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Original research article

FREQUENCY OF CLINICAL SYNDROMES IN CHILDREN WITH CONGENITAL HEART DEFECTS ADMITTED AT TERTIARY CARE HOSPITAL

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Abstract: *Congenital Heart Disease, more commonly known as CHD, is among the most common forms of heart disease that affect children as well as adults.* ***Objective:*** *The study's primary purpose is to find the frequency of clinical syndromes in children with congenital heart defects admitted at tertiary care hospitals.* ***Methods:*** *This retrospective observational study was conducted at MMC Teaching Hospital Peshawar from January 2023 to June 2023. Data were collected from 295 patients suffering from CHD and admitted at tertiary care hospitals. Children aged 0-18 years and with confirmed diagnosis of CHDs via echocardiography, cardiac MRI, or cardiac catheterization were included in the study. Patients who underwent heart surgery before initial diagnosis at the study hospital were excluded. Data were collected from hospital records, including demographic information, clinical presentation, type of congenital heart defect, associated clinical syndromes, and comorbidities.* ***Results:*** *Data were collected from 295 patients. Patients with congenital heart defects (CHDs) were young children, with 64.4% aged between 0 to 5 years. There was a slight male predominance, accounting for 54.2% of the patients. Cyanosis was most prevalent in patients with Tetralogy of Fallot (77.8%), while heart failure was commonly observed in those with Ventricular Septal Defect (44.4%) and Coarctation of the Aorta (50.0%). Growth retardation was significantly associated with Tetralogy of Fallot (44.4%) and Ventricular Septal Defect (27.8%).* ***Conclusion:*** *It is concluded that children with congenital heart defects experience a high frequency of clinical syndromes, necessitating early diagnosis and specialized, multidisciplinary care. Tailored management strategies based on specific CHD types can significantly improve these patients' health outcomes and quality of life.*

Keywords: Congenital Heart Defects, Growth Retardation, Heart Failure, Tetralogy of Fallot, Ventricular Septal Defect.

Introduction

Congenital heart defects (CHDs) represent a significant medical challenge, particularly among the pediatric population. These structural abnormalities of the heart, present at birth, can lead to various clinical syndromes, impacting the overall health and development of affected children (1). Despite advancements in medical science, CHDs remain one of the most prevalent congenital anomalies worldwide, necessitating comprehensive research and understanding of their associated clinical manifestations. Congenital Heart Disease, more commonly known as CHD, is among the most common forms of heart disease that affect children as well as adults (2). CHD takes a significant proportion of all major congenital malformations that occur in two to three percent of neonates in most regions. At the same time, the prevalence of CHD ranges from 3-10/1000 live births all over the world. In the case of children born with specific congenital abnormalities in Pakistan, around 40,000 children are estimated to be affected by congenital heart defects every year (3). Thus, the incidence was determined as equal to 8. 0/1000 live births based on research carried out in China and 8. 0.001 percent prevalence from a study done in Atlanta per one thousand live births. In developing nations, the prevalence of congenital heart defects is on the rise day by day due to a rise in risk factors &etelogical factors associated with congenital heart disease (4). This implies that mortality among CHD cases is high; additionally, the majority of the cases present at cardiac facilities when complications have occurred, which also contributes to the already high mortality rates. In developed countries, awareness, early intervention, and correct management have raised the survival rates from 80% down to 20%, thus voguish an increase in the number of adults with CHD (5). Congenital heart disease can be classified into simple and complex categories, and each can further be subdivided into many varieties. It is, in fact, the largest category of congenital anomalies, contributing about 30% of the total, with much emphasis on mortality, especially during infancy, depending on the type and severity of the lesion. However, it should be pointed out that the heart ailment herein is not a disease but a defect/abnormality (6). Heart defects can be present at birth; they are sometimes singly but more often are observed in conjunction with other heart defects. They are also present as a component alongside specific syndromes. Some types of CHD are classified into Major

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congenital heart defect (MCHD), which describes a structural abnormality of the heart and the great arteries or need for surgical or catheter intervention in the first six months of life. The frequency of clinical syndromes in children with CHD varies widely, influenced by the type and severity of the defect, as well as other genetic and environmental factors. Understanding these frequencies is crucial for early diagnosis, effective management, and improving the quality of life for these young patients. Clinical syndromes associated with CHDs often include a range of cardiovascular symptoms such as cyanosis, heart murmurs, and fatigue. Still, they can also encompass broader systemic issues like growth retardation and developmental delays (7).

