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Original Research Article

Clinical and anthropological profile of children presenting with features of congenital heart disease at tertiary care centre

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ABSTRACT

Background: Congenital heart diseases (CHD) are one of the most common causes of morbidity and mortality and also contribute to significant amount of malnutrition in pediatric population. This study was conducted to know the clinical features and anthropological parameters in children with CHD.
Methods: Children between the age group of 0-18 years with presenting complaints of CHD were enrolled. All relevant information of individual patient were collected. Detailed evaluation and physical examination along with detailed anthropometry measurements were taken. Echocardiograms were performed for definite diagnosis.
Results: A total of 70 children were present during the study period. The most common age group for CHD was 1 month to 5 years with 66% (46 cases). Acyanotic heart diseases were observed in 72.9% of cases and cyanotic CHD was observed in 21.4% of cases. VSD was the most common acyanotic CHD with 41.1% cases while TOF was the most common cyanotic CHD with 67% cases. The most usual presenting symptoms in children with CHDs were breathlessness with 70% cases, failure to thrive in 57% cases and cough in 43% cases. Male-to-female ratio was 1.7:1. The 63% children had weight-for-age of ≤3 SD while 61% children had height-for-age of ≤3 SD.
Conclusions: Cyanotic CHDs were less common than acyanotic CHDs with infancy and early childhood being the most common age-groups for presentation. Malnutrition is common in children with CHD. Both height and weight were affected more in cyanotic group when compared to acyanotic group.

Keywords: Anthropometry, CHD, Echocardiography

INTRODUCTION

The term congenital is acquired from Latin word "con" means together and "genitus" meaning born which means present at birth.[1] The functional or structural heart disease present at birth, even though diagnosis is made later on are defined as CHD.[1,2] Among all defects found at birth, the commonest defect is CHD. CHD represent a major global health problem.[3,4]

More than seventy-five percent of infants that are born with these congenital heart abnormalities can live beyond first year of life and can lead a normal life thereafter due to the recent and constantly advancing treatment modalities.[5] CHD is found in approximately 0.8% of live-born children.[6]

Congenital heart defects have a variable severity in infants. Only 2-3% of total cases will have symptoms in the first year of life and the diagnosis of CHD is made at 1 week in 40-50% and 1 month in 50-60% of patients.[7,8]

In our country, as routine neonatal screening is not so common because of highly prevalent home-deliveries and so prevalence of CHD at birth is not known.[9]

The clinical outline of CHD may be studied under two broad headings-cyanotic and acyanotic CHD.[7]

Acyanotic congenital heart defects (ACHD) account for 75% of all the CHD. The commonest defect seen in most of the studies is VSD followed by PDA.[7,9] Other common lesions that were seen are PS, ASD and coarctation of aorta.

Cyanotic congenital heart defects (CCHD) account for 25% of congenital heart defects (CHD). About one fifth of neonates suffer from cyanotic heart diseases. Cyanotic CHDs include Fallot tetralogy (TOF), TGA, TAPVC, TA and tricuspid valve abnormalities.[10,11]

Clinical presentations of CHD vary through both this group. These defects may be diagnosed during fetal life or soon after birth while some may be totally asymptomatic.[5] Few lesions have certain age group and gender specific presentation.

CHD is commonly linked with malnutrition and failure to thrive in children.[12] There are multiple risk factors which contribute to malnutrition in children with CHD which includes cyanosis, heart failure, anemia, delayed surgical correction.[13-15] L-R shunt in children with acyanotic malformation tend to lead to acute malnutrition. Stunting is often more severe in children with cyanotic defects.[16]

Physical diagnosis consists of physical examination and auscultation (heart murmurs). NADAS criteria can be used as a screening test for evaluation of a murmur.[17] In most cases, clinical examination, medical history, electrocardiogram (ECG) and roentgenogram (X-ray) are supportive to make the diagnosis of a CHD. Transthoracic echocardiography (TTE) is an important tool for confirmation of diagnosis and follow-up of patients with CHD.[18]

Timely accurate diagnosis and reliable information regarding CHD will not only help in defining the problem but will also help in prioritizing efforts in their management.

