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RESEARCH ARTICLE

Prevalence and predictors of psychological distress in congenital heart disease patients

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Abstract

Objective: To determine psychological distress in congenital heart disease (CHD) patients.

Methods: Cross-sectional study among consecutive CHD patients recruited from a single hospital outpatient clinic to determine anxiety and depression according to the Hospital Anxiety and Depression Scale (HADS) questionnaire.

Results: One hundred and sixty-nine CHD patients [29 (19–39) years old, 100 (59%) males] were studied. A total of 25% and 9% of CHD patients showed anxiety and depression symptoms, respectively. Patients with an HADS score ≥ 8 had a significantly worse New York Heart Association (NYHA) functional class, needed more psychological support, had more mental health history, and took more anxiolytic/antidepressant medication than the CHD patients with an HADS score below 8. A worse NYHA functional class [OR, 1.88 (1.01–3.52)] proved to be a predictor of a borderline/abnormal HADS score.

Conclusion: Psychological distress has a high prevalence among CHD patients and having an NYHA Class II and III is a significant predictor of an HADS score ≥ 8.

KEYWORDS

anxiety, congenital heart disease, depression, observational descriptive study, quality of life

1 | INTRODUCTION

Advances in the medical and surgical treatment of congenital heart disease (CHD) patients have resulted in improved survival (Willems, Werbrouck, De Backer, & Annemans, 2019), most of them reaching adulthood. Although many CHD patients adjust their individual lifestyles to the limitations imposed by their condition, research shows that a significant number of adult CHD patients suffer from cardiac and noncardiac comorbidities, neurocognitive deficits, and social challenges which lead to emotional distress in terms of depression, anxiety, and a compromised quality of life (Jackson, Leslie, & Hondorp, 2018). Moreover, anxiety and depression are, on their own, independently associated with increased mortality, excess disability, greater health care expenditures, and reduced quality of life both in CHD and control patients (Benderly et al., 2019; Eslami, Kovacs, Moons, Abbasi, & Jackson, 2017; Jha, Qamar, Vaduganathan, Charney, & Murrough, 2019; Sandtröm et al., 2019; Westhoff-Bleck et al., 2016). However, unlike the general population, adult CHD patients seem to have higher depression (weighted prevalence adult CHD: 24% vs. global prevalence: 15%) and anxiety (weighted prevalence adult CHD: 38% vs. global prevalence: 34%) rates (Andonian et al., 2018; Bandelow & Michaelis, 2015; Jackson et al., 2018; Kessler & Bromet, 2013).

The broad clinical variability in depression and anxiety symptoms, two illnesses that commonly occur together and have similar treatments (Meidlinger & Hope, 2017), makes the diagnosis difficult. This makes it essential that physicians have useful tools to minimize bias in studies of everyday practice (Nabbe et al., 2018). Therefore, having a simple, validated, and reliable screening tool may lead to a proper psychiatric referral, enabling the diagnosis and treatment of the most common and amenable mental disorders in clinical practice (Olssøn, Mykletun & Dahl, 2005).

The objectives of this study were (a) to determine the prevalence of mood and anxiety disorders in adult CHD patients using the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) and (b) to analyze demographic, clinical, and blood test parameters as predictors of an abnormal HADS score.

2 | METHODS

2.1 | Participants

Cross-sectional study was conducted among consecutive CHD patients recruited from a single outpatient clinic, once a week, between November 2017 and April 2018. Inclusion criteria were patients over 14 years old, the legal age of transition from pediatric care into adult care in Spain, capable of understanding and answering the questionnaires and with a structural CHD verified by echocardiography, cardiovascular magnetic resonance, cardiac catheterization, or surgery. Patients unable to answer the survey, who did not want to participate or with comorbidity problems that limited life expectancy were excluded from the study. All patients or their parents gave their written informed consent for participation. The protocol of the study was approved by the Hospital's Ethics Committee (CEIc/CEIm 890) and in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans.