Objective

The study's main objective is to find the frequency of clinical syndromes in children with congenital heart defects admitted at tertiary care hospitals.

Methodology

This retrospective observational study was conducted at MMC Teaching Hospital Peshawar from January 2023 to June 2023. Data were collected from 295 patients suffering from CHD and admitted at tertiary care hospitals. Children aged 0-18 years and with confirmed diagnosis of CHDs via echocardiography, cardiac MRI, or cardiac catheterization were included in the study. Patients who underwent heart surgery before initial diagnosis at the study hospital were excluded. Data were collected from hospital records, including demographic information, clinical presentation, type of congenital heart defect, associated clinical syndromes, and comorbidities. Syndromes documented included but were not limited to cyanosis, heart failure, growth retardation, and recurrent respiratory infections. The primary variables analyzed were the type of congenital heart defect, frequency, and type of clinical syndromes associated with CHDs. Data were analyzed using SPSS v29.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Statistical significance was set at $p < 0.05$. All statistical analyses were performed using SPSS version 26.0 (IBM Corp., Armonk, NY).

Results

Data were collected from 295 patients. Patients with congenital heart defects (CHDs) were young children, with 64.4% aged between 0 to 5 years. There was a slight male predominance, accounting for 54.2% of the patients. Most patients (67.8%) resided in urban areas, reflecting better access to healthcare services in these regions. Socioeconomic status indicated that half of the patients (50.8%) were from low-income families.

Table 1: Demographic Characteristics of Patients with CHDs

Demographic Characteristic	Number of Patients (%)
Age Distribution	
0 - 1 year	80 (27.1)
1 - 5 years	110 (37.3)
6 - 10 years	60 (20.3)
11 - 15 years	30 (10.2)
16 - 18 years	15 (5.1)
Gender	
Male	160 (54.2)
Female	135 (45.8)
Geographic Distribution	
Urban	200 (67.8)
Rural	95 (32.2)
Socioeconomic Status	
Low	150 (50.8)
Middle	100 (33.9)
High	45 (15.3)

The mean weight was 12.5 kg, ranging from 3.0 to 40.0 kg, and the mean height was 85.3 cm, ranging from 50.0 to 160.0 cm. The average Body Mass Index (BMI) was 16.2 kg/m², ranging from 10.0 to 25.0 kg/m². Oxygen saturation levels averaged 88.5%, reflecting the impact of CHDs on oxygenation, with values ranging from 60.0% to 98.0%. Hemoglobin levels averaged 12.0 g/dL, indicating a tendency toward anemia.

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Table 2: Baseline Clinical Values of Patients with CHDs

Clinical Value	Mean ± Standard Deviation	Range
Weight (kg)	12.5 ± 6.2	3.0 - 40.0
Height (cm)	85.3 ± 22.4	50.0 - 160.0
Body Mass Index (BMI) (kg/m²)	16.2 ± 3.4	10.0 - 25.0
Oxygen Saturation (%)	88.5 ± 7.6	60.0 - 98.0
Hemoglobin (g/dL)	12.0 ± 1.8	8.0 - 16.0
Ejection Fraction (%)	55.2 ± 9.1	30.0 - 75.0
Heart Rate (beats per minute)	110 ± 20	70 - 160
Respiratory Rate (breaths per minute)	30 ± 8	20 - 50

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Cyanosis was most prevalent in patients with Tetralogy of Fallot (77.8%), while heart failure was commonly observed in those with Ventricular Septal Defect (44.4%) and Coarctation of the Aorta (50.0%). Growth retardation was significantly associated with Tetralogy of Fallot (44.4%) and Ventricular Septal Defect (27.8%).

Table 3: Association Between CHD Types and Clinical Syndromes

CHD Type	Cyanosis (%)	Heart Failure (%)	Growth Retardation (%)	Recurrent Respiratory Infections (%)
Atrial Septal Defect	10 (16.7)	20 (33.3)	12 (20.0)	18 (30.0)
Ventricular Septal Defect	25 (27.8)	40 (44.4)	25 (27.8)	30 (33.3)
Tetralogy of Fallot	35 (77.8)	15 (33.3)	20 (44.4)	25 (55.6)
Patent Ductus Arteriosus	5 (12.5)	15 (37.5)	5 (12.5)	7 (17.5)
Coarctation of the Aorta	5 (25.0)	10 (50.0)	3 (15.0)	5 (25.0)
Other Types	15 (37.5)	10 (25.0)	5 (12.5)	10 (25.0)

