	0.630	CFI	0.98*	0.944
Item7	0.805	0.590	RMSEA	0.065*	0.945
Item8	0.872	0.700	SRMR	0.056*	0.942
Item9	0.835	0.740			0.943
Item10	0.870	0.810			0.942
Item11	0.768	0.730			0.946
Item12	0.813	0.790			0.944
Total	Variance: 64.104 Eigenvalues: 7.693				0.949

*: Good Concordance; **: Acceptable Concordance; EFA, Exploratory Factor Analysis; CFA, Confirmatory Factor Analysis; GFI, Goodness of Fit Index; AGFI, Adjusted Goodness of Fit Index; RMSEA, Root Mean Square Error of Approximation; SRMR, Standardized Root Mean Square Residual; ω, McDonald's Omega.

Discussion

Recent studies have shown that psychological distress following cardiac events is one of the most important factors negatively affecting the coping process and quality of life.[4,5] The negative and compelling emotions that follow an acute cardiac event are multidimensional and have been termed 'cardiac distress'. An important first step in the management of cardiac distress, however, is its accurate assessment. In this study, we report the development and validation of a 55-item original version and a twelve-item short form of the CDI to measure cardiac distress.

The McDonald ω of the Turkish version of the CDI was 0.97, indicating a high level of reliability. The factor structure and factor loadings of the original version of the inventory were not compatible with the original. The goodness of fit estimated by CFA was also not confirmed. The values of RMSEA, χ^2/df and CFI indices suggest that it is not suitable for Türkiye.

The McDonald ω of the Turkish version of the CDI-SF was 0.96, indicating that it is highly reliable. In accordance with the original version of the inventory, the Turkish version of the inventory consisted of a single factor as a result of EFA and the obtained factor structure was confirmed according to the goodness of fit analysis (GF I= 0.88 and AGFI = 0.91) estimated by CFA. The values of RMSEA, χ^2/df and CFI indices were within the limits of perfect fit. In addition, the values of GFI, AGFI, NFI and RFI were all above 0.90, indicating an acceptable fit. Based on these results, the one-factor model was confirmed. The CDI-SF is a brief, practical and valid indicator of cardiac distress for prevalent heart disease that is psychometrically sound and a good screening tool in clinical practice. Psychological problems after heart disease carry an increased risk of mortality, highlighting the importance of early diagnosis and timely intervention for patients experiencing cardiac distress.

Our findings support the psychometric strength of the Turkish version of the CDI-SF, which demonstrated good internal consistency and sufficient construct validity in a sample of hospitalized patients. While test-retest reliability could not be fully assessed due to the inpatient-only design, future outpatient follow-up studies will be valuable to further confirm its temporal stability and real-world utility in longitudinal care.

Table 3. Descriptive characteristics of the scales

	CDI	CDI-SF	PSS-10
Mean	1.182	1.772	2.648
Median	1.090	1.833	2.700
Standard Deviation	0.789	1.181	0.784
Percentiles			
25	0.509	0.750	2.200
50	1.090	1.833	2.700
75	1.536	2.667	3.150

CDI, Cardiac Distress Inventory; SF, Short Form.

The results align with those reported in recent validation studies from other cultural contexts, such as the CDI-SF study conducted in Hong Kong. That study demonstrated satisfactory factorial validity, reliability and convergent validity with related constructs such as depression, resilience and quality of life. Similar to the Hong Kong findings, we believe the CDI-SF offers a brief yet effective way to identify psychological distress in cardiac patients, even in healthcare environments, where time and resources are limited. Its ease of administration and clarity of items enhance its clinical acceptability.[16]

However, the true value of a screening tool lies not only in its psychometric properties, but also in its ability to be effectively integrated into routine clinical practice. In this regard, the CDI SF shows strong potential to become a standardized assessment instrument in various care settings, including outpatient cardiology clinics, cardiac rehabilitation programs and primary care. Particularly in countries like Türkiye and surrounding regions, where psychological distress after cardiac events remains under-recognized and under-assessed, the CDI-SF could fill a significant gap in psychosocial care.

To our knowledge, this is the first study to validate the CDI-SF in Turkish. As such, it provides an important foundation for future research exploring cross-cultural adaptation, implementation and longitudinal outcomes. Long-term cohort studies are needed to assess how well the CDI-SF predicts patient outcomes over time and contributes to care planning and recovery pathways.

The routine implementation of the CDI-SF may enhance clinical vigilance and inform policy decisions aimed at integrating psychosocial screening into cardiac care pathways. By enabling earlier detection and intervention, it has the potential to improve patient outcomes and alleviate systemic healthcare burdens. Furthermore, the use of a standardized instrument across countries can foster a unified framework for assessing cardiac distress, advancing both clinical practice and cross-national research efforts.

Limitations

This study has several important limitations. Although the Turkish version of the CDI-SF underwent a robust validation process and included an adequate sample size, it was administered only to inpatients, which limited the ability to conduct a full test-retest reliability assessment. Measuring cardiac distress during outpatient follow-up after hospital discharge could further strengthen the evidence regarding the applicability of the CDI-SF.

Additionally, longer-term cohort studies could provide valuable insights into the scale's temporal stability. Despite these limitations, the data suggest that the Turkish version of the CDI-SF demonstrates good reliability and sufficient validity. Continued use of the scale may enable the application of more sophisticated data analysis techniques.

Future research conducted in diverse settings and countries will contribute to broader validation and generalizability of the Turkish version of the CDI-SF. Cross-cultural data of this nature may help establish the universal structure of the measurement tool with greater confidence.

The findings may inform policymakers about the importance of ensuring adequate health resources for routine screening during outpatient follow-up after cardiac events, ultimately aimed at reducing the burden of disease on both the population and the healthcare system. Routine use of the CDI-SF could enhance healthcare providers' awareness, facilitate early identification of cardiac distress and promote timely interventions. These outcomes may contribute to improved health results—one of the core goals of healthcare services.

Conclusion

Psychological troubles after heart disease carry an increased risk of death in patients, highlighting the importance of early diagnosis of patients with cardiac distress. The CDI-SF will not only increase clinicians' ability to identify patients with cardiac distress, but will also optimize their ability to provide timely care. We believe that the CDI-SF is a psychometrically sound, concise, practical and valid indicator of cardiac distress, that is a good screening tool in clinical practice and provides a common language for use worldwide in the management of common cardiac diseases.

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