



RESEARCH ARTICLE

Prevalence of Congenital heart disease of Bangladeshi Children - A Nationwide survey

Prof. Dr. Mohd. Zahid Hussain^{1*}, Dr. Tahmina karim^{2*}, Prof. Md. Tariqul Islam¹, Dr. Mohammad Shakhawat Alam², Dr. Chaity Barua³, Dr. Diana Islam⁴, Dr. Md. Mostafizur Rahman Bhuiyan⁴, Dr. Faizul Haque Ponir⁴, Dr. Porimal Kumar Das⁴, Dr. K.M Enayet⁴, Dr. Heera Nand Yadav⁴, Dr. Rezaul Hayat⁴, Dr. Kashid Omar⁴

¹Professor of Paediatric Cardiology, BSMMU, Shahbag, Dhaka, Bangladesh

²Associate professor Paediatric cardiology, BSMMU Shahbag, Dhaka, Bangladesh

³Assistant professor Paediatric cardiology, BSMMU Shahbag, Dhaka, Bangladesh

⁴Medical Officer Paediatric cardiology, BSMMU Shahbag, Dhaka, Bangladesh



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ABSTRACT

Background— There is scarcity of data of Congenital heart disease (CHD) due to changing epidemiology. In this study we determined the prevalence of CHD, age distribution, and various forms of CHD including simple & complex CHD in the general population of Bangladesh.

Objective: To investigate the prevalence of congenital heart disease (CHD) in Bangladesh based on a large prospective multicenter screening study.

Study design: A total of 6146 consecutive children from 8 union of 8 division throughout Bangladesh between July 2021, and December 2022, were included. CHD Cases were identified by clinical assessment and echocardiography.

Results: The overall prevalence of CHD was 18.9 per 1000 live births. Out of 116 cases 64(55.2%) were female & 52 were male (44.8%) with a ratio of 1.2:1. Age from 0 to 18 years were included and CHD were found mostly in 1 to 5 years (39.7%). Distribution of Type of CHD were Acyanotic CHD 98(84.5%) and Cyanotic CHD were 18(15.5%). The most common CHD was atrial septal defect 33 (28.45%), followed by patent ductus arteriosus 28(24.14%) ventricular septal defect 26 (22.41%), AV canal defect 4 (3.45%), tetralogy of Fallot 12 (10.34%), and DORV with VSD with PS & Truncus arteriosus were 1 each (0.86%). Some combined lesions like VSD with ASD 2(1.72%) and ASD, VSD with PDA 1(0.86%) And other Congenital heart diseases were HCM 2(1.72%), DCM 1(0.86%). Dextrocardia 1(0.86%). Significantly higher rates of CHD were found in Comilla 23(19.8%) district, followed by Khulna 16 (13.8%) and Madaripur 15 (12.9%).

Conclusions: The prevalence of CHD in given population in this study is high from data from Western studies. This screening study may provide more accurate and complete information on the overall prevalence of CHD.

Keywords: Prevalence, CHD, Bangladesh

Background

Bangladesh is a densely populated country. Children as a share of the total population was 25.5% according to UNICEF Demographic data of Bangladesh. Congenital malformation contributes a large percentage in under five mortality, of which congenital heart disease is the most important one. A congenital heart defect (CHD) is defined as a gross structural abnormality of the heart or of the major thoracic vessels¹. CHD has been reported to occur in 5-8 per 1000 live births². It is by far the most common birth defect & a significant cause of childhood morbidity & mortality. Congenital heart diseases are the most prevalent and serious of all recognized structural birth defects. Surviving infants often require surgery or interventions and lengthy hospitalizations and will have a lifetime of disability that imposes a significant burden of the families. Cost associated with the care of a child with CHD are significant even in the developing countries, particularly when lifetime costs of management are considered¹.

Patients with CHD and cyanosis, pulmonary hypertension, and congestive heart failure also accompanies growth failure and malnutrition and thus has increased chance of morbidity and mortality.^{3,4} There is strong evidence that poor growth is associated with delayed mental development, and that there is a relationship between impaired growth status and both poor school performance and reduced intellectual achievement.⁵ Growth retardation in early childhood is also associated with significant functional impairment in adult life and reduced work capacity, thus affecting economic productivity.⁶

In developed countries, advancements in paediatric cardiac care, early prenatal and postnatal diagnosis, and supportive and timely corrective interventions for cardiac lesions have allowed the patients with a better lifestyle.⁷ In contrast, like many developing countries, in Bangladesh paediatric cardiac cares are not fully established, and epidemiological data on CHD-related morbidity and mortality are lacking.