Very few studies and surveys have been conducted in the north-western states of India. This study was undertaken to describe the clinical profile and prevalence of malnutrition in children with CHD in a tertiary center in Udaipur, Rajasthan.

METHODS

A descriptive observational study was conducted at Geetanjali medical college and hospital, Udaipur. Study was conducted during a period of 15 months (January 2020 to June 2021) after obtaining permission from ethical committee of institute.

Inclusion criteria

All the consecutive children in the age group of 0-18 years attending department of pediatrics with clinical features suggestive of congenital heart disease were included in this study.

Exclusion criteria

Children with any diagnosed chronic illness not directly related to CHD. Children in whom CHD was part of a syndrome like Down's syndrome; and children with acquired heart disease were excluded from the study.

All eligible children were consecutively enrolled in the study after taking prior informed consent from the parents/patients. Demographic profile, relevant information of individual patient, presenting complaints (feeding difficulties, fast breathing, easy fatigability, excessive cry, sweating, respiratory difficulties, cyanotic spells) were collected using well-structured proforma by interviewing the patients/parents/attendant. At the time of enrollment, detailed evaluation and physical examination of each patient was done.

Detailed anthropometry measurements were taken with appropriate techniques. All the patients suspected clinically were subjected to relevant investigations including roentgenogram. Echocardiograms were performed for definite diagnosis.

Statistical analysis

Statistical analysis was performed using the statistical packages for social sciences (SPSS) version 21 IBM corporation. Data was entered into MS excel software. Statistical analysis of categorical variables was compared between patients using the Chi square test. Quantitative data was analysed using student t test. A $p<0.05$ is considered to be significant.

RESULTS

We enrolled 70 eligible children who fulfilled the inclusion criteria in this study. Data was collected for each subject in pre-designed proforma.

Table 1 shows distribution of children according to gender, age and area of residence. Out of total 70 subjects, total no. of males was 44 (62.8%) and females were 26 (37.2%) ($p=0.0002$). The 16 children (22.9%) belonged to neonatal age group, 46 (65.6%) were among the age-group of 1 month-5 years and 8 children (11.5%) belonged to age group of 5-18 years. The 48 (68.6%) subjects were living in rural areas and 22 (31.4%) were living in urban areas ($p<0.0001$).Maximum number of children, 32 (45.7%), belonged to upper lower class, followed by 18 (25.7%) children belonging to lower class, 13 (18.5%) children to middle class and 7 (10%) children to upper middle class according to Kuppuswamy scale.

Table 2 shows that out of 70 children, the most common presenting complaint was breathlessness/easy fatigability

which was present in 49 (70%) children which was followed by failure to thrive in 40 (57.1%) children, cough which was present in 30 (42.9%) children and fever which was present in 20 (28.6%) children, cyanosis in 10 (14.3%) children and chest retractions in 7 (10%) children, excessive irritability in 5 (7.1%) children.

Table 3 shows distribution of cases according to types of CHD on the basis of 2D echo findings. Out of 51 children who had acyanotic CHD, most common was VSD in 21 (41.1%) children followed by ASD in 14 (27.4%) children and PDA in 3 (5.8%) children and 13 children had other types of acyanotic CHD. Out of 15 children with cyanotic CHD, 10 (66.7%) children had TOF and 4 (26.7%) children had TGA and 1 (6.6%) child had complex cyanotic CHD. All 4 (100%) children with obstructive CHD had coarctation of aorta. Thus, acyanotic CHD was more common than cyanotic CHD in our study.

Table 1: Distribution of socio-demographic factors among children with CHD.

