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Original Article

Clinical and Anthropometric Profile of Congenital Heart Disease in Children Admitted in Pediatric Ward

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Abstract

Introduction: Congenital heart disease (CHD) is defined as an abnormality in "cardio circulatory" structure or function that is present since birth; incidence being 8 CHD's per 1000 live births. Early establishment of diagnosis is important as newer available treatment modalities can significantly decrease mortality and morbidity. With limited resources in developing countries like India, clinical acumen still forms the backbone of diagnosis and later to be confirmed by echocardiography and to deliver the appropriate management at the right time.

Materials and Methods: Patients from 1 month to 14 years of age with features suggestive of CHD admitted in Department of Pediatrics, Netaji Subhash Chandra Bose Medical College, Jabalpur, were enrolled during the study period, that is, October 2014-September 2015 who fulfilled the inclusion and exclusion criteria. A standard pro forma was used during initial evaluation to get the detailed history and the clinical examination findings along with chest X-ray and electrocardiogram were evaluated, and clinical diagnosis is ascertained and subjected to two-dimensional echocardiographic evaluation to confirm the diagnosis.

Results: We observed that the major types of CHDs were ventricular septal defect (VSD) (33.3%), atrial septal defect (18.2%), tetralogy of fallot (TOF) (15.2%), and patent ductus arteriosus (6.1%). Male-to-female ratio was 2:1. Common symptoms were fever (78.7%) breathlessness (72.7%), fatigue (54.8%), anemia (45.5%), cough (43.5%), poor weight gain (40.9%), recurrent chest infection (34.8%), feeding problems (18.18%), palpitation (21.7%), and bluish discoloration of lips and fingertips (18.18%). Murmur with or without thrill and cardiomegaly was the most important cardiac finding. 54.5% of the study group children had their weight for age below −3 standard deviation.

Conclusion: Acyanotic heart diseases were found to be more common than cyanotic disease. VSD was found to be the most common acyanotic disease and TOF was found to be the most common cyanotic CHD. Majority of the children were malnourished and weight was found to be more affected than height in both cyanotic and acyanotic groups. Both height and weight were affected more in cyanotic group when compared to acyanotic group.

Key words: Anthropometry, Congenital heart disease, Echocardiography

INTRODUCTION

Congenital heart disease (CHD) comprises one of the major diseases in pediatric age group and is one of the leading causes of death in children with congenital malformations.[1] CHD by definition is the structural or functional heart disease present at the time of birth, even if it is detected later on.[2]

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The incidence of CHD in the normal population is approximately 0.5-0.8% of live-born children, with a higher percentage in those aborted spontaneously or still born.[3] In our country, majority of child births still takes place at home and routine neonatal screening is not common, so it is difficult to calculate the true birth prevalence of CHD.

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To detect as many children with CHD as possible, including those with mild lesions, very intensive studies are required which may not be available at all hospitals.

Two-dimensional echocardiography (ECHO) has revolutionized the diagnosis and management of cardiac malformations. It is a non-invasive investigation that can precisely diagnose most CHDs as well as offer treatment options, whether medical or surgical.[1]

CHD may present at any age group ranging from neonate to adolescence and clinical presentation varies, from being totally asymptomatic to fatal complications.[4]

CHD, if left untreated is an important cause of morbidity and mortality in children, therefore early diagnosis and proper intervention is most important.

Many cases of CHD attend pediatric unit at Netaji Subhash Chandra Bose Medical College and Hospital, Jabalpur, and studies regarding relative frequency, age, sex distribution, and clinical profile of CHD are very scanty from this region.

MATERIALS AND METHODS

This was a prospective, observational study conducted in the Department of Pediatrics. 66 patients were registered for this study over 1 year from January 2014 to 2015.

