



## Original Article

**Cite this article:** Keshavarzi R, Divsalar P, and Aliramezany M (2024) Prevalence of anxiety and depression in adult patients with CHD. *Cardiology in the Young* **34**: 1052–1057. doi: [10.1017/S1047951123004079](https://doi.org/10.1017/S1047951123004079)

Received: 5 July 2023  
Revised: 24 September 2023  
Accepted: 9 November 2023  
First published online: 7 December 2023

**Keywords:**

Adult; CHD; depression; anxiety; psychiatric disease; Depression Anxiety Stress Scales questionnaire; Beck questionnaire

**Corresponding author:**

Maryam Aliramezany;  
Email: [maliramezany@yahoo.com](mailto:maliramezany@yahoo.com)

<sup>1</sup>Kerman University of Medical Sciences, Kerman, Iran and <sup>2</sup>Cardiovascular Research Center, Institute of Basic and Clinical Physiology Sciences, Kerman University of Medical Sciences, Kerman, Iran

**Abstract**

**Introduction:** CHD are among the most common congenital defects. Due to the chronic nature of CHD, patients face various risk factors that threaten their mental health. However, a comprehensive understanding of the medical and social predictors of mental health issues in adults with CHD is lacking. This study aims to investigate the prevalence of anxiety and depression in adults with CHD. **Methods:** This cross-sectional descriptive study focused on adults with CHD in Kerman, Iran. The participants completed demographic information alongside two psychological assessment tools: the Beck Anxiety Inventory (BAI) and the Depression Anxiety Stress Scales (DASS)-21. The data were analyzed using SPSS 26. **Findings:** The mean age of the participants was  $29.94 \pm 12.36$  years, and 63.8% were female. According to the DASS, 73.4% did not have depression, 61% did not have anxiety, and 76.2% did not have stress. In total, 19% had mild stress, and 4.8% had moderate stress. According to the BAI, 27.6% did not have anxiety. Individual characteristics were not significantly associated with depression. However, gender, age, and type of surgery were significantly associated with anxiety. Cyanosis was significantly associated with stress. **Conclusion:** The results show that mental disorders like depression, anxiety, and stress are highly prevalent in adults with CHD. The prevalence depends on individual factors such as age, gender, and disease severity. Therefore, it is recommended that mental disorders in this population be evaluated and treated accurately.

CHD is one of the most common types of birth defects, occurring in about 1% of live births. Various studies have reported the prevalence of these disorders in young adults to be about five cases per 1000 people.<sup>1,2</sup> In addition, due to advances made in the diagnosis and treatment of CHDs, more than 95% of babies born with CHDs now reach adulthood.<sup>3</sup>

They face complications related to this disease as it is a chronic condition that affects various aspects of life, including quality of life and mental and psychological well-being.<sup>4,5</sup> As a matter of fact, it can be said that these patients have several risk factors for psychiatric disorders, which increase with age due to the need for more hospitalisations and longer hospital stays.<sup>6</sup>

Furthermore, the disruption of individual performance and daily activities caused by various surgeries and the type of disease can increase the risk of mental disorders.<sup>7,8</sup> This can lead to an increased risk of developing psychiatric disorders, such as depression and anxiety.<sup>9</sup>

Potential psychological challenges include stressors related to the environment, concerns about mortality, decision-making about treatment options, preparation for surgery, and adaptation to implanted cardiac devices.<sup>10</sup> Young people with CHDs may have a higher prevalence of psychiatric disorders, such as depression, anxiety, impatience, and insomnia, due to the lasting consequences of invasive interventions, frequent chest pain, wound sites from previous surgeries, and the development of arrhythmia compared to the general population.<sup>11–14</sup>

However, there is a lack of comprehensive understanding of the medical and social predictors of mental health problems in adults with CHD. Additionally, only a few studies have addressed the psychological experiences of this group.<sup>15</sup>

Furthermore, the results of similar studies investigating depression and anxiety disorders in these patients have been contradictory, possibly due to factors such as small sample sizes, low response rates, differences in socio-cultural factors, and variations in the measurement of different parameters (e.g., disease severity).<sup>16–19</sup>

Moreover, despite searches of domestic databases such as SID, Iranmedex, and Irandoc, as well as international databases including PubMed, Scopus, WOS, Embase, and PsychINFO, no comprehensive studies on mental illness in young adults with CHD have been conducted in Iran. Therefore, we aimed to investigate the prevalence of anxiety and depression in adults with CHD in the city of Kerman, Iran.