2.2 | Demographic, clinical, and echocardiographic data

Patients were classified into diagnostic groups according to the underlying cardiac anatomy. Patients with more than one defect were classified according to the prevalent lesion from a clinical and/or hemodynamic point of view. Consistent with published classification schema, cardiac defects were categorized as simple, moderate, or of great complexity (Webb & Williams, 2001).

Data registered included age, gender, cardiovascular risk factors such as arterial hypertension and diabetes mellitus (Rydén et al., 2013, Williams et al., 2018), smoking habit, drug abuse, marital status (single, married, divorced), employment status (employee, retired, stay-at-home, student, unemployed), educational level (no education, elementary, primary education, secondary education, university), psychological support, past mental health history, or the previous use of antidepressant or anxiolytic treatment. Patients were also classified according to the New York Heart Association (NYHA) into one of four categories based on their limitations during physical activity (The Criteria Committee of the New York Heart Association, 1994). It was also determined if the patient had cardiac surgery or not, the number of cardiac surgeries in each patient, hospital admission for heart surgery under 14 years old, basal electrocardiographic rhythm, medical history of arrhythmias (atrial fibrillation and flutter, atrial tachycardia, intranodal tachycardia, accessory tachycardia, or ventricular tachycardia) and the need of pacemaker or implantation of a cardioverter-defibrillator. Patients were defined as cyanotic if basal hemoglobin oxygen saturation was under 93%.

Two-dimensional and pulsed Doppler echocardiography was performed with an iE33 echocardiography system (Philips Medical Systems, Bothell, WA) to assess systemic ventricular function. The systemic ventricular ejection fraction of a morphologic left ventricle was calculated by Simpson's biplane method (Schiller et al., 1989). Left ventricular systemic function was considered abnormal when it was <55% (Kosaraju & Makaryus, 2018). The morphologic right ventricular function was determined with the tricuspid annular plane systolic excursion and was considered abnormal below 16 mm (Rudski et al., 2010).

2.3 | Instruments

The Euro-Quality-of-Life Five Dimensions (EQ-5D-3L) and the HADS questionnaires were facilitated in a face-to-face interview after ensuring their ability to understand them.

The EQ-5D-3L is a simple, generic health-related quality-of-life instrument that is widely used as a patient-reported outcome measure and which has been validated in the Spanish population (Cabasés, Sánchez-Iriso, & Errea, 2014). It encompasses five health dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension has three levels: no problems, moderate problems, and extreme problems (Badia et al., 2001; Brooks, Rabin, & De Charro, 2003). The EQ-5D-3L questionnaire also includes a Visual Analog Scale (VAS), by which respondents can report their perceived health status with a grade ranging from 0 (*the worst possible health status*) to 100 (*the best possible health status*).

The HADS questionnaire (Zigmond & Snaith, 1983), which has been validated in Spanish samples (Terol-Cantero, Cabrera-Perona, & Martín-Aragón, 2015), consisted of 14 questions, 7 reflecting anxiety and 7 reflecting depression, related to their feelings during the past week. The anxiety items were focused on general anxiety, and five of them were close to the diagnostic criteria of generalized anxiety disorders. The depression items were based on anhedonia, an essential criteria of depression (Watson et al., 1995). Each item scored on a four-point (0–3) response category, so the possible scores range from 0 to 21 for anxiety and 0–21 for depression. Scores on each scale, anxiety, and depression, were interpreted in ranges: *normal* (0–7), *borderline* (8–10), or *abnormal* (11–21). According to the Diagnostic and Statistical Manual of Mental Disorders (DSM), an HADS-anxiety and an HADS-depression cut-off ≥ 8 correctly classifies generalized anxiety disorders and major depressive episodes with high sensitivity and specificity in general practice (Olssøn et al., 2005). Moreover, the HADS survey is one of the two instruments considered sufficiently effective and reliable for use in the depression diagnosis in Europe according to the DSM (Nabbe et al., 2018). At the end of our study, those patients who scored above 8 in the HADS questionnaire were given the option of being assessed by the psychiatrist/psychologist of reference.