The present study aimed to describe the prevalence of congenital heart disease in children. The findings of the present study could be applied to current and future paediatric cardiac care practice, and also used for policy decision-making and future research.

Material & Methods

This Cross-sectional prospective study was conducted after obtaining ethical approval from Institutional Review board. The Study period was between July 2021, and December 2022. Bangladesh has 8 Divisions. So we randomly involved 8 union from 8 divisions of Bangladesh. In this study estimated sample size was 6146. Sample were collected by random sample technique.

INCLUSION CRITERIA INCLUDES –

- children aged from 0 day to 18 years
- all healthy and sick children

& EXCLUSION CRITERIA WERE –

Non-Bangladeshi resident & children and parents unwilling to participate in the study were excluded.

DATA COLLECTION -

The day before investigation, data collector visited each home where eligible children were available. They selected cases in view of cyanosis, low SPO₂%, Heart murmur, high risk neonates, history of CHD in siblings. And they were asked to come on the day of investigation with their Expanded program on Immunization (EPI) card and they marked them with a marker at finger. After taking written informed consent at the day of investigation meticulous history taking and clinical examination were done. Pulse oximetry were checked in both upper and lower limbs. Echocardiography were performed by Paediatric cardiologist by GE Echocardiography machine model no VIVID IQ, using M4S and 6S probes. Sedation used for those children who needed to be calm at the time of performing echocardiography. Patient were examined in supine and lateral position. And all standard echocardiographic views 2D, Color Doppler Echo

were recorded. Those who were diagnosed as having congenital heart diseases were counted.

Data was described using mean, standard deviation, frequency and percent & analyzed using computer based statistical analysis (SPSS 22) and prevalence of CHD was measured. P value of <.05 was taken as significant.

Results

A total of 6146 children under went Echocardiographic assessment in this study.

The overall prevalence of CHD was 18.9 per 1000 live births. Out of 116 cases 64(55.2%) were female & 52 were male (44.8%) with a ratio of 1.2:1. Age from 0 to 18 years were included and CHD were

found mostly in 1 to 5 years (39.7%). Distribution of Type of CHD were Acyanotic CHD 98(84.5%) and Cyanotic CHD were 18(15.5%). The most common CHD was atrial septal defect 33 (28.45%), followed by patent ductus arteriosus 28(24.14%) ventricular septal defect 26 (22.41%), AV canal defect 4 (3.45%), tetralogy of Fallot 12 (10.34%), and DORV with VSD with PS & Truncus arteriosus were 1 each (0.86%). Some combined lesions like VSD with ASD 2(1.72%) and ASD, VSD with PDA 1(0.86%) And other Congenital heart diseases were HCM 2(1.72%), DCM1(0.86%).Dextrocardia 1(0.86%). Significantly higher rates of CHD were found in Comilla 23(19.8%) district, followed by Khulna 16 (13.8%) and Madaripur 15 (12.9%).

Table-1: Prevalence of CHD

Findings	Number of respondents	Percent
Number of CHD	116	1.89
Acyanotic	98	84.5
Cyanotic	18	15.5
Normal findings	6036	98.11
Total	6146	100.0

