

Psychiatric symptoms among children with congenital heart disease

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Objective

Psychiatric symptoms are a significant part of chronic illnesses and they can affect the prognosis and outcome. The aim of this study was to examine the presence of depressive and anxiety symptoms and neurocognitive deficits among children with congenital heart disease.

Participants and methods

Thirty children with operated congenital heart disease and 30 control healthy children were subjected to a psychiatric semistructured interview and diagnosis was made according to the *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed. criteria, the Wechsler Intelligence Scale for children, the Anxiety Scale for Children, Children's Depression Inventory, and the child behavior checklist.

Results

There were significant differences in depression and anxiety scales, internalizing behavior in the child behavior checklist, and some performance subscales in the Wechsler Intelligence Scale.

Conclusion

There is a high prevalence of behavioral, emotional, and cognitive problems in children with congenital heart disease.

Keywords:

anxiety, children, cognitive impairment, congenital heart disease, depression

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Introduction

The incidence of congenital heart diseases (CHD) has been reported to be eight of 1000 live born infants [1]. Annually, there are 400 000 deaths and hundreds of thousands of children die because of CHD [2].

The prevalence of heart diseases in children in Egypt has not been estimated precisely. Quality of life is an estimate of remaining life free of impairment, disability, or handicap [3].

Major physical illnesses usually have an impact on the psychological well-being of any individual. An illness of early onset, which requires frequent diagnostic and therapeutic interventions, can adversely affect the emotional balance and behavioral adaptation of children and adolescents. This is true for CHD, especially if it is severe and life-threatening. Psychological implications are a significant part of chronic illnesses and they can affect the prognosis and outcome [4].

When children develop cardiac disease, their self-concept and their relationships with the environments change and, as a result, certain psychological adjustments are necessarily made [5]. Children with CHD have more medical fears, and more physiological anxiety than normal peers [6]. Also, they have low self-esteem and depression and are at particular risk for poor school adjustment [7].

Withdrawn aggressive behavior, somatic complaints, depression, and anxiety are found in children with CHD [8]. Studies have shown that although the vast majority of children with CHD have normal outcomes, as a group, they generally have higher rates of neurodevelopmental problems. The developmental sequelae include mild problems in cognition, attention, and neuromotor functioning [9].

Aim of the work

Psychological implications are a significant part of chronic illnesses and they can affect the prognosis and outcome. The aims of this study were as follows:

- (1) To study the presence of depressive and associated anxiety symptoms among children with CHD.
- (2) To study the neurocognitive deficits among children with CHD.

Participants and methods

Participants

This was a case-control study that included 30 patients with a diagnosis of variable CHD, 'cases'. They had been

operated for variable congenital heart diagnoses. A post-operative follow-up period of at least 2 years was chosen to exclude the effect of acute psychological distress. In addition, we only focused on a pediatric population and thus included patients who were on average younger than 12 years at the time of assessment. They were attendants for clinical follow-up. Children were selected according to the inclusion and exclusion criteria 2 days per week from the outpatient pediatric cardiology clinic in Beni-Suef University Hospital (consecutive sampling). Another group of 30 children from the gastrointestinal outpatient pediatric clinic who had complaints of acute gastroenteritis were selected as 'controls'. Both samples were selected in the period from May 2011 to November 2011. Research ethical committee clearance was obtained and the consent of all enrolled children to participate was obtained in addition to parents' written consent approval.

Inclusion criteria

Both sexes.
Age between 6 and 12 years.
Consent to participate in this study was obtained through an informed consent from the legal guardian.
Children with average or below average intelligence quotient (IQ).

Exclusion criteria

Refusal to participate in this study by the legal guardian or refusal of the child to participate.
Patients with chromosomal anomalies (syndromes) comorbid with the CHD.
Current or history of other chronic medical condition.

Methods

The participants of the study were subjected to the following:

Semistructured interview

Patients and controls were interviewed using a history taking sheet designed at the Department of Psychiatry, Beni-Suef University. This included detailed developmental, family, educational, and past history. Also, it included a mental status examination. Psychiatric diagnoses, if any, had been made according to the *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed. [10] diagnostic criteria.

Wechsler Intelligence Scale for Children [11]

This is one of the best standardized and most widely used intelligence tests in clinical practice today. Designed in 1939, the original Wechsler Adult intelligence Scale has gone through several revisions. This scale can be used for children 5–15 years of age.

This scale consists of verbal subtests, which include the following:

- (1) Knowledge.
- (2) Comprehension.

- (3) Arithmetic.
- (4) Similarities.

This scale also has performance subtests, which include the following:

- (1) Picture completion.
- (2) Block design.
- (3) Picture arrangement.
- (4) Object assembly.
- (5) Digit symbol.