2.4 | Blood test

After an overnight fast of at least 10 hr, blood samples were drawn and processed immediately upon receipt. Complete blood counts were performed on a Coulter LH 750 (Beckman Coulter, Fullerton, CA) analyzer to determine hemoglobin concentrations (normal range: 12.0–17.0 g/dl). Serum creatinine (normal range: 0.67–1.17 mg/dl) and thyroid-stimulating hormone (TSH; reference range: 0.34–5.6 mIU/L) were determined by spectrophotometry by using an Olympus AU 2700 (Olympus Diagnostic, Hamburg, Germany) and N-terminal pro-brain natriuretic peptide (NT-pro-BNP; normal range: 0–125 pg/ml) was measured by immunoassay in a Siemens Stratus CS Acute Care Diagnostic System (Siemens Healthcare Diagnostics Inc., Newark, DE). Hemoglobin oxygen saturation was assessed by pulse oximetry (Pulsox 300i; Konica Minolta Sensing Inc., Osaka, Japan).

2.5 | Statistical analysis

Quantitative variables were expressed as mean and standard deviation or median and quartiles (25–75) depending on the normality of distribution using the Kolmogorov–Sirmov test. Qualitative variables were expressed in percentages. Possible associations between categorical variables were examined by using Pearson's χ^2 test. Fisher's exact test was employed instead of Pearson's χ^2 test when sample sizes were small. Continuous data were compared by Student's *t* test or Mann–Whitney test for variables with or without normal distribution, respectively. Linear regression analysis attempted to model the relationship between HADS anxiety and depression scores. Finally, binary logistic regression analysis was performed to compare patients with normal (<8) and borderline/abnormal (≥8) HADS anxiety and/or depression scores with those independent variables that had $p < .05$ in the univariate analysis. The results were expressed as odds ratios (ORs) with their 95% confidence intervals (CIs). $p < .05$ was considered statically significant. Data analysis was carried out using the SPSS software 24.0 (IBM Corporation, Armonk, NY).

3 | RESULTS

A total of 169 out of 173 consecutive CHD patients were recruited from our outpatient CHD unit, and three patients with chromosomal/genetic diseases unable to answer the survey and one patient who did not want to participate in the study were excluded. No patient was excluded due to comorbidity problems that limited life expectancy. Median age was 29 (19–39) years old and 100 (59%) patients were male. Out of 169 patients, 19 (11%) were cyanotic. According to complexity, patients were grouped as simple (72 patients), moderate (60 patients), and great (37 patients) complexity (Table 1). Table 2 shows the EQ-5D-3L results according to CHD complexity (simple vs. moderate and great). Patients with moderate and great CHD complexity showed no significant differences in the employment and educational status, the VAS score and the five health dimensions of the EQ-5D-3L test (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression) when compared with CHD patients with mild complexity.

In contrast, as shown on Table 3, the HADS survey revealed that out of 169 CHD patients, 44 (26%) patients had an HADS anxiety and/or depression score ≥ 8, 42 (25%) patients had an HADS anxiety score ≥ 8, and 15 (9%) patients had an HADS depression score ≥ 8. Additionally, 13 out of 15 (87%) CHD patients with an HADS depression score ≥ 8 also showed an HADS anxiety score ≥ 8 ($p < .001$). No significant differences were seen in the HADS anxiety and/or depression score ($p = .060$) and in the HADS anxiety score ($p = .209$) according to CHD complexity (simple vs. moderate and great). However, CHD patients with moderate and great complexity defects had significantly higher HADS depression scores ($p = .003$) than CHD patients with mild defects. Meanwhile, linear regression analysis showed a positive coefficient indicating that as the value of the HADS anxiety score increased,