Factors	Number (%)
Gender	
Male	44 (62.8)
Female	26 (37.2)
Total	70 (100)
P value	0.0002
Age group	
0-1 month	16 (22.9)
1 month-5 years	46 (65.6)
5-18 years	8 (11.5)
Total	70 (100)
Residence	
Rural	48 (68.6)
Urban	22 (31.4)
Total	70 (100)
P value	<0.0001
Socioeconomic status	
Upper lower	32 (45.7)
Lower	18 (25.7)
Middle	13 (18.5)
Upper middle	7 (10)
Total	70 (100)

Table 2: Distribution of children according to presenting complaints.

Presenting complaints	Number (%)
Breathlessness/easy fatigability	49 (70)
Failure to thrive	40 (57.10)
Cough	30 (42.9)
Fever	20 (28.60)
Cyanosis	10 (14.30)
Chest retractions	7 (10)
Excessive irritability	5 (7.10)
Others**	4 (5.70)

Others**abnormal pulsations in chest, chest pain.

Table 3: Distribution of cases according to type of CHD based on 2D echo findings.

Type of CHD		Number (%)
Acyanotic	VSD	21 (41.1)
	ASD	14 (27.4)
	PDA	3 (5.8)
	Others**	13 (25.4)
Total		51 (100)
Cyanotic	TOF	10 (66.7)
	TGA	4 (26.7)
	Complex cyanotic	1 (6.6)
Total		15 (100)
Obstructive	Coarctation of aorta	4 (100)
Total		4 (100)

Others**-PDA+ASD, PDA+ASD+VSD VSD-ventricular septal defect, ASD-atrial septal defect, PDA-patent ductus arteriosus, TOF-tetralogy of Fallot, TGA-transposition of great arteries.

A total 35 number of cases have abnormal chest X-ray finding on presentation. 4 (26.7%) of cyanotic and 31 (60%) of acyanotic CHD had abnormal radiological finding of cardiomegaly. This showed that there was a higher chance of presence of cardiomegaly among children with acyanotic CHD (p=0.0007; statistically significant). Table 4 shows in children with ACHD, 31.3% had moderate and 31.3% had severe underweight according to weight for age whereas in children with CCHD, 20% had moderate and 60% had severe underweight whereas 100% children with obstructive CHD had normal weight.

Table 4: Distribution of acyanotic, cyanotic and obstructive CHD according to weight for age.

Weight for age	Type of CHD (%)		
	Acyanotic	Cyanotic	Obstructive
Normal (>-2 SD)	19 (37.4)	3 (20)	4 (100)
Moderate underweight (B/w -2 and -3 SD)	16 (31.3)	3 (20)	0
Severe underweight (<-3 SD)	16 (31.3)	9 (60)	0
Total	51 (100)	15 (100)	4 (100)

A total 35 number of cases have abnormal chest X-ray finding on presentation. Four (26.7%) of cyanotic and 31 (60%) of acyanotic CHD had abnormal radiological finding of cardiomegaly. This showed that there was a higher chance of presence of cardiomegaly among children with acyanotic CHD (p=0.0007; statistically significant).

Table 5 shows in children with ACHD, 31.4% had moderate and 29.4% had severe stunting according to height for age whereas in children with CCHD, 40% had

moderate and 40% had severe stunting whereas 100% children with obstructive CHD had normal height.

Table 5: Distribution of acyanotic, cyanotic and obstructive CHD according to height for age.

Height for age	Types of CHD (%)		
	Acyanotic	Cyanotic	Obstructive
Normal (>-2 SD)	20 (39.2)	3 (20)	4 (100)
Moderate stunting (B/w -2 and -3 SD)	16 (31.4)	6 (40)	0
Severe stunting (<-3 SD)	15 (29.4)	6 (40)	0
Total	51	15	4

DISCUSSION

In the present study, total 70 children between the age group of 0 months-18 years of age confirmed with features of CHD were enrolled and were subjected to a detailed examination of clinical features, anthropometry and echocardiography.