The raw score obtained by a child examined for each subtest was transformed into a standard score according to tables of standardization. Then, the total IQ, verbal IQ, and performance IQ can be determined according to the use of specific tables.

In this study, we used the Wechsler Intelligence Scale for Children (short form). This was supported by Donders [12], who concluded that this short form of the Wechsler Intelligence Scale for Children-III (eight subtests) is a valid substitute for the complete version under most clinical circumstances and allows the practitioner to expand on interview, history, or more specific neuropsychological tests without adding financial or time burdens to the evaluation.

Children's Depression Inventory: this scale was designed by Gharib [13]

The test was derived from the Beck Depression Inventory for adults. It was translated into Arabic and was prepared for Egyptian culture use. The inventory includes 27 groups of statements. Each statement had a score of 0, 1, and 2. This test can be used for children 6–16 years of age.

Anxiety Scale for Children: this scale was developed by El Beblawy [14]

The Anxiety Scale for Children is the Arabic version of the Children's Manifest Anxiety Scale. It was prepared and translated into Arabic by El Beblawy [14] to be suitable for the Egyptian community.

The scale consists of 42 items for the measurement of anxiety in children, which the child answers with a yes or no response.

Achenbach's Child Behavior Checklist

This instrument was initially designed by Achenbach [15] to provide a reliable means of assessing the behavior problems and social competencies of children 4–16 years of age. It is one of the most extensively used parent report questionnaires that assesses social competencies and behavioral problems in children. It consists of nine subscales, measuring variable behavioral disorders in children. The Arabic version was developed by El-Defrawi and Mahfouz [16]. The instrument was initially translated into Arabic for use with Egyptian patients. After being modified during the course of this review, the instrument was back translated by a professional translator.

All scales were applied in Arabic language.

Statistical analysis

We computerized special data files using Excel program 2010. Data were converted using SPSS software program version 17.0 (The SAS Institute Inc., Cary, North Carolina, USA), analyzing the characteristics of the samples. Numbers and percentages were calculated in terms of sex distribution and type of diagnosis. We compared the quantitative scores in cases and controls using a *t*-test, and *P*-values were calculated. Significance was set at 0.05. When the *P*-value was less than 0.05, the test was considered significant. Tables were presented using the same SPSS program [17].

Results

Table 1 showed a nonsignificant difference in the mean age and sex between patients and controls.

Table 2 showed that the majority of patients (23.4%) had adjustment disorder.

Table 3 showed a highly significant difference between patients and controls in picture arrangement, object assembly, and digit symbol (performance subscales).

Table 4 showed that there is a significant difference between patients and controls in anxiety and depression scales.

Table 1 Comparison between the patients and the controls in terms of age and sex

	Patients (n=30)	Controls (n=30)	P-value
Age (mean \pm SD)	9.2 \pm 2.9	10.6 \pm 3.2	0.223
Sex [N (%)]			1
Male	17 (56.7)	16 (53.3)	
Female	13 (43.3)	14 (46.7)	

Table 2 Distribution of psychiatric diagnosis among the patient group

Diagnosis	N (%)
Adjustment disorder with depressed mood	3 (10)
Adjustment disorder with depressed and anxious mood	4 (13.4)
Conduct traits	1 (3.3)
Oppositional defiant disorder	1 (3.3)

Table 3 Comparison between the patients and the controls on the Wechsler Intelligence Scale for Children

	Mean \pm SD		P-value
	Patients (n=30)	Controls (n=30)	
Total	91.71 \pm 1.76	92.63 \pm 1.88	0.055
Verbal total	92.90 \pm 1.94	93.19 \pm 2.01	0.572
Performance total	92.03 \pm 1.99	92.03 \pm 2.07	1.00
Knowledge	9.01 \pm 1.04	9.11 \pm 0.99	0.704
Comprehension	7.23 \pm 0.47	7.23 \pm 0.47	1.000
Arithmetic	7.56 \pm 0.49	7.46 \pm 0.57	0.469
Similarities	8.39 \pm 1.99	8.45 \pm 1.99	0.907
Picture arrangement	7.29 \pm 0.79	8.21 \pm 0.84	<0.001
Object assembly	7.47 \pm 0.79	8.46 \pm 0.48	<0.001
Picture completion	7.37 \pm 0.80	7.41 \pm 0.78	0.845
Block design	7.70 \pm 0.82	7.74 \pm 0.83	0.852
Digit symbol	7.83 \pm 0.92	8.83 \pm 0.99	<0.001

Table 5 showed a significant difference between patients and controls on anxious depressed, withdrawal depressed, thought problems and rule-breaking behavior, internalizing, and total score of Achenbach's Child Behavior Checklist.