TABLE 1 CHD classification according to complexity

Types of CHD	Number of patients
Simple defects	72
Ventricular septal defect	26
Atrial septal defect	17
Pulmonary valve disease	12
Aortic valve disease	12
Ductus	2
Other simple defects	3
Defects of moderate complexity	60
Coarctation of the aorta	21
Tetralogy of Fallot	15
Atrioventricular septal defects	10
Subvalvular or supravalvular pulmonary stenosis	5
Subvalvular or supravalvular aortic stenosis	4
Ebstein's anomaly	2
Other defects of moderate complexity	3
Defects of great complexity	37
Dextro-transposition of the great arteries	10
Levo-transposition of the great arteries	9
Pulmonary atresia	8
Single ventricle	4
Double outlet right ventricle	3
Eisenmenger syndrome	2
Tricuspid atresia	1
Total of CHD patients	169

Abbreviation: CHD, congenital heart disease.

the mean of the HADS depression score also tended to rise (standardized beta coefficient, .62; 95% CI, 0.642–0.95; $p < .001$; R^2, .381).

Table 4 shows demographic, clinical, and blood test data in CHD patients with an HADS anxiety and/or depression score above and below 8. No significant differences were seen in relation to age, gender, marital and employment status, educational level, cardiovascular risk factors, number of cardiac surgeries, arrhythmias, cardiac devices, blood test, and systemic ventricular dysfunction between CHD patients with an anxiety and/or depression HADS score above and below 8. On the contrary, CHD patients with an HADS anxiety and/or depression score ≥ 8 had a significantly worse NYHA functional class (II and III of the NYHA classification as no patients in our study fell into Class IV), needed more previous psychological support, had more mental health history, and had taken more anxiolytic or antidepressant medication than CHD patients with an HADS anxiety and/or depression score below 8. None of the patients was undergoing anxiolytic or antidepressant treatment at the time of the interview.

In relation to gender, no significant differences were seen neither in the HADS anxiety and/or depression score, as stated above nor in the HADS anxiety score. By contrast, female CHD patients had significantly higher HADS depression scores (≥8) than males [10 (67%) female vs. 5 (33%) male CHD patients; $p = .033$]. Finally, the only parameter that reached statistical significance in the multivariate regression analysis, as a predictor of an HADS anxiety and/or depression score ≥ 8, was having a worse NYHA functional class (II and III) with an adjusted OR with its 95% CIs of 1.88 (1.01–3.52; Table 5).

TABLE 2 Demographic, clinical, and the Euro-Quality-of-Life Five Dimensions Questionnaire (EQ-5D-3L) data in CHD patients according to complexity

	CHD complexity			
	Simple	Moderate and great	*p*	All CHD
Number of patients	72	97		169
Age, years	28 (19–39)	29 (19–39)	.881	
Sex (male), *n*	43 (60)	57 (59)	.900	100 (59)
NYHA class (II and III), *n*	12 (17)	29 (30)	.047	41 (24)
Employment status, *n*			.131	
Employed	19 (26)	42 (44)		61 (36)
Retired	11 (15)	12 (12)		23 (14)
Stay-at-home	8 (11)	4 (4)		12 (7)
Student	22 (31)	30 (31)		52 (31)
Unemployed	4 (6)	2 (2)		6 (3)
Others	8 (11)	7 (7)		15 (9)
Educational level, *n*			.121	
No education	4 (6)	1 (1)		5 (3)
Elementary	10 (14)	6 (6)		16 (10)
Primary education	16 (22)	18 (19)		34 (20)
Secondary education	36 (50)	61 (63)		97 (57)
University	6 (8)	11 (11)		17 (10)
Health condition[a]	85 ± 17	82 ± 18	.688	83 ± 18
Mobility, *n*			.670	
No problems	59 (82)	80 (83)		139 (82)
Moderate problems	13 (18)	16 (16)		29 (7)
Extreme problems	0 (0)	1 (1)		1 (1)
Self-care, *n*			.634	
No problems	64 (89)	90 (93)		154 (91)
Moderate problems	5 (7)	5 (5)		10 (6)
Extreme problems	3 (4)	2 (2)		5 (3)
Usual activities, *n*			.683	
No problems	59 (82)	82 (85)		141 (83)
Moderate problems	11 (15)	14 (14)		25 (15)
Extreme problems	2 (3)	1 (1)		3 (2)
Pain/discomfort, *n*			.785	
No problems	58 (80)	75 (77)		133 (79)
Moderate problems	12 (17)	20 (21)		32 (19)
Extreme problems	2 (3)	2 (2)		4 (2)
Anxiety/depression, *n*			.256	
No problems	64 (89)	77 (79)		141 (84)
Moderate problems	7 (10)	17 (17)		24 (14)
Extreme problems	1 (1)	3 (3)		4 (2)