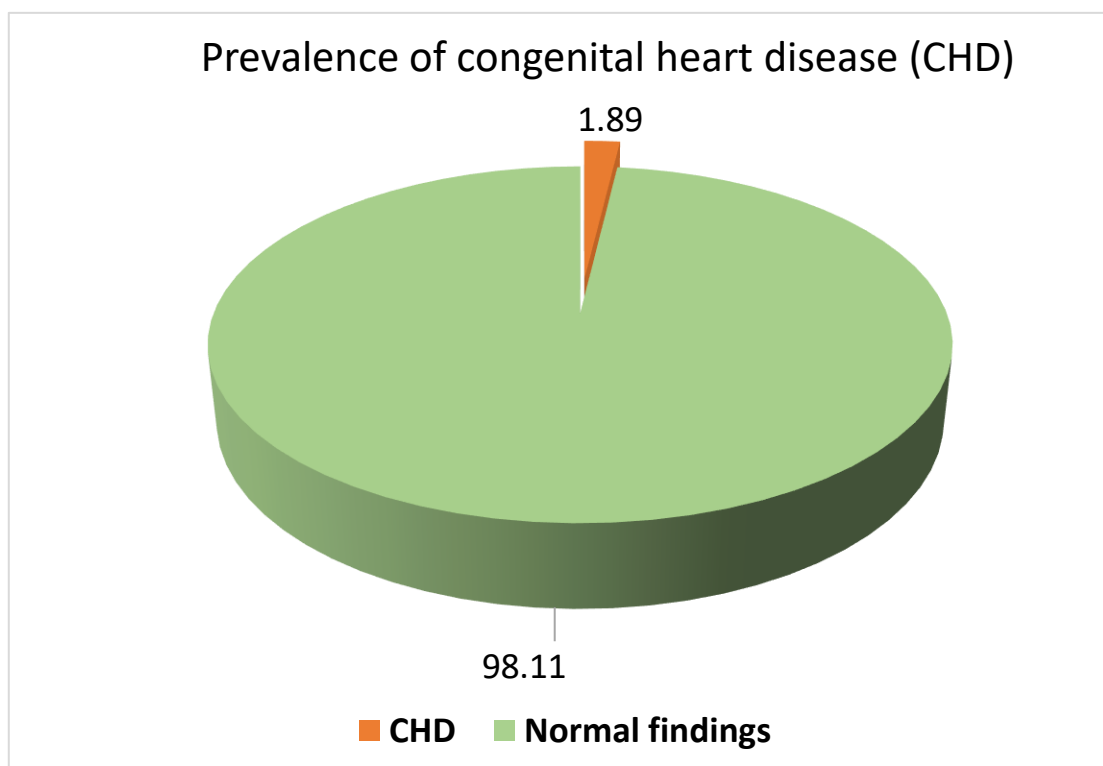


Table-2: Distribution of the study subjects by Color Doppler Echocardiography (N=116)

Type of CHD	Frequency	Percentage (%)
Acyanotic CHD		
ASD	33	28.45
PDA	28	24.14
VSD	26	22.41
Valvular PS	2	1.72
CoA	1	0.86
AV canal	4	3.45
ASD+PDA	2	1.72
VSD+PDA	1	0.86
VSD+PDA+ASD	1	0.86
Cyanotic CHD		
TOF	12	10.34
DORV with VSD with PS	1	0.86
Truncus arteriosus	1	0.86
Others		
Dextrocardia	1	0.86
HCM	2	1.72
DCM with MR with AR	1	0.86
Total	116	100.0

Table-3: Age distribution of the CHD patients (n=116)

Age group	Frequency	Percent (%)
<1 year	23	19.8
1-5 years	46	39.7
5-10 years	34	29.3
10-15 years	9	7.8
>15 years	4	3.4
Total	116	100.0
Mean±SD	4.84±4.52	
Range (min- max)	(16 days – 18 years)	