This study is carried out in children aged 0-14 years old. The cases with suspected CHD will be studied and confirmed by electrocardiography, chest X-ray, and ECHO. Written consent will be taken from the parents. All cases will be evaluated using the following variables age, sex, signs and symptom of CHD, type of CHD based on ECHO report, length, weight, Z-scores will be calculated for height/length for age, weight for age and weight for height/length, mid-upperarm circumference (below age of 5 years), duration of hospital stay, and immediate outcome. Height is measured in centimeters using infantometer below the age of 2 years and stadiometer above the age of 2 years and weight in kilograms using infant weighing scale and adult weighing scale. Head circumference is recorded at the level of supraorbital ridge to occipital protuberance in centimeters.

Inclusion Criteria

1 month-14 year's both male and female with CHDs clinically detected and confirmed by investigations.

Exclusion Criteria

1. Age <1 month
2. Children with acquired heart disease
3. Unstable patients who died before the confirmation of diagnosis.

RESULT

This study included 66 patients of Congenital heart disease. 36 (54.5%) patients presented before 6 months of life. 10 of them, that is, 15.2% presented between 6 and 12 months, 4 patients (6.1%) presented between 1 and 2 years of age, 8 patients (12.1%) presented between 2 and 4 years, and similarly 8 patients (12.1%) presented after 4 years of age. There were 44 male and 22 female patients in our study and the ratio being 2:1.

Acyanotic CHD outnumbered cyanotic CHD. The most common lesion was ventricular septal defect (VSD) alone 36 (33.3%), followed by atrial septal defect (ASD) alone 22 (18.2%), tetralogy of fallot (TOF) 12 (15.2%), complex cyanotic 8 (12.1%), and patent ductus arteriosus (PDA) 4 (6.1%). 6 (9.09%) patients had ASD with VSD and 2 patients (3.03%) each in groups ASD + VSD + PDA and VSD + PDA.

Clinical symptoms observed were fever 52 (78.79%), breathlessness 48 (72.73%), feeding problem 12 (18.18%), and cyanosis 12 (18.18%). Poor weight gain was presentation in 8 (12.12%) cases, and 14 (21.21%) patients presented with other symptoms.

History of first-degree consanguineous marriage was there in 18 parents (27.27%) and CHD in sibling was present in 2 children (3.03%). 4 patients had cleft lip and cleft palate. 2 (3.03%) children had Down syndrome. Imperforate anus, inguinal hernia, and biliary atresia were found in one patient each.

Examination findings observed in our study were respiratory distress 48 (72.73%), cyanosis 12 (318.18%), pallor 24 (36.3%), shock 2 (3.03%), and respiratory failure 2 (3.03%).

In our study, 52 (78.79%) children with CHD presented with murmur, 10 (15.15%) children (6.06%) had abnormal 1st or 2nd hear sounds on auscultation, and 10 children had normal findings on auscultation at presentation(Table 1-5).

Anthropometry

Weight for age

In children with acyanotic CHD, 26 (55%) of patients were found to have weight for age < −3 standard deviation (SD) and 12 (25%) of patients were having weight for age falling between −2 SD and −3 SD. In children with cyanotic CHD, 10 (55.5%) patients were found to have weight for age <−3 SD and 4 (22.2%) patients were having weight for age falling between −2 SD and −3 SD.

Height for age (H/LFA)

A total of 14 (48.48%) children with acyanotic heart disease had their height for age below −3 SD and 12 (25%) of patients had their height for age falling between −2 SD and −3 SD. 2 (11.1%) of children with cyanotic heart disease had their height for age below −3 SD and 6 (33.3%) of patients had their height falling between −2 SD and −3 SD.

Weight for height

A total of 4 (83.3%) children with acyanotic heart disease had their height for age below −3 SD and 18 (37.5%) of patients had their height for age falling between −2 SD and −3 SD. None of the children with cyanotic heart disease had their height for age below −3 SD and 6 (36.36%) of patients had their height falling between −2 SD and −3 SD.