Note: The data are expressed as median and quartiles (25–75), mean ± standard deviation and as number and percentage in parenthesis.

Abbreviations: CHD, congenital heart disease; *n*, number of patients; NYHA, New York Heart Association.

[a]Visual Analog Scale average score.

TABLE 3 Anxiety and depression total scores determined with HADS in CHD patients with simple and moderate/great complexity defects

	CHD complexity			
	Simple	Moderate and great	*p*	All CHD
Number of patients	72	97		169
Anxiety and/or depression, *n*			.060	
Normal (0–7)	59 (82)	66 (68)		125 (74)
Borderline (8–11)	11 (15)	20 (21)		31 (18)
Abnormal (11–21)	2 (3)	11 (11)		13 (8)
Anxiety, *n*			.209	
Normal (0–7)	59 (82)	68 (70)		127 (75)
Borderline (8–11)	8 (11)	17 (18)		25 (15)
Abnormal (11–21)	5 (7)	12 (12)		17 (10)
Depression, *n*			.003	
Normal (0–7)	70 (97)	84 (87)		154 (91)
Borderline (8–11)	0 (0)	11 (11)		11 (7)
Abnormal (11–21)	2 (3)	2 (2)		4 (2)

Note: The data are expressed as number and percentage in parenthesis.
Abbreviations: HADS, Hospital Anxiety and Depression Scale; *n*, number of patients.

4 | DISCUSSION

Symptoms of depression include low mood, decreased interest in pleasurable activities, changes in weight or sleep, difficulty concentrating and recurrent thoughts of death or suicide. In contrast, anxiety foresees danger or misfortune accompanied by apprehension, dysphoria, or tension. It should be noted that symptoms of depression and anxiety commonly occur concomitantly and may range from mild to severe symptoms that may affect an individual's daily life activities, social roles, and quality of life (Jackson et al., 2018).

Previous studies measuring different dimensions of behavioral and emotional problems in adolescents and adult CHD patients have shown contradictory results. On the one hand, some authors have found a high frequency of depression and anxiety disorders among CHD patients (Benderly et al., 2019; Westhoff-Bleck et al., 2016) while other authors have not found that anxiety or depression were greater than in a general population (Eslami et al., 2017). In our study, we found that 16% of patients related "anxiety/depression" in the EQ-5D-3L questionnaire which is similar to what has been reported in the Spanish National Health Survey (Ministerio de Sanidad & Servicios Sociales e Igualdad, 2014a) where, according to the specific item of the EQ-5D-5L questionnaire, "anxiety/depression" affected 14.6% of the interviewees.

In contrast, we found that 25% and 9% of our CHD patients showed borderline to abnormal anxious and depressive symptoms, respectively according to the HADS questionnaire. These fractions were above the expectations considering, for example, the 2011 Spanish National Health Survey (Ministerio de Sanidad & Servicios Sociales e Igualdad, 2014b) where 9.6% of the adult population was reported having anxiety, chronic depression, and other mental problems. A similar study performed in the adult population of the Canary Islands in 2014 found that the declared prevalence of mental disorders was 13.4% (9% in males and 17.8% in females; Ministerio de Sanidad & Servicios Sociales e Igualdad, 2014b). Furthermore, the ESEMeD-Spain, an epidemiological study about mental disorders in Spain, found that 8.4% of the individuals presented a mental disorder in the last 12 months. Within this group, the most frequent disorder was the major depressive episode with a 12-month prevalence of 3.9% followed-up by specific phobia, alcohol abuse disorders, and dysthymia (Haro et al., 2006).

