

# Prevalence and Pattern of Congenital Heart Disease among Children—A Population Based Study in a District in North Bengal of Eastern India

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## Abstract

**Introduction:** Prevalence of congenital cardiac defects varies in different locations and the types of population selected in study. However CHD is the commonest and present in about 1% of all live births. Age of presentation also varies depending on the type of CHD and its complexity. Main objective of this study was to assess the prevalence of CHD in the population of a specific district in North Bengal of Eastern India by a direct community level assessment. Such type of study in this area was not known so far. **Methods:** This retrospective observational study was done at the department of cardiothoracic surgery NRS Medical college during a period from April 22 to March 23. The study was based on all children (0 to 18 yrs age) screened at community level in the district by health workers. All CHD pts screened were notified to this department through an online network. They were called to attend the OPD, and seen by a paediatric cardiologist. Echocardiography was done in all of them and CHDs were categorised. Prevalence of CHD was studied per 1000 paediatric population and per 1000 live births separately during the period. Age-wise and disease-wise distribution of CHD in the district was studied. Cases demanding surgery were operated in the department of CTVS of NRS Med coll. **Results:** The prevalence of CHD in the present community-based study was 4.55 per 1000 live birth which is comparable to many school-based studies but on the lower side of many hospital-based studies. Majority of CHD cases were detected in less than 1 year age (46%) and in 1 - 5 years age (33%). Most of our patients were acyanotic (82%), majority being VSD (43.4%), while the cyanotic patients were 15%, majority being TOF (8%). The rest 3% was of obstructive variety. **Conclusion:** Our study involved the population at commu-

nity level involving newborns at point of delivery, pre-school and school (both primary and secondary) children altogether in a district which is more perfect than isolated newborn unit or paediatric OPD patients in tertiary care hospitals where the prevalence is more possibly because of many factors like quality of care and concentration of patients in those hospitals. VSD and TOF are the most common acyanotic and cyanotic congenital heart defects respectively.

## Keywords

Congenital Heart Diseases (CHD), Eastern India, Prevalence, Echocardiography, Pattern

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## 1. Introduction

Congenital Heart Disease is present in around 1% of all live births in USA studied in a population based perspective [1]. The prevalence of CHD in India is 0.77 to 5.2 per 1000 in school based studies and 3.9 to 26.4 per 1000 in hospital based studies [2] [3]. In China this is 9.3 per 1000 live births [4] and in Bangladesh this is 25 per 1000 live births [5] [6].

CHD is the commonest group of congenital defects (About 1 per 100 live births and 28% of all congenital defects) worldwide [7]-[9]. Unlike to other group of congenital diseases it has a wide variations of types on which surgical mortality also depends (RACHS-1 risk scoring) [10].

However with the advancement of earlier diagnosis and on going improvement of modalities of treatment majority can be successfully managed at present. Also the prognosis and quality of life have considerably improved in patients with CHD over the past few decades [11].

At times prompt diagnosis and very early intervention become crucial for some newborn with critical congenital heart defects (CCHD) presenting with a combination of cyanosis and heart failure [12].

At present early diagnosis, assessment and management with population based surveillance of CHD is lacking in eastern India where school based or hospital OPD based studies are found [13] [14].

Therefore the present study is aimed at finding the prevalence and classification of CHD in a district of north east India to create a community based framework to identify prevalence, classify the disease of CHD, assessment for possible intervention and its results, leading to improvement of entire outcome strategy of CHD.

## 2. Materials and Methods

Retrospective observational study was conducted in entire population in Coochbhar district in North Bengal during a period from April 2022 to march 2023. Aim of study was to find out burden of CHD in children in that district. Out of all children (0 to 18 years) of age newborns (0 - 20 Days old) were screened at delivery point (that is obstetric care unit of primary health center, rural Hospitals, SD, Hospitals,

Superspeciality and district Hospitals) of Coochbehar district.

