

Original Research Article

Profile of congenital heart disease and its mode of presentation in children admitted in a tertiary care hospital: a cross-sectional study

M. Suhail Alam Mallick, Jadab Kumar Jana*, Swarupananda Maiti, Abhay Charan Pal

Department of Paediatrics, Bankura Sammilani Medical College and Hospital, Bankura, West Bengal, India

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*Correspondence:

Dr. Jadab Kumar Jana,

E-mail: jadabjana69@gmail.com

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ABSTRACT

Background: Congenital heart disease (CHD) is contributing more to the infant mortality rate these days. Therefore, we must investigate the profiles of CHD, its presenting clinical features, and its consequences to assist pediatricians and cardiologists in taking the necessary actions as soon as possible to reduce infant mortality further.

Methods: This cross-sectional study was carried out on 111 infants with CHD who were admitted to the Bankura Sammilani Medical College and Hospital's pediatric medicine department in Bankura, India. The children ranged in age from one month to five years. Following approval by the Institutional Ethics Committee and parental/guardian consent, we used a case record proforma to gather data on enrolled children over ten months. To analyze the data, EpiInfo (version 3.5.1) software was used. This study received approval from the Institutional Ethics Committee.

Result: Male children contributed 53.15%, while female children contributed 46.85%. Children between the ages of one and six months made up 55.86% of the total. Among cardiac lesions, acyanotic CHD was more prevalent than cyanotic CHD (81.08% vs. 18.92%). In all cases of CHD, the most prevalent lesion type was ventricular septal defect (VSD) (43.24%). The most prevalent form of cyanotic CHD, however, was the tetralogy of Fallot's (9.9%). Most of the children with atrial septal defects presented in late infancy. Inadequate weight gain (85.59%) and malnutrition (84.68%) were the most prevalent clinical characteristics and complications of CHD.

Conclusion: The most common complication of CHD in children under five is malnutrition, a risk factor for infant death. Hence, a community-based case-control study is essential to determine the precise extent of these burdens.

Keywords: Acyanotic, Cyanotic, Children, Congenital heart disease, Profile

INTRODUCTION

Congenital heart disease (CHD) is the most common disorder of the heart as well as the commonest of all congenital lesions in children.¹ As per Mitchel et al CHD is "a gross structural abnormality of the heart or intrathoracic great vessels that is actually or potentially of functional significance".² It possesses global health problems in terms of morbidity and mortality. Globally, the incidence of CHD is 8–10 per 1000 live births, according to various studies, with higher rates in prematurity, stillbirth, and spontaneous abortion.³ In India, the reported incidence of CHD is 0.8 to 4.2/per 1000 live births, and it contributes about 10% to infant

mortality.^{4,6} As infant mortality from readily preventable causes declines, the contribution of CHD to the infant mortality rate is likely to increase.⁷ The clinical features that bring the children to a health care facility mostly depend on the heart's structural defects. The most common clinical features include shortness of breath, cough, fever, feeding problems, cyanotic spells, poor weight gain, and convulsions.⁸ However, congenital heart disease may be diagnosed incidentally during their stay in the hospital while a child is admitted for other reasons. Due to the inadequate reporting systems in developing countries such as India, the western region of West Bengal lacks accurate data about the various profiles of CHD, its presentation features, and its complications.

Therefore, we plan to investigate the various profiles, clinical presentations, and complications associated with CHD. I hope this study will help pediatricians and cardiologists to diagnose and treat early and thereby reduce morbidity and mortality arising out of CHD. To study the different profiles, clinical features, and complications of CHD in children aged 1 month to 5 years.

METHODS

Study place

The Department of Pediatric Medicine of Bankura Sammilani Medical College and Hospital (BSMCH), West Bengal, India, was the research area. Study design: Descriptive cross-sectional study.

Study duration

The study duration was of 10 months from December 2023 to September 2024.

Study population

This includes 1– 60-month-old child.

Inclusion criteria

It includes 1-60 months old child with CHD confirmed by echocardiography. Those parents/guardians have given consent.

Exclusion criteria

Neonates and more than 60 months aged child, Children who had acquired heart disease such as Kawasaki disease and rheumatic heart disease. Children who had CHD but operated. Those parents/guardians didn't give consent.

Sample size:

The sample size was 111 (one hundred and eleven).

Sample size calculation

Sample size calculation was done by Cochran's formula. Sample size $n = (Z\alpha)^2 \times P \times (1-P) / d^2$, where Z is normal standard variate at 95% confidence interval, P is the event of interest, here TOF (Tetralogy of Fallot's) which is 10.6% from the previous study, and d i.e., 6 is the absolute precision or error. Putting all data into the above formula, we got $n=101$. Taking a 10% nonresponse rate, the final sample size became 111.

Study technique

This research work was initiated after receiving approval from the Institutional Ethics Committee. 1-month to 60-month-old children who were admitted to the department of pediatric medicine during the study period with different clinical features and subsequently diagnosed to have a CHD and confirmed by echocardiography, were enrolled consecutively till we got the desired sample size. We took consent from the parents/guardians of all enrolled children. We gathered data about basic demography like age and gender, clinical manifestation, type cardiac lesion, and complications of all study subjects in the case record proforma.