Discussion

CHD represent the second main cause of death in children, and are associated with psychological maladjustment [18] and cognitive decline [19]. In our study, we attempted to determine the presence of depression, anxiety, and cognitive impairment in children with CHD. Our patients showed a nonsignificant difference compared with controls, where their mean age was 9.2 \pm 2.9 years compared with the controls, 10.6 \pm 3.2. Also, there was a nonsignificant difference between both groups in terms of sex as there were 17 (56.7%) males among the patients and 16 (53.3%) among the controls, whereas there were 13 females (43.3%) among the patients and 14 (46.7%) among the controls. This study showed that patients had lower scores on the Wechsler Intelligence Scale for Children compared with the controls (total scores 91.71 \pm 1.76 for patients and 92.63 \pm 1.88 for controls, verbal IQ 92.90 \pm 1.94 for patients and 93.19 \pm 2.01 for controls, and performance part 92.03 \pm 1.99 for patients and 92.03 \pm 2.07 for controls), with no significant difference. However, this difference did not reach significance, and there was a significant difference in the performance subscales such as in picture arrangement, object assembly, and digit symbol ($P \leq 0.001$).

Table 4 Comparison between the patients and the controls on the Anxiety Scale for Children and Children's Depression Inventory

	Mean \pm SD		P-value
	Patients (n=30)	Controls (n=30)	
Anxiety Scale for Children	28.7 \pm 6.3	24.6 \pm 4.8	0.006
Children's Depression Inventory	15.6 \pm 3.0	13.9 \pm 2.4	0.019

Table 5 Comparison between the patients and the controls on the Achenbach's Child Behavior Checklist (subscales, internalizing, externalizing, and total)

	Mean \pm SD		P-value
	Patients (n=30)	Controls (n=30)	
Anxious depressed	8.3 \pm 3.2	5.6 \pm 3.7	0.004
Withdrawal depressed	5.2 \pm 2.1	3.9 \pm 2.5	0.033
Somatic complaints	6.5 \pm 2.7	5.2 \pm 2.5	0.058
Social problems	5.7 \pm 2.5	4.5 \pm 2.3	0.058
Thought problems	7.4 \pm 3.6	4.9 \pm 3.1	0.006
Attention problems	5.7 \pm 2.3	4.8 \pm 2.2	0.127
Rule-breaking behavior	7.5 \pm 2.6	6.2 \pm 2.4	0.049
Aggressive behavior	5.6 \pm 2.3	4.6 \pm 2.4	0.105
Other problems	9.8 \pm 4.9	8.6 \pm 4.2	0.313
Internalizing	64.3 \pm 9.7	56.8 \pm 7.5	0.001
Externalizing	63.1 \pm 10.4	63.8 \pm 7.9	0.771
Total score	66.5 \pm 11.4	60.6 \pm 8.7	0.028

This result was consistent with that of Van Der Rijken *et al.* [9], who provided a detailed description of problem areas in the functioning of these children. Areas of motor function and perceptual organizational abilities, such as visuospatial and visuomotor integration skills, are most vulnerable. Mahle *et al.* [20] found a cognitive decline in children with heart disease, and this may possibly be explained by the fact that heart diseases were associated with risk factors that have a cumulative adverse effect on cognitive functioning. For example, patients with more severe disease are at an increased risk for congenital brain anomalies that may be associated with prenatal physiological events and by chromosomal anomalies [21]. Moreover, patients with heart disease are at an increased risk for acquired cognitive impairments as a result of more difficult and frequent surgery preoperatively and postoperatively, poor cerebral perfusion, seizures, and physical incapacity [22]. In addition to the direct effects of hypoxia and other heart-related factors, it is also likely that more prolonged cyanosis, influence of parenting attitudes, treatment of the child by teachers and peers, and self-esteem could all affect cognitive and academic performance [19].