TABLE 4 Demographic and clinical data in CHD patients with normal (<8) and borderline/abnormal (≥8) HADS score

	Anxiety and/or depression HADS scores		
	Normal	**Borderline and abnormal**	***p***
Number of patients	125	44	
Age (years)	28 (19–39)	30 (19–40)	.484
Gender (male), *n*	76 (61)	24 (55)	.616
NYHA functional class (II and III), *n*	25 (20)	16 (36)	.029
Marital status, *n*			.235
Single	107 (86)	32 (73)	
Married	15 (20)	10 (23)	
Divorce	3 (2)	2 (5)	
Employment status, *n*			.543
Employee	50 (40)	13 (30)	
Retired	16 (13)	7 (16)	
Stay-at-home	7 (6)	5 (11)	
Student	40 (32)	12 (27)	
Unemployed	12 (10)	7 (16)	
Educational level, *n*			.196
No education	5 (4)	0 (0)	
Elementary	10 (8)	6 (14)	
Primary education	24 (19)	10 (23)	
Secondary education	76 (61)	21 (48)	
University	10 (8)	7 (16)	
Arterial hypertension (yes), *n*	21 (17)	9 (20)	.585
Diabetes mellitus (yes), *n*	4 (3)	3 (7)	.300
Smoking habit (yes), *n*	11 (9)	2 (5)	.298
Drug addiction (yes), *n*	3 (2)	0 (0)	.300
Psychological support (yes), *n*	21 (17)	17 (39)	.003
Mental health history (yes),[a] *n*	2 (2)	8 (8)	<.001
Previous anxiolytic treatment (yes), *n*	4 (3)	8 (18)	.001
Previous antidepressant treatment (yes), *n*	1 (1)	7 (16)	<.001
Cardiac surgery (yes), *n*	90 (72)	35 (80)	.327
Cyanosis (oxygen saturation < 93%), *n*	13 (10)	6 (14)	.559
Number of cardiac surgeries (number)	1(0–2)	1(1–2)	.554
Cardiac complexity (moderate or great), *n*	76 (61)	31 (70)	.125
Hospital admission for surgery <14 years (yes), *n*	77 (62)	30 (68)	.436
Basal electrocardiographic rhythm (sinus rhythm), *n*	113 (90)	39 (89)	.770
Arrhythmias (yes), *n*	17 (14)	12 (27)	.130
ICD, *n*	3 (2)	3 (7)	.173
Cardiac pacemaker, *n*	9 (7)	2 (4)	.539

TABLE 4 (Continued)

	Anxiety and/or depression HADS scores		
	Normal	Borderline and abnormal	*p*
Blood test			
Hemoglobin, g/dl	15 (14–16)	15 (14–16)	.872
Creatinine, mg/dl	0.9 (0.8–1.0)	0.9 (0.8–1.0)	.774
TSH (mIU/L)	2.3 (1.6–4)	2.3 (1.7–2.9)	.484
NT-pro-BNP (pg/ml)	85 (21–285)	158 (34–559)	.253
Systemic ventricular dysfunction,[b] *n*	18 (14)	10 (23)	.201

Abbreviations: CHD, congenital heart disease; HADS, Hospital Anxiety and Depression Scale; ICD, implantable cardioverter-defibrillator; *n*, number of patients; NT-pro-BNP, N-terminal pro-brain natriuretic peptide; NYHA, New York Heart Association; TSH, thyroid-stimulating hormone.

[a]Five patients had previous anxiety disorders and five patients had previous mood disorders.

[b]Systemic ventricular dysfunction includes patients with left and right ventricular morphology. The data are expressed as median and quartiles (25–75) and as number and percentage in parenthesis.