In our study, out of 70 patients, 39 patients presented before 1 year of age (55.7%), out of which 16 (22.9%) patients presented during neonatal life and 23 (32.8%) patients presented between the ages of 1 month to 12 months. This showed that CHD presented more commonly during first year of life. 23 patients presented (32.8%) between the age of 1 year and 5 years. Eight patients (11.5%) presented after the age of 5 years. This was in accordance with most of the studies. A similar study including 66 cases was done by Karthiga et al which showed that out of total 33 patients, 54.5% cases were presented before 6 months of age.[9] The 15.2% of total patients presented between 6 and 12 months, 6.1% of total cases presented between 1 and 2 years of life, and 12.1% of total cases presented between 2 and 4 years and 4 patients were more than 4 years of age.

In our study, out of 70 patients, 44 (62.8%) were male and 26 (37.2%) were females with a M:F ratio of 1.7:1. This was in accordance with a study conducted by Mughal et al which showed higher preponderance of males (59.7%) over female (40.3%) with a male: female ratio of 1.5:1.[19]

Number of cases of CHD from rural areas (68.6%) in our study were higher as compared to those from urban regions (31.4%). This contrasts with the study of Kumari et al who reported higher occurrence in the urban population (75%).[20] The higher percentage of rural population affected by CHD in our study may be due to proximity and easy approach of our tertiary care centre to rural areas.

In our study, out of the 70 patients included, employing modified Kuppuswamy's scale as an index of socioeconomic status of the enrolled patients' families, cases were seen most commonly in the upper lower class (45.7%) followed by (25.7%) cases in lower class while (18.5%) cases were observed in middle class and (10%) cases were seen in upper middle class. Ibadin et al too reported similar finding of higher prevalence in middle and lower socioeconomic class (85%) as compared to high class (15%).[21] The socio-economic status of the families of the affected patients acts as an important determinant for malnutrition in such patients in addition to other factors and also offers an overview of their ability in the management of the cases.

Out of total 70 study subjects in our study, 30 patients (41.7%) positive past H/O repeated lower respiratory tract infections and 28 patients (40%) have negative past history, i.e., no significant past events and 12 (17.1%) patients had H/O cyanotic spells. In a study by Sandeep et al 10 (12.5%) patients had history of lower respiratory tract infections and 57 (71.2%) had no significant past history and 16% of patient had h/o cyanotic spells.[22]

The children included in our study were presented with cluster of symptoms. Breathlessness was the most common symptom found in 70% patients, followed by failure to thrive (57.1%) and cough (42.9%) of patients.

Table 6: Frequency of various presenting symptoms in different studies.

Clinical features	Our study (%)	Karthiga et al[9]	Sharmin et al[23]	Golmei et al[24]
Breathlessness/easy fatigability	70	72.73	60	85.5
Failure to thrive	57.1	40.9	41.7	26.5
Cough	42.9	40	43.5	60.2
Fever	28.6	78.8	54.8	62.7
Cyanosis	14.3	18.2	13	13.2
Recurrent respiratory infections	41.7	40	34.8	57.8

In our study, out of 70 patients, 51 (72.9%) patients had acyanotic CHD while 15 (21.4%) patients had cyanotic CHD and 4 (5.7%) patients had obstructive CHD. This was in accordance with study by Karthiga et al where out of 66 patients, 48 (72.7%) patients had acyanotic CHD and 18 (27.3%) patients had cyanotic CHD.[9]

Most common lesions in CHD are VSD (36%), ASD (5%), PDA (9%), AVSD (4%), PS (9%), AS (5%), CoA (5%), TGA (4%), and TOF (4%). Remaining 20% CHD are contributed by complex heart defects.[25] In our study, VSD was the most common congenital heart defect which contributes 30% of total CHD cases. Most of

literature indicates incidence of CHD in range of 21-53%. In our study, ASD was found in 20% cases and was the second most common cause of CHD. This incidence is similar to the reported 10-23% incidence in various Indian studies and it was higher than Western studies in which it was 6-8%.[6] Among cyanotic CHD, TOF was the most common which consist of 14.2% of total patients. Similar results were obtained by Karthiga et al in which VSD was the most common defect (33%) among all CHD cases.[9] ASD was the second most common CHD in the study comprising 18.2%. TOF was the most common cyanotic CHD found in 10 patients (15.2%) in this study.