Patients in this study had a score of 28.7 ± 6.3 on the Anxiety Scale of children and controls had a score of 24.6 ± 4.8 , with a significant difference between both groups ($P = 0.006$). However, patients had a score of 15.6 ± 3.0 on Children's Depression Inventory and controls had a score of 13.9 ± 2.4 , with a significant difference between both groups ($P = 0.019$). According to the *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed. [10] criteria, 10% of children were diagnosed with adjustment disorder with depressed mood in addition to 13.3% with adjustment disorder with depressed and anxious mood. This result was consistent with that of Gupta *et al.* [6], who found that children with heart diseases experience depression and anxiety because of postoperative stress, frequent hospitalization, daily medications, and limitations imposed by the disease and, in most of the cases, depression is under-recognized, either because health professionals consider it inevitable or because children are not able to seek help. In contrast, patients with complex heart disease and those who are in the end stage tend to express anxiety and depression as the fear of imminent death is quite strong. Poor social acceptance is another factor in the development of anxiety and depression. Physical impairment makes the children unable to perform their duties with feeling of rejection, loneliness and social isolation [23]. Another important factor in the development of anxiety and depression is the familial reaction to the illness. The relationship of the patient to different family members can affect the reaction of the children to the stress produced by the disease. Another major mistake made by the family is overprotection. This makes the children less initiative and reduce their abilities with feeling of low self-esteem. Also, this allows passing of parents' anxiety toward the child [24]. The patients in this study had more internalizing than externalizing problems, with a significant difference between patients and controls in the internalizing scores of Achenbach's Behavior

Checklist (the mean score of patients on internalizing problems was 64.3 ± 9.7 and that for controls was 56.8 ± 7.5 , $P = 0.001$, whereas the mean score of patients on externalizing problems was 63.1 ± 10.4 and that for controls was 63.8 ± 7.9 , $P = 0.771$). This had been emphasized by the significant difference in anxious depressed and withdrawal depressed subscales ($P = 0.004$ and 0.033 , respectively). Also, children showed a significant difference in terms of the rule-breaking behavior externalizing subscale ($P = 0.049$). Psychiatric diagnosis indicated only one child with conduct traits and another with oppositional defiant disorder (Table 2). This result was in agreement with that of LeBovidge *et al.* [25], who found that children with heart diseases show an increased risk of overall, internalizing, and to a lesser extent externalizing behavior problems. These findings suggest that exposure to potential risk factors during the course of a patient's life may increase the development of specifically internalizing behavior problems in older children with heart diseases. The finding that older children with heart diseases showed more internalizing than externalizing problems is consistent with other reviews of pediatric chronic disease [26]. Future research should focus on the mechanisms that may explain the increased levels of internalizing problems among older children with heart diseases. An overprotective parenting style in heart diseases may be a possible risk factor for internalizing problems. Alternatively, hormonal and brain changes during old children period triggering the expression of genetic vulnerabilities in combination with potential stressful disease experiences may increase the internalizing behavior problems [27].

Conclusion

There is a high prevalence of behavioral, emotional, and cognitive problems in children with CHD. A comprehensive approach in this field is essential so that effective psychiatric interventions and guidance can be planned.

Limitations

Despite this careful attention to methodology, the study has important limitations that must be borne in mind when interpreting the results. The sample size was small; thus, we could not deal with CHD separately or even divide the patients into cyanotic versus noncyanotic groups.

Recommendations for further researches are to perform a psychiatric assessment of the CHD by dividing patients into cyanotic and acyanotic subgroups and to increase the sample size. Also, longitudinal studies with a preoperative psychiatric assessment at a younger age must be carried out and compared later postoperatively.

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Conflicts of interest

There are no conflicts of interest.

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الأعراض النفسية بين الأطفال المصابين بأمراض القلب الخلقية

الهدف: الاثار النفسية هي جزء هام فى الامراض المزمنة والتي يمكن أن تؤثر على التشخيص والنتائج. والهدف هو دراسة وجود أعراض الاكتئاب والقلق والعجز المعرفى بين الأطفال الذين يعانون من أمراض القلب الخلقية فى فترة ما بعد الجراحة. الطريقة: قد تم تقسيم العينة إلى مجموعتين: المجموعة الأولى وتشمل ثلاثون مريضاً من الأطفال الذين يعانون من أمراض القلب الخلقية والمجموعة الثانية وتشمل ثلاثين من الأطفال الذين لا يعانون من أمراض القلب الخلقية " ضوابط".

وقد استخدمت الاختبارات والفحوصات التالية على جميع أفراد المجموعتين:

- 1- التقييم الإكلينيكي.
- 2- اختبار وكسلر لقياس الذكاء للأطفال (WISC).
- 3- مقياس القلق للأطفال.
- 4- مقياس الاكتئاب عند الأطفال.
- 5- قائمة السلوك عند الأطفال.

النتائج: أظهرت الدراسة وجود اختلافات ذات دلالات إحصائية كبيرة بين المجموعتين فى مقياس القلق للأطفال ومقياس الاكتئاب للأطفال والأعراض الداخلية بقائمة السلوك عند الأطفال وبعض الاختبارات العملية باختبار وكسلر لقياس الذكاء للأطفال.

والخلاصة: كان هناك ارتفاع بمعدل انتشار المشكلات السلوكية والعاطفية والإدراكية لدى الأطفال المصابين بأمراض القلب الخلقية.