An HADS score of ≥8 is considered as an indicator of depression in the Identifying Depression As a Comorbid Condition (IDACC) project (Cheok, Schrader, Banham, Marker, & Hordacre, 2003) which is consistent with other cardiac patient studies (Roberts, Bonnici, Mackinnon, & Worcester, 2001; Strik, Honig, Lousberg, & Denollet, 2001). In fact, one report of the National Institute for Health and Care Excellence (NICE) recommends this tool as a way to perform the diagnosis of depression and anxiety in the general population (National Collaborating Centre for Mental Health, 2014). Moreover, the Spanish version of the HADS had good internal consistency and external validity, with favorable sensitivity and specificity in identifying cases of psychiatric disorder as defined by the Structured Clinical Interview for the DSM (Quintana et al., 2003). Even though the HADS has proven good internal consistency and validity to detect psychiatric disorders, different authors state that a joint scale performs better than the subscales separately (Brennan, Worrall-Davies, McMillan, Gilbody, & House, 2010; Cosco, Doyle, Ward, & McGee, 2012) reflecting the coexistence of depressive and anxious symptoms in a common psychological distress syndrome (Terol et al., 2007). In fact, the high percentage of CHD patients with an abnormal HADS score seen in our study (26%), may be explained by the fact that the subscales could measure different aspects of affective disorders such as anhedonia, negative affectivity or restlessness, more than anxiety or depression (Coyne & van Sonderen, 2012), as also reported by Terol-Cantero et al. (2015) who recommend HADS as a psychological distress-screening tool to provide further information in a clinical evaluation.

TABLE 5 Binary logistic regression analyses of congenital heart disease patients with normal versus borderline/abnormal HADS anxiety and/or depression score

Covariates	OR (crude) (95% CI)	OR (adjusted) (95% CI)
Psychological support (yes)	3.19 (1.45–6.71)	1.58 (0.62–4.02)
Mental health history (yes)	13.7 (2.79–67.2)	4.01 (0.54–28.75)
Previous anxiolytic treatment (yes)	6.72 (1.91–23.6)	1.27 (0.18–8.91)
Previous antidepressant treatment (yes)	23.46 (2.80–196.86)	6.00 (0.35–102.42)
NYHA functional class (II and III)	1.95 (1.09–3.50)	1.88 (1.01–3.52)

Abbreviations: CI, confidence interval; HADS, Hospital Anxiety and Depression Scale; NYHA, New York Heart Association; OR, odds ratio.

In relation to the clinical data, neither age nor gender showed pathological HADS anxiety and/or depression scores which is in agreement with previous studies (Celik et al., 2016). On the contrary, female patients showed significantly higher HADS depression scores (≥8) than males. This may be explained by the fact that women are more likely to experience depression during periods of marked hormonal fluctuations, suggesting that gonadal hormones are involved in stress pathology (Solomon & Herman, 2009). It is also noteworthy that neither cardiac complexity nor cyanosis emerged as significant parameters of a pathological HADS anxiety and/or depression score in our series, as also observed by others (Andonian et al., 2018, Kovacs et al., 2009). Nonetheless, when focusing only on depression the HADS depression subscale found that moderate and great complexity CHD patients had a higher risk of depression than CHD patients with mild defects probably because physical functioning and general health perceptions are somewhat hampered in the most complex patients. Similarly, the presence of pacemakers and implantable cardioverter-defibrillators, which are increasingly implanted with the intention of reducing sudden cardiac death in CHD patients (Santharam et al., 2017), did not reach statistical significance. Although some authors (Berg et al., 2019) have reported that nearly half of the patients with acquired heart disease needing implantable cardioverter-defibrillators present with depression and anxiety, as also occurs in patients with pacemakers but at lower rates (Allam, Nabih, & El-Missiry, 2018), we found no significant differences among CHD patients with or without cardiac devices. An explanation could be that our study mostly included young patients who have only experienced life with a device protecting them from maladaptive responses that may lead to anxiety and depression in older patients. Also, as it occurs in the general population, CHD patients with a previous history of depression or anxiety disorders or under previous antidepressant or anxiolytic treatment showed a significantly worse HADS anxiety and/or depression score (Adams, Wrath, Mondal, & Asmundson, 2018) than CHD patients without psychological and/or psychiatric medical history.