## Methods

### Design

This cross-sectional descriptive-analytical study was conducted on adult patients above 18 years of age with CHD who visited the heart clinic in Kerman, Iran. The sample was selected using a simple random method. Diagnosis of CHD was made by an adult congenital cardiologist based on echocardiographic findings and other paraclinical methods. After obtaining the necessary permissions from the university and the ethics committee of Kerman University of Medical Sciences, 130 adult patients with CHD were included in the study. Of these, 105 patients (80.7% response rate) completed the questionnaire. The inclusion criteria were patients aged over 18 years without any underlying disease other than CHD, and with a complete and accurate history of previous diseases and medications. Patients who did not wish to participate in the study were excluded.

### Instrument

After providing necessary information and obtaining informed consent, patients were given a checklist to complete, which included age, sex, marital status, and educational and employment status, as well as the standard Beck Anxiety and Depression and Depression Anxiety Stress Scales (DASS) questionnaires. All patients underwent transthoracic echocardiography to check ventricular size and function, as well as pulmonary pressure. Other items of the questionnaire, such as the type of underlying disease (simple, moderately complex, great complex), type of previous surgery (corrective, palliative, or none), presence of residual defect, New York Heart Association function class, and the presence or absence of cyanosis (saturation of O<sub>2</sub> less than 94%), were completed by the researcher based on available documents. Cardiac dysfunction was diagnosed and graded based on left ventricular function (systemic ventricle) on echocardiography as follows: an ejection fraction above 55% was considered normal, between 55 and 45% was considered mildly reduced, between 44 and 30% was considered moderately reduced, and below 30% was considered severely reduced. After completing the questionnaires (without name and with a special code), the score of the questionnaire was considered final based on the criteria explained below

### Assessment of psychological functioning

We used two standard questionnaires to assess psychological disorders. The first questionnaire was Beck's Anxiety Inventory, a 21-item self-report scale designed to measure the intensity of anxiety in adolescents and adults. Each item offers four response options (ranging from 0 to 3) that indicate the severity of anxiety symptoms experienced by the respondent. The total score on this questionnaire ranges from 0 to 63, with higher scores indicating greater levels of anxiety. This questionnaire is specifically designed to assess anxiety symptoms and does not measure depression. Studies have demonstrated high validity of the Beck's Anxiety Inventory, and Kaviani and Mousavi reported a Cronbach's alpha of 0.92 for the Persian version of the questionnaire.<sup>20</sup>

The second questionnaire was the DASS, which consists of three self-report subscales designed to measure negative emotional states of depression, anxiety, and stress. Each subscale contains seven items, and patients were asked to rate the extent to which they experienced each state in the last week using a 4-point intensity/frequency scale. The items in DASS were selected to

represent all three subscales, and full 42-decimal scales of DASS-42 could be derived by multiplying the subscale scores by two. The Persian version of the DASS questionnaire demonstrated good internal consistency for the three subscales, with a Cronbach's alpha of 0.77 for depression, 0.79 for anxiety, and 0.78 for stress, as calculated by Sahibi and colleagues.<sup>21</sup>

### Statistical analysis

Descriptive statistics including frequency, relative frequency, and measures of central tendency were used to summarise the data. For quantitative data analysis, a t-test was conducted, while for qualitative data analysis, a Chi-square test was performed. The results were analysed using SPSS version 26 software.

### Ethical statement

The study was approved by ethics committee of Kerman University of Medical Sciences (IR.KMU.REC.1401.129). We ensured that the information of patients who were eligible for inclusion in the study was kept confidential. Participation in the study was completely voluntary, and patients had the right to withdraw from the study at any time

## Results

### Participant characteristic

In this study, the mean age of the participants was  $29.94 \pm 12.36$  years. Of the participants, 63.8% were female and 36.2% were male. The majority of participants (55.2%) were single, while 40% were married, and 4.8% were divorced. In terms of education, 46.7% of participants had less than a high school diploma, 40% had a high school diploma, and 13.3% had university education. Regarding occupation, 46.7% of participants were housewives, 8.6% were students, 14.3% had part-time jobs, and 30.5% had full-time jobs (see Table 1).