Data analysis

Data was analyzed using EpiInfo (version 3.5.1) software. The continuous variables were expressed as mean and standard deviation while categorical variables were in terms of rate and ratio.

RESULTS

Basic demography

We enrolled 111 children of either gender for this research work. The male children contributed 53.15% of the total study subjects, while the female children contributed 46.85%. The male-to-female children ratio was 1.13:1, and the mean age was 0.95 ± 1.23 years. Considering the age of the presentation, 1-6 months, 7-12 months, and 13-60 months old children contributed 55.86%, 30.63%, and 13.51% of the total study subjects, respectively, as shown in Table 1.

Table 1: Age and gender-wise distribution.

*Age	†Male (%)	Female (%)	Total (%)
1 -6 months	37 (33.34)	25 (22.52)	62 (55.86)
7 - 12 months	14 (12.61)	20 (18.02)	34 (30.63)
13 – 60 months	8 (7.21)	7 (6.31)	15 (13.51)
Total (%)	59 (53.15)	52 (46.85)	111(100)

*Mean age= 0.95 ± 1.23 yrs. †Male-to-female children ratio=1.13:1.

Table 2: Age-wise pattern of CHD.

Types CHD	1 -6 m	7 - 12 months	13 – 60 months	Total (%)
Acyanotic CHD	46	30	14	90 (81.08)
*VSD	25	13	10	48 (43.24)
†ASD	4	9	2	15 (13.51)
‡PDA	7	2	1	10 (9.00)
VSD+ASD	2	1	0	3 (2.7)
VSD+PDA	2	0	0	2 (1.80)
ASD+PDA	1	1	0	2(1.80)
VSD+ASD + PDA	1	0	0	1(0.90)
VSD+**TR	1	0	0	1(0.90)
ASD+TR	0	1	0	1(0.90)
VSD+ASD+Situs inversus	1	0	0	1(0.90)
TR	0	1	0	1(0.90)
††MR	1	1	0	2(1.80)
Aortic stenosis	0	0	1	1(0.90)
‡‡PS	0	1	0	1(0.90)
Cor triatimum	1	0	0	1(0.90)
Cyanotic CHD	16	4	1	21 (18.92)
Tetralogy of Fallot	6	4	1	11(9.90)
Pentalogy of Fallot	1	0	0	1(0.90)
VSD+PS	4	0	0	4(3.6)
***TGA+VSD	4	0	0	4(3.6)
TGA+ASD	1	0	0	1(0.90)
Total (%)	62 (55.86)	34 (30.63)	15 (13.51)	111 (100%)

*VSD – ventricular septal defect, †ASD – atrial septal defect, ‡PDA – patent ductus arteriosus, **TR – tricuspid regurgitation, ††MR – mitral regurgitation, ‡‡PS – pulmonary stenosis, ***TGA – transposition of great arteries

Table 3: Clinical features.

Variables	ACHD (%) (n=90)	CCHD (%) (n=21)	Total (%) (n=111)
Shortness of breath	79 (87.78)	13 (61.90)	92 (82.88)
Cough	67 (74.44)	5 (23.81)	72 (64.86)
Fever	60 (66.67)	4 (19.05)	64 (57.68)
Poor feeding	82 (91.11)	9 (42.86)	91 (81.98)
Poor weight gain	78(86.67)	17 (80.95)	95 (85.59)
Anaemia	90 (100)	0 (0)	90 (81.08)
Cyanosis	0 (0)	12 (57.14)	12 (10.81)
Cyanotic spell	0 (0)	15 (41.43)	15 (13.51)
Oedema	17 (18.89)	2 (9.52)	19 (17.12)

Different kinds of CHD

Acyanotic congenital heart disease (ACHD) contributed 81.08% of the total CHD; the remaining 18.92% was cyanotic congenital heart disease (CCHD). The four most common types of CHD were ventricular septal defect (VSD), atrial septal defect (ASD), patent ductus arteriosus (PDA), and tetralogy of Fallot's (TOF) accounting for 43.24%, 12.61%, 9%, and 9.9% of all CHD, respectively.

VSD and TOF were the most common CHD among ACHD and CCHD, respectively. 54.95%, 31.53%, and 13.51% of study subjects came to the healthcare facility

at 1-6 months, 7-12 months, and 13-60 months respectively. Table 2 displays the age-wise distribution of different patterns of CHD.

Clinical presentation

Table 3 depicts the clinical features based on ACHD and CCHD. The four most common clinical features of ACHD were poor feeding (91.11%), shortness of breath (87.78%), poor weight gain (86.67%), and anaemia (81.08%).

On the other hand, the four most prevalent clinical features of CCHD were poor weight gain (80.95%),

shortness of breath (61.90%), cyanosis (57.14%), and poor feeding (42.86%).

Poor weight gain (85.59%), shortness of breath (82.88%), poor feeding (81.98%), and anaemia (81.08%) were the four most common clinical features of CHD as a whole.