Pulmonary hypertension was observed in 15.3% of patients, with similar prevalence across Atrial Septal Defect (16.7%), Ventricular Septal Defect (16.7%), and Patent Ductus Arteriosus (17.5%). Respiratory tract infections were prevalent in 28.8% of patients, exceptionally high in those with Tetralogy of Fallot (55.6%) and Ventricular Septal Defect (33.3%). Failure to thrive affected 20.3% of patients, notably those with Ventricular Septal Defect (27.8%) and Coarctation of the Aorta (25.0%). Neurological disorders and gastrointestinal disorders were less common, affecting 6.8% and 5.1% of patients, respectively, but were distributed across various CHD types.

Table 4: Comorbid Conditions in Children with CHDs

Comorbid Condition	Number of Patients (%)	ASD (%)	VSD (%)	TOF (%)	PDA (%)	CoA (%)	Other Types (%)
Pulmonary Hypertension	45 (15.3)	10 (16.7)	15 (16.7)	5 (11.1)	7 (17.5)	3 (15.0)	5 (12.5)
Respiratory Tract Infections	85 (28.8)	18 (30.0)	30 (33.3)	25 (55.6)	7 (17.5)	5 (25.0)	10 (25.0)
Failure to Thrive	60 (20.3)	12 (20.0)	25 (27.8)	10 (22.2)	3 (7.5)	5 (25.0)	5 (12.5)
Neurological Disorders	20 (6.8)	3 (5.0)	5 (5.6)	3 (6.7)	3 (7.5)	2 (10.0)	4 (10.0)
Gastrointestinal Disorders	15 (5.1)	3 (5.0)	4 (4.4)	2 (4.4)	2 (5.0)	2 (10.0)	2 (5.0)

Discussion

This study provides a comprehensive analysis of the frequency of clinical syndromes in children with congenital heart defects (CHDs), utilizing data from 295 pediatric patients. As expected, a high prevalence of clinical syndromes with various severities was observed: cyanosis 32. 2%, heart failure 37. 3%, growth retardation 23. 7%, and recurrent respiratory infections 28. 8%. These syndromes were related to the particular CHDs, for example, cyanosis along with tetralogy of Fallot, heart failure with Ventricular septal defect, & coarctation of the aorta. This is crucial in underlining the importance of establishing differential management approaches to enhance the performance of patients with different kinds of CHD (8).

The study also revealed that genetic predictors prevailed among the patients, notably Down syndrome, having a prevalence rate of 11. 9%, DiGeorge syndrome was 6. 8%, and Turner syndrome was 3. 4%. These genetic conditions pose health issues in the clinical management of CHDs, given that the patient has to deal with other conditions. Also, new comorbid conditions included pulmonary hypertension 15. 3%, and there is a history of recurrent respiratory infections 28. 8%, and failure to thrive 20. 3% supports the comprehensive care delivery models for these children (9). The primary demographic data showed that the patients treated at the hospital were relatively very youthful, with a total complete percentage of 64 percent. 4% of the affected population was between 0-5 years, so early detection and treatment is paramount. The male-to-female ratio was slightly tilted in the male's favor (54. 2%), while a large number of patients hailed from the urban areas (67. 8%), which could be owed to their probable better literacy about available healthcare products and services (10). The socioeconomic status data revealed that many patients (50. 8%) belong to a low SEP, suggesting appropriate and affordable medical care availability is relevant for patients of such background. The concepts of the baseline period were significantly different; therefore, the variability of the clinical values corresponded to a highly heterogeneous group of children with CHDs (11). For example, the mean oxygen saturation was 88, lower than the overall mean of UE patients at 94. 5 percent, especially in cyanotic heart diseases, and the mean hemoglobin showed probable anemia (10). These baseline values are important because they determine the parameters of particular care strategies and actions. However, it should be noted that the study has some limitations. A limitation of the retrospective design is that the study is only as good as the medical records data, which may have reporting bias.

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Conclusion

It is concluded that children with congenital heart defects experience a high frequency of clinical syndromes, necessitating early diagnosis and specialized, multidisciplinary care. Tailored management strategies based on specific CHD types can significantly improve these patients' health outcomes and quality of life.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate.
It is approved by the department concerned. (IRB-MMC-w309/22)
Consent for publication
Approved
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Conflict of interest

The authors declared an absence of conflict of interest.

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