Among the patients studied, 34.2% had simple disease, 35.2% had moderate complexity, and 30.5% had high complexity. Among the studied patients, 53.3% had undergone complete correction surgery, 6.7% had undergone palliative surgery, and 40% had not undergone surgery. Regarding ventricular dysfunction, 13.3% of patients did not have ventricular dysfunction, while 44.8%, 24.8%, and 17.1% had mild, moderate, and severe ventricular dysfunction, respectively. In terms of disease complexity, 34.2% had simple disease, 35.2% had moderate complexity, and 30.5% had high complexity. Among the participants, 77.1% had remaining CHDs, while 22.9% did not have any remaining defects. Based on the New York Heart Association functional classification, 42.9% of patients were in class I, 26.7% were in class II, 29.5% were in class III, and 1% were in class IV. Additionally, 25.7% of patients had cyanotic heart disease, while 74.3% had a cyanotic heart disease (see Table 2).

### Prevalence of psychological disorders

According to the DASS questionnaire, the mean scores for depression, anxiety, and stress among the participants were  $6.5 \pm 5.73$ ,  $7.56 \pm 6.22$ , and  $9.26 \pm 5.79$ , respectively. In terms of depression, 9.5% of participants had mild depression, 17.1% had moderate depression, and 73.4% did not have depression. Regarding anxiety, 8.6% had mild anxiety disorder, 12.4% had moderate anxiety disorder, 20% had severe anxiety disorder, and 1% had very severe anxiety disorder, while 61% did not have

**Table 1.** Demographic data of studied subjects.

	variable	Frequency (Percent)
age	18–28	65 (61.9)
	28–38	17 (16.2)
	38–48	9 (8.6)
	48–58	10 (9.5)
	58–68	4 (3.8)
gender	male	38 (36.2)
	female	67 (63.8)
Marital status	Never married	58 (55.2)
	Married or living with partner	42 (40)
	Divorced or widowed	5 (4.8)
Educational level	Less than high school	49 (46.7)
	high school	42 (40)
	College degree	14 (13.3)
Employment status	Part-time	15 (14.3)
	Homemaker or retired	49 (46.7)
	Full-time student	9 (8.6)
	other	32 (30.5)

**Table 2.** Studied subjects by CHDs.

Features	Classification	Frequency (Percent)
Disease type	Simple	36 (34.2)
	Moderately complex	37 (35.2)
	Complex	32 (30.5)
Surgery type	Corrective	56 (53.3)
	Palliative	7 (6.7)
	None	42 (40)
Residual defect	Yes	81 (77.1)
	No	24 (22.9)
Functional class	Class I	45 (42.9)
	Class II	28 (26.7)
	Class III	31 (29.5)
	Class IV	1 (1)
Cardiac dysfunction	Normal	14 (13.3)
	Mild	47 (44.8)
	Moderate	26 (24.8)
	Severe	18 (17.1)
cyanosis	Yes	27 (25.7)
	No	78 (74.3)

anxiety. Of the participants, 76.2% did not have stress disorder, while 19% had mild stress and 4.8% had moderate stress.

The results of the chi-square test showed that none of the individual characteristics of the participants had a significant relationship with the degree of depression, but the participants' gender and type of surgery had a significant relationship with the intensity of their anxiety. Additionally, the results of the chi-square test indicated that the presence of cyanotic or acyanotic disease had a significant relationship with participants' stress levels. The logistic regression test was conducted to determine the factors predicting anxiety and stress in the participants. The results of the test showed that none of the variables including gender and type of surgery were able to predict participants' anxiety ( $P$ -value  $< 0.05$ ). Similarly, the presence or absence of cyanosis in congenital heart patients was not a predictor of their stress levels ( $P$ -value  $< 0.05$ ).

The mean anxiety score of the participants based on the Beck's anxiety questionnaire was  $18.24 \pm 13.6$ . Among the participants, 27.6% did not suffer from anxiety, 26.7% had mild anxiety, 20% had moderate anxiety, and 25.7% had severe anxiety. The chi-square test results indicated that the participants' gender and age had a significant relationship with their anxiety. However, the logistic regression test results showed that neither gender nor age were able to predict the degree of anxiety in the participants ( $P$ -value  $< 0.05$ ).