Complications

As shown in Figure 1, complications of CHD that were seen in this study included malnutrition (84.68%), pneumonia (54.05%), recurrent chest infection (42.34%), congestive cardiac failure (CCF) (35.14%), and cyanotic spell (13.51%).

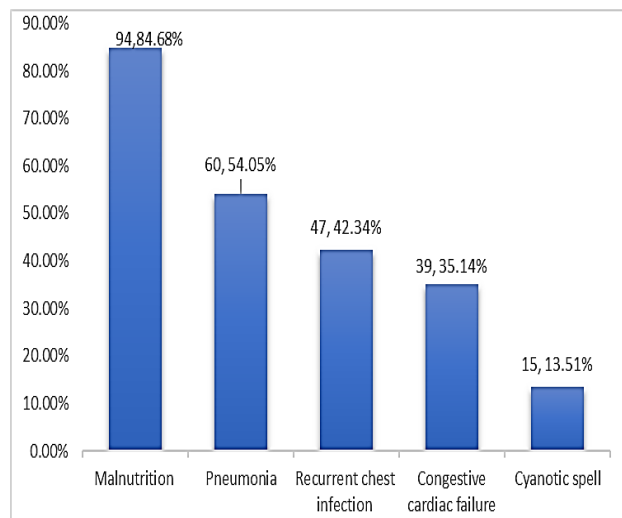


Figure 1: Complications of CHD.

DISCUSSION

We conducted this cross-sectional study in a rural-based tertiary healthcare facility over 10 months in 111 children aged 1 month–60 months old of either gender. Male children outnumbered female children, and the ratio was 1.13:1. But in the age group 7–12 months, female children outnumbered male children (18.02% vs. 12.61%). Most of the children belonged to the age range of 1–6 months and contributed 55.86% of all cases. Song et al and Gupta et al, reported a male-to-female-child ratio of 1.04:1 and 1.17:1, respectively, which are comparable to the present study.^{8,10} In contrast to Borker et al's study, which reported a diagnosis rate of 20.14%, the present study revealed a diagnosis rate of 48.65% of CHD between 1 and 6 months.¹¹ This disparity may be due to the difference in age between study subjects and the sample size. Borker et al's study included 412 children aged 0–18 years old, while the present study enrolled 111 children aged 1 month–60 months.

The present study revealed that 81.08% of CHD cases were ACHD, with CCHD accounting for the remaining 18.92%. VSD was the most common type of CHD, accounting for 43.24% of all cases, followed by ASD and

PDA, which accounted for 12.61% and 9% of all CHDs, respectively. However, TOF was the most common type of CCHD and contributed 9.9% of all CHDs. Golmei et al, reported that VSD, ASD, PDA, and TOF accounted for 38.6%, 19.3%, 15.7%, and 10.8% of all CHDs, respectively, which aligns with the findings of the present study.¹² Other authors also reported that VSD, ASD, PDA, and TOF are the four most common patterns of CHD, but at different frequencies across the globe.¹³⁻¹⁷

Among all CHD categories, the majority of children with ASD received a diagnosis in late infancy and beyond, a diagnosis they frequently overlooked during childhood. This finding of the present study is in line with Kishore et al.'s study in Patna, India.¹⁸ The clinical features of CHD depend on the number, types, and severity of the defects. The clinical features observed in the present study included poor weight gain (85.59%), shortness of breath (82.88%), poor feeding (81.98%), anaemia (81.08%), cough (64.86%), fever (57.18%), oedema (17.12%), and cyanosis (10.81%). Other studies also observed these clinical features of CHD, albeit at varying frequencies.^{8,19,20}

The present study observed the following complications of CHD: malnutrition (84.68%), pneumonia (54.05%), recurrent chest infection (42.34%), congestive cardiac failure (CCF) (35.14%), and cyanotic spell (13.51%). The causes of malnutrition in children with CHD include feeding problems that result in insufficient nutrition, malabsorption from an oedematous gastrointestinal tract in those with chronic heart failure, chronic hypoxia, malfunctioning body metabolism, and recurrent respiratory tract infections.

Rubia et al, reported 83.5% malnutrition based on weight for age in under-5 children, which is comparable to the present study.²¹ In contrast, Mohd U et al, reported a malnutrition rate of 90% in children with CHD, which is higher than the current study.²² This discrepancy may be due to differences in the study population's age, sample size, and socioeconomic status. Congested lungs in CHD with increased blood flow and malnutrition may explain pneumonia and recurrent chest infections. In the present study, 35.14% of children developed CCF, which was in line with Sommers C et al.'s study, which showed 39.1% of CCF in their study subjects.²³

The present study has some limitations. First, the study area was a tertiary-level healthcare facility; secondly, the sample size was small. Third, we excluded neonates and children above five years old. Fourth, we included children with suspected CHD who required inpatient care, as well as those admitted for other reasons and incidentally detected CHD. All mentioned limitations lead to selection bias. Therefore, it is impossible to generalize the aforementioned observations in the community.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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