In our study, out of 51 patients with acyanotic CHD, 60% had abnormal findings of cardiomegaly on radiography while out of 15 patients with cyanotic CHD, 26.7% had abnormal findings on radiography. In a study by Jain K et al[26] on 100 patients, 73% had abnormal chest X-ray findings on presentation out of which 68.5% patients with acyanotic CHDs had cardiomegaly while 8.9% patients with cyanotic CHD had findings of cardiomegaly.

Mechanisms for growth deficiency in CHD are due to multiple factors.[22] Decreased caloric intake was believed to be the most relevant cause of growth failure in heart diseases.

In our study, weight-for-age was recorded in all children with CHD. Out of 70 children included in our study, 26% had normal weight, 27.2% children were moderately underweight (b/w -2 and -3 SD) while 35.7% children were severely underweight (≤SD). Out of 51 children with acyanotic CHD, 31.3% children were severely underweight while out of 15 children with cyanotic CHD, 60% children were severely underweight thus showing underweight was more common in children with cyanotic CHD. Okoromah et al in his study found that 20.5% children with acyanotic CHD had severe underweight while 44% children with cyanotic CHD had severe underweight.[27] Rabiya et al in her study had 69.2% children with acyanotic CHD having severe underweight while 35.7% children with cyanotic CHD had severe underweight.[28]

In our study, height-for-age was determined in all study subjects. According to height-for-age, out of 70 children, 38.6% had normal height-for-age, 31.4% children had moderate stunting (b/w -2 and -3 SD) while 30% had severe stunting (≤3 SD). Out of 51 children with acyanotic CHD, 29.4% children had severe stunting while out of 15 children with cyanotic CHD, 40% children had with severe stunting thus showing that stunting was more common in children with cyanotic CHD. Karthiga et al in her study found that 48.5% children with acyanotic CHD had height-for-age of ≤3 SD while 11.1% patient with cyanotic CHD had severe stunting.[9] Rabiya et al in her study had 42.9% children with acyanotic CHD having severe stunting while 57.1% children with cyanotic CHD had severe stunting.[28]

Habeeb et al did a similar study in which he concluded that the frequency of malnutrition was 65.8% and frequency of stunting was in 66.4% of cases.[29] He also concluded that frequency of malnutrition and stunting was higher in cyanotics (62.8% and 74.4%) as compared to acyanotics (49.5% and 63.3%) respectively.[29]

A similar study conducted by Baaker et al showed that frequency of acute malnutrition (29.5%) was higher than chronic malnutrition (21.9%) among cases with acyanotic CHD.[30] In their study, chronic malnutrition was more common in cyanotic CHD (26.3%).[30] In North India, Begum et al observed that 82.53% cases had underweight and 58.72% cases had stunting.[31]A similar study was conducted in South India by Vaidynathan et al which showed that underweight was present in 59% of cases and stunting was observed in 26.3%.[16]

Limitation of this study

This study was conducted in hospitalized patients and so the results in this study are not a true representation of generalized population.

CONCLUSION

CHD was present with maximum prevalence in children less than 1 year of age with males being more commonly affected than females. Breathlessness was the most common presenting feature followed by failure to thrive and cough. Majority of children were suffering from acyanotic CHD (72.9%) with VSD (30%) being the commonest CHD. TOF (14.3%) was the most common cyanotic CHD. According to weight for age, 63% children had underweight indicating malnutrition. Children with cyanotic CHD were more likely to be underweight as compared to children with acyanotic CHD. According to height for age, 61% had varying grades of stunting, indicating chronic malnutrition. Children with cyanotic CHD were more likely to be stunted as compared to children with acyanotic CHD.

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