Relation between individual characteristics of patients with the degree of psychologic disorder based on the Beck and DASS Questionnaire score are summarised in Table 3.

## Discussion

The aim of this study was to investigate the prevalence of anxiety and depression in adults with CHD. The results showed that the highest frequency of participants belonged to the age group of 18–28 years (61.9%), which is consistent with previous studies. Donovan et al. reported an average age of 32 years among the participants in their study,<sup>22</sup> while Kovacs et al. found an average age of 31.9 years.<sup>15</sup> These findings suggest that the majority of individuals with CHD are young people. Given the importance of mental health in the young population, it is crucial to have a proper understanding of anxiety, depression, and other mental health issues in these patients.

In our study, a majority of the participants were married (80.4%). This rate is higher than that reported by Donovan et al., where only 47% of participants were married.<sup>22</sup> Conversely, Eslami et al. reported that more than half of their study participants were married.<sup>23</sup> Given that a significant proportion of individuals with CHD are married, their mental health status can potentially impact their marital relationships and lead to mental health problems for their partners and children. Therefore, it is essential to investigate the mental health issues of these patients and identify their associated factors.

The educational profile of the participants in our study was as follows: 46.7% had less than a high school education, 40% had completed high school, and 13.3% had a college degree. Eslami et al. reported that 28.5% of participants had primary education, 44.1% had completed high school, and 24.2% had a university education, which was comparable to our study.<sup>23</sup> Similarly, Donovan et al. found that only 26% of their participants had a university education, while the rest had lower levels of education.<sup>22</sup>

**Table 3.** Relation between individual characteristics and the degree of psychologic disorder based on the Beck and DASS questionnaires.

Individual characteristics	DASS Questionnaire			Beck Questionnaire
	Anxiety degree (P-value)	Stress degree (P-value)	Depression degree (P-value)	Anxiety degree (P-value)
Age group	0.391	0.928	0.153	0.046*
Sex	0.022*	0.536	0.935	0.025*
Disease type	0.437	0.451	0.723	0.265
Surgery type	0.037*	0.051	0.062	0.283
Residual defect	0.107	0.916	0.962	0.176
Functional class	0.537	0.612	0.777	0.191
Cardiac dysfunction	0.339	0.587	0.985	0.483
Presence of cyanosis	0.665	<0.001*	0.283	0.338
Educational level	0.469	0.489	0.269	0.187
Employment status	0.461	0.129	0.876	0.129
Marital status	0.832	0.683	0.075	0.243

Dass = Depression Anxiety Stress Scales.

\*Indicates the difference is significant at  $P < 0.05$ .

These findings suggest that a small proportion of individuals with CHD have higher educational attainment, and there are conflicting results regarding the relationship between education and psychiatric disorders among these patients.<sup>24,25</sup> This is noteworthy because higher education is often associated with a better quality of life, longer lifespan, and better health outcomes. In our study, 14.3% of participants were employed. Eslami et al. reported that 62.2% of their participants were not employed, which is a concern along with our findings. Low income can lead to various socio-economic problems that can adversely affect an individual's mental health.<sup>22,23</sup>

In our study, 34.2% of participants had a simple CHD, 35.2% had moderate complexity, and 30.5% had high complexity. In contrast, Kovacs et al. reported that only 10% of their participants had a simple disease, while the rest had moderate or severe complexity.<sup>15</sup> Donovan et al. found a higher frequency of moderate and high complexity diseases compared to our study.<sup>22</sup> These differences in disease complexity may be attributed to geographic and genetic factors. According to present study, 53.3% of participants underwent complete correction surgery, 6.7% had palliative surgery, and 40% had not undergone surgery. Westhoff-Bleck et al. reported that 83.3% of their participants had undergone at least one corrective surgery, with 18.6% having undergone three or more corrective surgeries.<sup>24</sup> Prior research has suggested that preoperative preparation, surgery, and postoperative complications can cause lasting psychological distress in these patients.<sup>26,27</sup>