Preprimary school Children (0 - 6 Years) were screened for CHD by accredited social health activist (ASHA) worker and Anganwari worker (AWW). In Coochbehar district there were 2413 ASHA worker (each for 1000 population). They maintained the monthly record of all births and health status of children below 6 years age of that village via door to door visit and regular checkups at AWW centers on fixed day in a week in the village. AWW also share the information related to birth that total patient in a month. Where the ANM reported to PHN and MO of PHC. They conveyed to district headquarters. Where preliminary investigation including echocardiography was being done. The informations from district headquarters were mailed to NRS Medical College for opinion where subsequently patients attended SishuSathi Clinic and were diagnosed and treated. In this way all cases of Congenital Heart disease patient of that district reached NRS Medical College.

Primary School Children (6 - 10 Years) were screened at SishuSikhya Kendra (SSK) and Primary Schools.

Higher School children (10 - 18 Years) were screened at MadhyamikShikhya Kendra (MSK), Secondary and Higher Secondary Schools.

Those screened out babies were verified and referred by MO of MHT through proper referral card to district head quarter where echocardiography was done and then the same was mailed to NRS Medical College.

### 3. Results and Analysis

A total of 31,824 live birth reported in the district during the period of study (April 2022 - March 2023) and the total cases of CHD reported during that period was 145. The prevalence was calculated using Freeman and Tukey, s method used in EUROCAT analysis.

The Population (0 - 18 Years) was 742,036 (Male-373,267 and female-368,769) during the period of study.

All CHD cases of Coochbehar district referred to the SishuSathi Clinic of NRS Medical College (Monday/Tuesday) where they were thoroughly examined and repeat echocardiography was done in all cases. The types of cases were diagnosed and sorted out as per diagnosis.

Different types of Congenital Heart Diseases detected (April 2022 - March 2023) at Coochbehar district was noted as below **Table 1**.

**Table 1.** Major classification and types of congenital heart disease.

Major Classification	Types of CHD (n)	Subtypes	Percentage and Confidence Interval (Wald)
Acyanotic (L to R shunt) n = 118	VSD-63	Membranous-45 Muscular-9	43.44% with CI (from 35.21 to 51.67)

**Continued**

		Inlet-6	
		Outlet-3	
	ASD-37	OS ASD-29 SV ASD-5 OP ASD-3	25.51% with CI (from 18.27 to 32.75)
	PDA-16		11.03% with CI (from 5.83 to 16.23)
	AVSD-2		1.38% with CI (0 to 3.25)
Cyanotic n = 22	TOF-12	PS-7 PA-4 Absent Pulmonary Valve-1	(8.27%) with CI (from 3.69 to 12.85)
	TAPVC-1	Supracardiac-1	0.69% with CI (0 to 2.07)
	Single Ventricle-2		1.38% with CI (0 to 3.25)
	TGA-2	TGA + VSD + PS-1 TGA + IVS-1	1.38% with CI (0 to 3.25)
	DORV-4	DORV + PS-3 DORV + PA-1	2.76% with CI (0.04 to 5.48)
	Truncus Arteriosus-1		0.69% with CI (0 to 2.07)
	AS (BAV)-3 (2.07%) with CI (0 to 4.43)		(2.07%) with CI (0 to 4.43)
	PS-1 (0.69%) with CI (0 to 2.07) Wald		(0.69%) with CI (0 to 2.07) Wald
	Coarctation of Aorta-1 (0.69%) with CI (0 to 2.07)		(0.69%) with CI (0 to 2.07)
		<b>Total-145</b>	

A total of 145 CHD case detected in that district of Coochbehar during this period. Male to female ratio was Male-69 (47.5%) Female-76 (52.4%). The percentage of different types of congenital heart diseases detected in this study and their confidence interval were calculated following Wald technique (**Table 1**).

In the present study most of the patient *i.e.* 46.2% were less than 1 year age and next common age group was 2 - 5 years (33.1%). While the number in the age group of 6 - 10 years and 11 - 18 years were exactly same that was (10.35%) each (**Table 2**).