Table 1: Age-wise distribution of cases

Age group	Number of patients (%)
<6 months	36 (54.5)
6-12 months	10 (15.2)
13-24 months	4 (6.1)
25-48 months	8 (12.1)
>48 months	8 (12.1)

Table 2: Gender distribution of CHD

Gender	Frequency (%)
Male	44 (66.6)
Female	22 (44.4)

CHD: Congenital heart disease

Table 3: Relative frequency of various types of CHD

Types of CHD	Number of patients (%)
VSD	22 (33.3)
ASD	12 (18.2)
TOF	10 (15.2)
PDA	4 (6.1)
Complex cyanotic	8 (12.1)
ASD+VSD	6 (9.09)
ASD+VSD+PDA	2 (3.03)
VSD+PDA	2 (3.03)

CHD: Congenital heart disease, VSD: Ventricular septal defect, ASD: Atrial septal defect, PDA: Patent ductus arteriosus, TOF: Tetralogy of fallot

Body mass index (BMI)

A total of 13 (27.2%) children with acyanotic heart disease had their BMI below −3 SD and 8 (16.6%) of patients had their BMI falling between −2 SD and −3 SD. 6 (30.77%) children with cyanotic heart disease had their BMI below −3 SD and 2 (33.33%) children had their BMI falling between −2 SD and −3 SD.

Mid-upper arm circumference (MUAC)

It was taken in children of age group 6 months-5 years (12 children). Among them, 75% had their MUAC < 12.5 cm and 33.33% had < 11.5 cm.

Head circumference

Out of the total 66 children, 8 (12.1%) children had microcephaly.

DISCUSSION

Age at Presentation (Table 5-10)

The age at detection of CHD varies due to the normal hemodynamic alterations occurring after birth such as fall in pulmonary vascular resistance, physiological, and anatomical closure of PDA. Many CHDs, especially minor defects tend to be asymptomatic and hence missed unless specifically sought.[5]

A study by Jatav *et al.*[5,6] showed only 37.06% of CHD cases were detected by the age of 1 year and up to 15.51% were detected after the age of 18 year, so this delay in the diagnosis can be explained due to lack of awareness, health facilities, and pediatric care program's in India.[7]

Shah *et al.*[8] in their study showed that out of 84 CHD cases, 8 children (9.1%) presented before 1 month of age and 39 cases (46.4%) presented between 1 and 12 months. This study showed that CHD presented more frequently during infancy. 31% of cases presented between 1 and 5 years, 4.8% between 5 and 9 years and 8.3% after 9 years.

Khan *et al.*[9] study on patients from birth to 10 years of age with clinical and ECHO evidence of CHD showed more than two-thirds (71%) patients were < 1 year of age. Out of these, 79 (69.3%) patients had acyanotic and 35 (30.7%) had cyanotic congenital heart lesions.

Table 4: Age-wise distribution of various types of CHD

Age group	ASD	VSD	PDA	ASD+VSD+PDA	ASD+VSD	VSD+PDA	TOF	Complex cyanotic	Percentage
6 month and less	6	12	2	2	6	0	0	8	54.5
7-12 months	2	6	0	0	0	2	0	0	15.2
13-24 months	2	0	0	0	0	0	2	0	6.1
25-48 months	0	4	0	0	0	0	4	0	12.1
>48 months	2	0	2	0	0	0	4	0	12.1

CHD: Congenital heart disease, VSD: Ventricular septal defect, ASD: Atrial septal defect, PDA: Patent ductus arteriosus, TOF: Tetralogy of fallot

Table 5: Clinical presentation of CHD

Complaints	Frequency (%)
Fever	52 (78.79)
Breathing difficulty	48 (72.73)
Feeding difficulty	12 (18.18)
Poor weight gain	27 (40.9)
Other symptoms	14 (21.21)
Cyanosis	12 (18.18)
Pallor	24 (36.36)
Respiratory distress	48 (72.73)
Shock	2 (3.03)
Respiratory failure	2 (3.03)
Murmur	52 (78.79)
Abnormal sounds	10 (15.15)
Anemia	30 (45.5)