Our study examined the effects of CHDs on the health of patients' hearts and bodies. We found that 77.1% of participants had residual CHDs, which can lead to stressful conditions for patients and their families and adversely affect their mental health. Frequent hospital visits for residual defect evaluation and the need for re-surgery can also put patients' mental health at risk.<sup>28</sup> Regarding cardiac function, 42.9% of participants were in class 1, 26.7% were in class 2, 29.5% were in class 3, and 1% were in class 4. Kovacs et al. reported that 65% of their participants were in New York Heart Association function class 1, indicating better cardiac function than our study findings.<sup>15</sup> Similarly, Westhoff-Bleck et al. found that 74.3% of their participants were in class 1, indicating better cardiac function in the majority of their participants.<sup>24</sup>

CHDs and their effects on New York Heart Association function class can significantly impact the quality of life of individuals with these defects. Previous research has suggested that the New York Heart Association function class of patients can have a significant impact on their mental health.<sup>18,24</sup>

Based on the findings of the DASS questionnaire in our study, we found that 26.6% of participants had symptoms of depression, 42% had symptoms of anxiety, and 21% had severe or very severe anxiety disorders, which is concerning. However, 23.8% of participants had mild to moderate stress, which is promising. Previous studies have also examined the degree of depression, anxiety, and psychiatric disorders in individuals with CHD.<sup>16,17,22,23,27</sup> Adults with CHD face various potential psychosocial challenges, which can increase their likelihood of experiencing symptoms consistent with mood and anxiety disorders.<sup>17</sup> Donovan et al. reported that 23% of their participants had symptoms of depression and 30% had anxiety, which is lower than the rates found in our study.<sup>22</sup> This difference may be due to socio-economic conditions, better care and treatment services, or other environmental factors.

The present study found no significant relationship between individual patient characteristics and degrees of depression. However, patient gender and type of surgery had a significant relationship with patient anxiety, while the presence of cyanosis had a significant relationship with stress levels. One of the underlying factors contributing to this issue may stem from the systemic repercussions of cyanosis on multiple organs and their associated side effects. As evidenced by prior research,<sup>29</sup> chronic hypoxia can lead to a spectrum of complications affecting the brain, haematological system, pulmonary function, and renal function, among others. Each of these complications may have a detrimental effect on an individual's quality of life, potentially culminating in the development of psychological disorders. Donovan et al. also reported that a patient's initial perception of their disease could predict their quality of life, anxiety, and depression in the following year.<sup>22</sup> Bromberg's study showed that among patients deemed to be "adjusting well to their illness," 36.4% experienced a diagnosable psychiatric disorder with prominent symptoms of anxiety or depression. Additionally, there

was a significant relationship between the severity of CHD and the diagnosis of depression.<sup>17</sup>

The findings of the present study, along with previous research, highlight the significant concerns regarding psychological trauma and the occurrence of psychiatric disorders, including depression, anxiety, and stress, among adults with CHD, particularly in those with complex lesions such as cyanosis. It is crucial to prioritise the psychological evaluation of these patients. Early identification, diagnosis, and treatment of these disorders, even in patients who appear to be coping well with their illness, can prevent physical and mental disability in these patients

In our study, the average anxiety score of patients based on the Beck anxiety questionnaire was  $18.24 \pm 13.6$ . Additionally, 72.4% of patients were found to be suffering from anxiety, and 25.7% of them had severe anxiety. Compared to the anxiety results of the DASS questionnaire, more patients in our study suffered from anxiety with greater severity, which may be due to the higher scoring of the Beck anxiety questionnaire. Furthermore, the results showed that patient sex and age had a significant relationship with their anxiety. In Kovacs et al.'s study, the average anxiety score of participants based on the State-Trait Anxiety Inventory-Trait Subscale (STAI-T) anxiety questionnaire was 36.5 (with a maximum score of 70), and 36% of participants were diagnosed with an anxiety disorder. Loneliness and fear of others' opinions about the patient were predictive factors of this disorder.<sup>15</sup> Bromberg et al.'s study<sup>17</sup> found that based on the 4th version of Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and the Brief Symptom Inventory, about 36.4% of adults with CHD had detectable psychological disorders, with symptoms of anxiety and depression being more prevalent. However, Jan Muller et al.'s study,<sup>30</sup> showed that the prevalence of depressive symptoms in people with CHD is lower than that of the general population (with a prevalence of 8.6%). Nonetheless, even mild depressive symptoms can significantly impact the quality of life of these individuals. In a study conducted by Amelia E. Mercado et al.<sup>31</sup> it was found that approximately 15.6% of hospitalised patients with CHD had at least one psychological disorder, and these patients differed from healthy individuals in terms of demographic characteristics. The difference in depression prevalence between this study and ours could be due to cultural differences and differences in the patients' place of residence. Michal Benderly et al.'s study,<sup>32</sup> showed that depression and anxiety disorders in adults with CHD are more prevalent in older age and among women. The presence of these disorders can increase the number of medical visits, mortality rates, and ultimately, healthcare costs. Anxiety can be distressing and debilitating, particularly in young patients with CHD. Therefore, healthcare workers' adequate training and awareness of these patients can effectively help reduce this mental disorder.