**Table 2.** Age wise distribution of various types of congenital heart disease.

Major Classification	Types of CHD	0 - 1 Y (n)	2 - 5 Y (n)	6 - 10 Y (n)	11 - 18 Y (n)	Total
Acyanotic CHD n = 118	VSD	38	13	6	6	63
	ASD	13	16	5	3	37
	PDA	3	10	2	1	16
	AVSD	0	1	1	0	2
	AP Window	0	0	0	0	0
Cyanotic CHD n = 22	TOF	4	6	1	1	12
	TAPVC	1	0	0	0	1
	Single Ventricle	1	0	0	1	2
	TGA	1	1	0	0	2
	DORV	3	1	0	0	4
	Truncus Arteriosus	0	0	0	1	1
	CCTGA + VSD + PS	0	0	0	0	0
Obstructive lesion n = 5	AS (BAV)	2	0	0	1	3
	PS	0	0	0	1	1
	Coarctation of Aorta	1	0	0	0	1
Total no (n)		67	48	15	15	145
Percentage with confidence interval		46.20% with CI 37.92 to 54.48	33.10% with CI 25.3 to 40.9	10.35% with CI 5.30 to 15.38	10.35% with CI 5.3 to 15.38	

Incidences of different types of CHD amongst male and female patients were compared using Chi square test and significant differences were noted in VSD, ASD and PDA (**Table 3**).

**Table 3.** Sex wise distribution and its significance in various types of Congenital heart disease.

Diagnosis	Male	Female	Total	P Value (Chi Square test)	Significant (Y/N)
VSD	39	24	63	0.00029	Yes

## Continued

ASD	10	27	37	0.011644	Yes
TOF	07	05	12	0.325964	No
PDA	1	15	16	0.001003	Yes
AVSD	1	1	2	0.882254	No
TAPVC	0	1	1		
Single Ventricle	0	2	2		
TGA	1	1	2	0.882254	No
DORV	3	1	4	0.218511	No
Truncus Arteriosus	1	0	1		
AS (BAV)	1	2	3	0.685825	No
PS	0	1	1		
COA	1	0	1		
<b>Total</b>	<b>65</b>	<b>80</b>	<b>145</b>		

The Prevalence of CHD in the age group 0 - 18 years was calculated as 4.55 per 1000 live birth and 0.2 per 1000 population (0 - 18 years). This was done following Freeman and Tukey, s variance stabilising transformation for a random Poisson variable as used in EUROCAT prevalence calculation [15].

Major classification and types of CHD in the present study was depicted in **Table 1**. Acyanotic CHDs were 118 (82%), Cyanotic CHDs were 22 (15%), Obstructive CHDs were 5 (3%) amongst 145 cases. Maximum cases were of Acyanotic type amongst which VSD was commonest (43.4%). Various sub types of Cyanotic, Acyanotic and Obstructive types were also shown in **Table 1**. Such results were also confirmatory to other similar studies [16].

#### 4. Discussion

The prevalence of CHD varies in different geographical regions. It is also calculated in 2 ways one is against the population data and the other is against the total live births of the population.

The prevalence when calculated against the paediatric population, the population is considered as either of the following ways:

- 1) No of children attended in Paediatric OPD in hospital [14].
- 2) No of school children [17].
- 3) No of Neonatal age group patients admitted/attended in hospital.

But the studies based on the total paediatric population directly assessed at community level is lacking in India.

The present study is therefore having an importance regarding assessment of the magnitude of the burden of taking care of such children in West Bengal and the facilities to be developed in future.

## 5. Conclusions

Globally the prevalence of CHD is varying from 4 to 50 per live births [18] and in India from 0.8 to 26.4 per 1000 children either of school students or hospital patients [19]. In the present study we have found this prevalence as 4.55 per thousand live births (3.84 to 5.36, as per 95% confidence limit) following EUROCAT prevalence calculation [15], and 0.2 per 1000 paediatric population at community level analysis.

The present study also revealed the most common type of CHD was VSD (43.44%) followed by ASD (25.51%), PDA (11.03%) TOF (8.27%). As the present study is including actual population of 0 to 18 years at community level the assessed prevalence value of CHD per 1000 children is less (0.2) in comparison to school based or hospital based study.

Majority of patients in this study were in the age group of less than 1 year as it was found in the study of Meshram and others [20] though in some other studies [21] it is of lesser no in this age group.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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