With respect to the functional class, the NYHA classification provides a simple way of classifying the extent of heart failure, a frequent cardiac comorbidity seen in CHD patients that increases as patients age, representing the most common cause of death in this population (Diller, 2018; Yu, Moore, Kotchetkova, Cordina, & Celermajer, 2018). In this context, the NYHA functional class has proved to be a valuable clinical tool in CHD patients, as it correlates with exercise capacity, the severity of the underlying cardiac disease, and the mid-to-long term outcome (Bredy et al., 2018). A worse NYHA functional class results in reduced activity and social contacts, more time to dwell on health conditions and increased feelings of helplessness and loneliness (Haworth et al., 2005). The majority of prior studies have indicated that there is a significant correlation between NYHA class and anxiety and depressive symptoms in heart failure patients (Angermann & Ertl, 2018; Bordoni, Marelli, Morabito, & Sacconi, 2018; Celano, Villegas, Albanese, Gaggin, & Huffman, 2018) as also seen in our series. However, no significant differences were seen in relation to serum NT-pro-BNP levels, a test used to help diagnose and monitor heart failure, and a pathological HADS anxiety and/or depression score. This may be because NT-pro-BNP level in some CHD patients is more related to the morphology of the dysfunctional systemic ventricle than to the patient's functional class (Eindhoven et al., 2013; Martínez-Quintana, Marrero-Negrín, Gopar-Gopar, & Rodríguez-González, 2017) which may hinder its use in the diagnosis of anxious and depressive symptoms.

Treatment of depression in cardiac patients reduces cardiac disease symptoms, morbidity, and disabilities (Mavrides & Nemeroff, 2015; Pedersen, von Känel, Tully, & Denollet, 2017), so it is important to monitor CHD patients, in particular, CHD patients with increasing NYHA class, to identify psychological distress. In such cases, the optimization of the medical treatment, inclusion in rehabilitation programs (Martínez-Quintana, Miranda-Calderín, Ugarte-Lopetegui, & Rodríguez-González, 2010), the promotion of physical activity and enabling psychological or psychiatric assessment (Sandberg et al., 2015) may be useful. Due to the high prevalence of psychological distress among CHD patients, as revealed in our study, special attention must be paid to these patients to allow an early diagnosis and an adequate treatment by a mental health unit. Therefore, simple and validated surveys about anxiety and depression should be included in the symptom review, in adult CHD patients, as structured professional psychological evaluation may identify up to 50% more patients with mood disorders who benefit from for mental health evaluation and treatment (Stout et al., 2019).

There are, however, limitations in our study. First, it should be emphasized that self-assessment scales are only valid for screening purposes and definitive diagnosis must rest on the process of clinical examination (Snaith, 2003). Additionally, limited research has compared these scales to identify the best performing tools (Batterham, Sunderland, Slade, Calear, & Carragher, 2018; Nabbe et al., 2018). Secondly, NYHA class underestimates the degree of limitation in some CHD patients, as a large number of "asymptomatic" (NYHA Class I) patients do not achieve normal peak oxygen consumption (Bredy et al., 2018). Finally, it is difficult to establish causal relationships from cross-sectional analysis, as these studies are prone to certain biases and depend on the prevalence of an outcome (Setia, 2016).

5 | CONCLUSIONS

In conclusion, psychological distress has a high prevalence among CHD patients. NYHA, which describes the stage of heart failure based on the symptoms to everyday activities, seems to be a good predictor of an HADS score ≥ 8. Therefore, assessment of anxiety and depression symptoms in heart failure CHD patients should be an integral part of an adequate diagnostic approach in CHD patients.

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