## Conclusion

In summary, this study highlights the prevalence of mental disorders, including depression, anxiety, and stress, in a population of young patients diagnosed with CHD. The prevalence of these disorders is intricately related to individual characteristics, such as age and gender, in addition to disease severity. In such a way that patients with a history of palliative surgery and the presence of cyanosis in the patients increase the prevalence of psychological disorders. This issue shows that the chronicity of the disease (one of the signs of which is the presence of cyanosis) can cause psychological disorders and negative effects on the quality of life.

Therefore, timely diagnosis and treatment of such heart defects can have beneficial effects on the future life of these patients.

**Acknowledgment.** This paper constitutes a segment of an MD thesis conducted at Kerman University of Medical Sciences. We extend our gratitude to the authorities at Kerman University of Medical Sciences for their generous support. Furthermore, we express our appreciation to all the patients whose participation made this study possible.

**Competing interests.** No competing interests to declare.

## References

1. Liu Y, Chen S, Zühlke L, et al. Global birth prevalence of congenital heart defects 1970-2017: updated systematic review and meta-analysis of 260 studies. *Int J Epidemiol* 2019; 48: 455–463.
2. Van Der Linde D, Konings EE, Slager MA, et al. Birth prevalence of congenital heart disease worldwide: a systematic review and meta-analysis. *J Am Coll Cardiol* 2011; 58: 2241–2247.
3. Warnes CA. The adult with congenital heart disease: born to be bad? *J Am Coll Cardiol* 2005; 46: 1–8.
4. Gan Y, Gong Y, Tong X, et al. Depression and the risk of coronary heart disease: a meta-analysis of prospective cohort studies. *BMC Psychiatr* 2014; 14: 1–11.
5. Park J-H, Tahk S-J, Bae SH. Depression and anxiety as predictors of recurrent cardiac events 12 months after percutaneous coronary interventions. *J Cardiovasc Nurs* 2015; 30: 351–359.
6. Opatowsky AR, Siddiqi OK, Webb GD. Trends in hospitalizations for adults with congenital heart disease in the US. *J Am Coll Cardiol* 2009; 54: 460–467.
7. Jobson MC. A new look at neurodevelopmental and neuropsychological outcome in children with congenital heart disease. *Indian J Mental Health* 2021; 8: 28.
8. Marelli A, Miller SP, Marino BS, Jefferson AL, Newburger JW. Brain in congenital heart disease across the lifespan: the cumulative burden of injury. *Circulation* 2016; 133: 1951–1962.
9. Calderon J, Bellinger DC. Executive function deficits in congenital heart disease: why is intervention important? *Cardiol Young* 2015; 25: 1238–1246.
10. McGrath LB, Kovacs AH. Psychological resilience: significance for pediatric and adult congenital cardiology. *Prog Pediatr Cardiol* 2019; 54: 101129.
11. Crossland D, Jackson S, Lyall R, et al. Patient attitudes to sternotomy and thoracotomy scars. *J Thorac Cardiovasc Surg* 2005; 53: 93–95.
12. Agarwal S, Sud K, Khera S, et al. Trends in the burden of adult congenital heart disease in US emergency departments. *Clin Cardiol* 2016; 39: 391–398.
13. Lundqvist CB, Potpara TS, Malmberg H. Supraventricular arrhythmias in patients with adult congenital heart disease. *Arrhythm Electrophysiol Rev* 2017; 6: 42.
14. Amedro P, Dorka R, Moniotte S, et al. Quality of life of children with congenital heart diseases: a multicenter controlled cross-sectional study. *Pediatr Cardiol* 2015; 36: 1588–1601.
15. Kovacs AH, Saidi AS, Kuhl EA, et al. Depression and anxiety in adult congenital heart disease: predictors and prevalence. *Int J Cardiol* 2009; 137: 158–164.
16. Roseman A, Kovacs AH. Anxiety and depression in adults with congenital heart disease: when to suspect and how to refer. *Curr Cardiol Rep* 2019; 21: 1–6.
17. Bromberg JI, Beasley PJ, D'Angelo EJ, Landzberg M, DeMaso DR. Depression and anxiety in adults with congenital heart disease: a pilot study. *Heart Lung* 2003; 32: 105–110.
18. Utens EM, Verhulst FC, Erdman RA, et al. Psychosocial functioning of young adults after surgical correction for congenital heart disease in childhood: a follow-up study. *J Psychosom Res* 1994; 38: 745–758.
19. Rao P. Evolution of pediatric cardiology over the Last 50 Years (Trends in Transcatheter interventions for pediatric heart disease-part I). *Int J Clin Cardiol* 2021; 8: 220.