CHD: Congenital heart disease

Table 6: Prevalence of undernutrition, failure to thrive, short stature, and microcephaly in children with acyanotic CHD

Standard Deviation	WFA	L/HFA	WFH/A	HC	BMI
<−3 SD	26 (54.1)	14 (29.1)	4 (83.3)	4 (8.3)	13 (27)
−3 to <−2 SD	12 (25)	12 (25)	18 (37.5)	40 (83.3)	8 (16.6)
>−2 SD	10 (20)	22 (45.8)	26 (54.1)	4 (8.3)	27 (56.2)

SD: Standard deviation, CHD: Congenital heart disease

Table 7: Prevalence of undernutrition, failure to thrive, short stature, and microcephaly in children with cyanotic CHD

Standard Deviation	WFA	L/HFA	WFH/L	HC	BMI
<−3 SD	10 (55.5)	2 (11.1)	(0)	4 (22.2)	6 (33.33)
−3 to <2 SD	4 (22.2)	6 (33.3)	6 (36.36)	14 (77.7)	2 (11.1)
>−2 SD	4 (22.2)	10 (55.5)	12 (27.27)	0	10 (55.5)

SD: Standard deviation, CHD: Congenital heart disease

Table 8: Parental consanguinity

History of consanguinity	*N* (%)
Yes	18 (27.27)
No	48 (72.73)

Table 9: CHD in sibling

CHD in sibling	*N* (%)
Yes	2 (3.03)
No	64 (96.97)

CHD: Congenital heart disease

Table 10: Associated malformations

Malformations	Number of patients (%)
Down syndrome	2 (3.03)
Cleft lip/palate	4 (6.06)
Imperforate anus	2 (3.03)
Inguinal hernia	2 (3.03)
Biliary atresia	2 (3.03)

da Silva *et al*. studied on 135 hospitalized children with CHD in Brazil. The average age was 4.74 months (SD ± 3.78) in those children, with 25% up to 1 month and 75% up to 8 months old. However, the highest frequency occurred in the age range of up to 3 months (46.7%).[6]

In our study, 18 out of 33 patients were presented before 6 months of life (54.5%). Five of them, that is, 15.2% presented between 6 and 12 months, 6.1% presented between 1 and 2 years of life, and 12.1% presented between 2 and 4 years of life. Four patients (12.1%) presented after 4 years of age.

Gender Distribution

CHD as a whole occurs with equal frequency in male and females but some lesions such as aortic stenosis (AS), coarctation of aorta, transposition of great vessels, and TOF are more common in males, whereas ASDs are more common in females.[10]

Khan *et al*.[9] stated in their study that out of 114 patients 60 (52.6%) were males and 54 (47.4%) were females with a male-to-female ratio of 1.1:1.

da Silva *et al*. also observed 66.7% were male children, corresponding to two boys for one girl, and this proportion was higher (four boys for one girl) in extreme ends of the confidence intervals, whereas the lowest percentage of female children is 20%, and the highest for male 80%.[6]

In our study, total number of patients was 66, out of which 33 were male and 22 were female with a male-to-female ratio of 2:1.

Clinical Presentation

The clinical presentation of CHD varies according to the type and severity of the defect.[11] In infancy and childhood, the usual presenting features are cyanosis, digital clubbing, murmur, syncope, squatting, heart failure, arrhythmia, and failure to thrive.[12] The adolescent and adults present with heart failure, murmur, arrhythmia, cyanosis, hypertension, and late consequences of previous cardiac surgery (e.g., arrhythmia, heart failure).[12]

Breathlessness 60%, fatigue 54.8%, cough 43.5%, poor weight gain 41.7%, recurrent chest infection 34.8%, fever 28.7%, feeding problem 26.1%, palpitation 21.7%, cyanotic spell 13%, and convulsion 1.7% were the clinical presentations observed by Sharmin *et al*.[13]

Recurrent respiratory tract infections were the most common symptom (40%) in a study by Smita *et al*. in rural India in 2011-2013.[14]

In a study by Sandeep *et al.*,[15] the most common examination finding was tachypnea (88%) followed by tachycardia (76%). Other findings were cyanosis (26%), fever (24%), and 6% of infants had edema.

The clinical symptoms we observed in our study were fever 52 (78.79%), breathlessness 48 (72.73%), feeding problem 12 (18.18%), and cyanosis 12 (18.18%). Poor weight gain was presentation in 8 (12.12%) cases and 14 (21.21%) patients presented with other symptoms.

Relative Frequency of Lesions

The relative frequency of the most common lesions varies with different reports but nine common lesions form 80% of CHD as stated by Jackson *et al.* in their study.[16] These are VSD (36%), ASD (5%), patent arterial duct (9%), atrioventricular septal defect (AVSD) (4%), pulmonary stenosis (PS) (9%), AS (5%), coarctation of aorta (5%), transposition of great arteries (4%), and TOF (4%). The other 20% of CHD consists of many rare or complex lesions.[16]

In our study, VSD was the most common congenital heart defect which was accounting for 33.3% of CHD cases and correlates well with the reported range of 21-53% in the literature. ASD was the second most common CHD in our study comprising 18.2%. This correlates well with the frequency of 10-23% reported in various Indian studies, but it is higher than 6-8% reported from Western countries.[17] TOF was the most common cyanotic CHD comprising 15.2%, correlating well with other studies.[17-20]

Anthropometry

Mechanisms for growth deficiency in CHD are multifactorial including associated chromosomal anomalies/genetic syndromes, inadequate nutrition due to feeding difficulties, and poor nutritional absorption from the digestive tract in chronic congestive heart failure (CHF).[15] However, inadequate caloric intake appears to be the most important cause of growth failure in CHD.[21,22] A characteristic feeding pattern of children with CHD is defined, with a large variation in caloric intake.[21]

Furthermore, increased caloric support is required to sustain the increased myocardial, respiratory, and neurohumoral functions in CHD-related heart failure. Chronic CHF and chronic underoxygenation in CHD impair cellular metabolism and cell growth, whereas repeated chest infections demand an increased metabolism.[23]

Smita *et al.*[14] performed a study on clinical profile of patients with acyanotic CHD in pediatric age group in rural India. In their study, weight of 68% cases was below 10th percentile while height was below 10th percentile in 25% of cases.

According to da Silva *et al.*,[6] variables significant for malnutrition in logistic regression models were sex, type of heart disease, birth weight, birth length, subscapular thickness, triceps thickness, and cephalic circumference.

Associated Anomalies

In the study by Sandeep *et al.*,[15] the most common associated anomaly was involving the musculoskeletal system (58.33%) which includes Congenital Telipes Equinovarus, Polydactyly(CTEV), and webbed neck. Down syndrome was seen in 5 children. In our study, two patients had cleft lip and cleft palate. One child had Down syndrome. Imperforate anus, inguinal hernia, and biliary atresia were found in 2 patients each.

Parental Consanguinity

Becker *et al.* in his study found that the first-cousin consanguinity was significantly associated with VSD, ASD, AVSD, PS, and pulmonary atresia. There was no relationship between consanguinity and TOF, tricuspid atresia, AS, coarctation of the aorta, and PDA.

In the present study, the history of first-degree consanguineous marriage was there in 18 (27.27%).

CONCLUSION

CHD is the leading cause of death in children with malformation. Acyanotic heart diseases were found to be more common than cyanotic disease. VSD was found to be the most common acyanotic disease, and TOF was found to be the most common cyanotic CHD. Weight was found to be more affected than height in both cyanotic and acyanotic groups. Both height and weight were affected more in cyanotic group when compared to acyanotic group.

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