20. Kaviani H, Mousavi AS. Psychometric properties of the persian version of beck anxiety inventory (BAI). *Tehran Univ Med J* 2008
21. Sahebi A, Asghari MJ, Salari RS. Validation of depression anxiety and stress scale (DASS-21) for an Iranian population. *Q Iran Psychol* 2005; 1: 36–54.
22. O'Donovan CE, Painter L, Lowe B, Robinson H, Broadbent E. The impact of illness perceptions and disease severity on quality of life in congenital heart disease. *Cardiol Young* 2016; 26: 100–109.
23. Eslami B, Sundin Ö., Macassa G, Khankeh HR, Soares JJ. Anxiety, depressive and somatic symptoms in adults with congenital heart disease. *J Psychosom Res* 2013; 74: 49–56.
24. Westhoff-Bleck M, Briest J, Fraccarollo D, et al. Mental disorders in adults with congenital heart disease: unmet needs and impact on quality of life. *J Affect Dis* 2016; 204: 180–186.
25. Cocomello L, Dimagli A, Biglino G, Cornish R, Caputo M, Lawlor DA. Educational attainment in patients with congenital heart disease: a comprehensive systematic review and meta-analysis. *BMC Cardiovasc Dis* 2021; 21: 1–20.
26. Burchill LJ, Gao L, Kovacs AH, et al. Hospitalization trends and health resource use for adult congenital heart disease-related heart failure. *J Am Heart Assoc* 2018; 7: e008775.
27. Westhoff-Bleck M, Winter L, Aguirre Davila L, et al. Diagnostic evaluation of the hospital depression scale (HADS) and the beck depression inventory II (BDI-II) in adults with congenital heart disease using a structured clinical interview: impact of depression severity. *Eur J Prev Cardiol* 2020; 27: 381–390.
28. Miller VM, Sorabella RA, Padilla LA, et al. Health-related quality of life after single ventricle palliation or tetralogy of fallot repair. *Pediatr Cardiol* 2022; 44: 1–7.
29. Khajali Z, Maleki M, Amin A, et al. Prevalence of cardiac dysfunction among adult patients with congenital heart disease: a single-center investigation. *Iran Heart J* 2019; 20: 12–19.
30. Müller J, Hess J, Hager A. Minor symptoms of depression in patients with congenital heart disease have a larger impact on quality of life than limited exercise capacity. *Int J Cardiol* 2012; 154: 265–269.
31. Mercado AE, Well A, Lamari-Fisher A, et al. Mental health diagnoses in hospitalized adults with congenital heart disease in the state of Texas: a 10-year review. *Int J Cardiol Congenit Heart Dis* 2022; 7: 100340.
32. Benderly M, Kalter-Leibovici O, Weitzman D, et al. Depression and anxiety are associated with high health care utilization and mortality among adults with congenital heart disease. *Int J Cardiol* 2019; 276: 81–86.