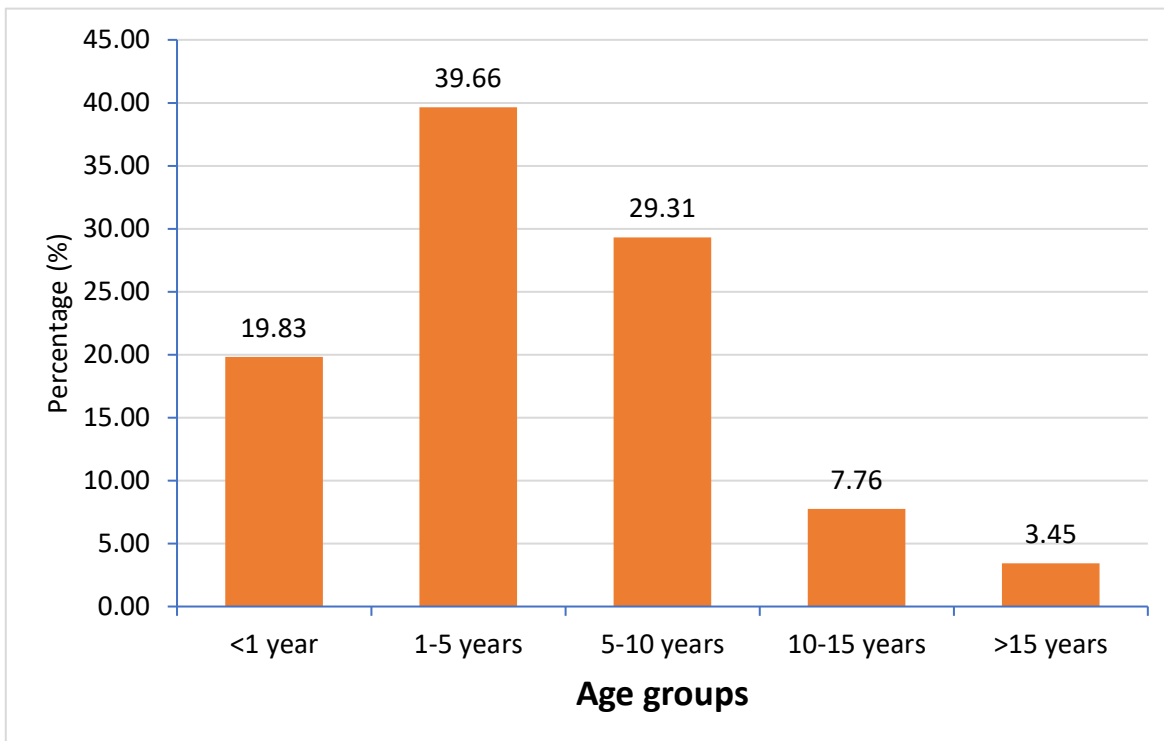


Figure-3: Bar diagram showing the age distribution of the CHD patients (n=116)

Table-4: Gender distribution of the CHD patients (n=116)

Gender	Frequency	Percent (%)
Male	64	55.2
Female	52	44.8
Total	116	100.0
Male : Female ratio	1.2:1	

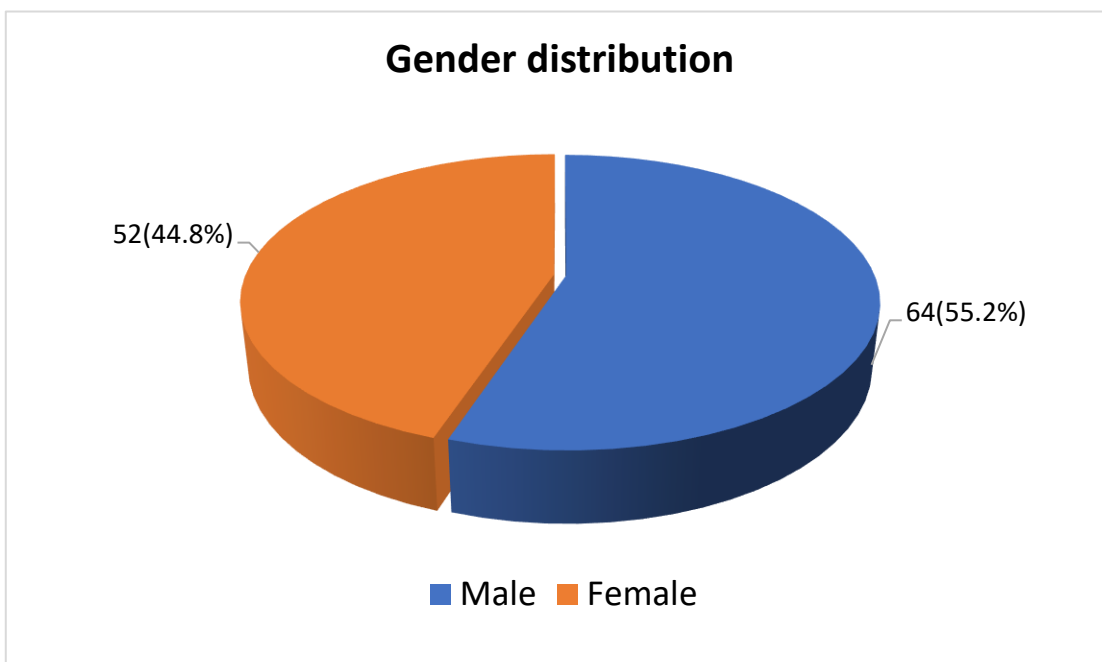
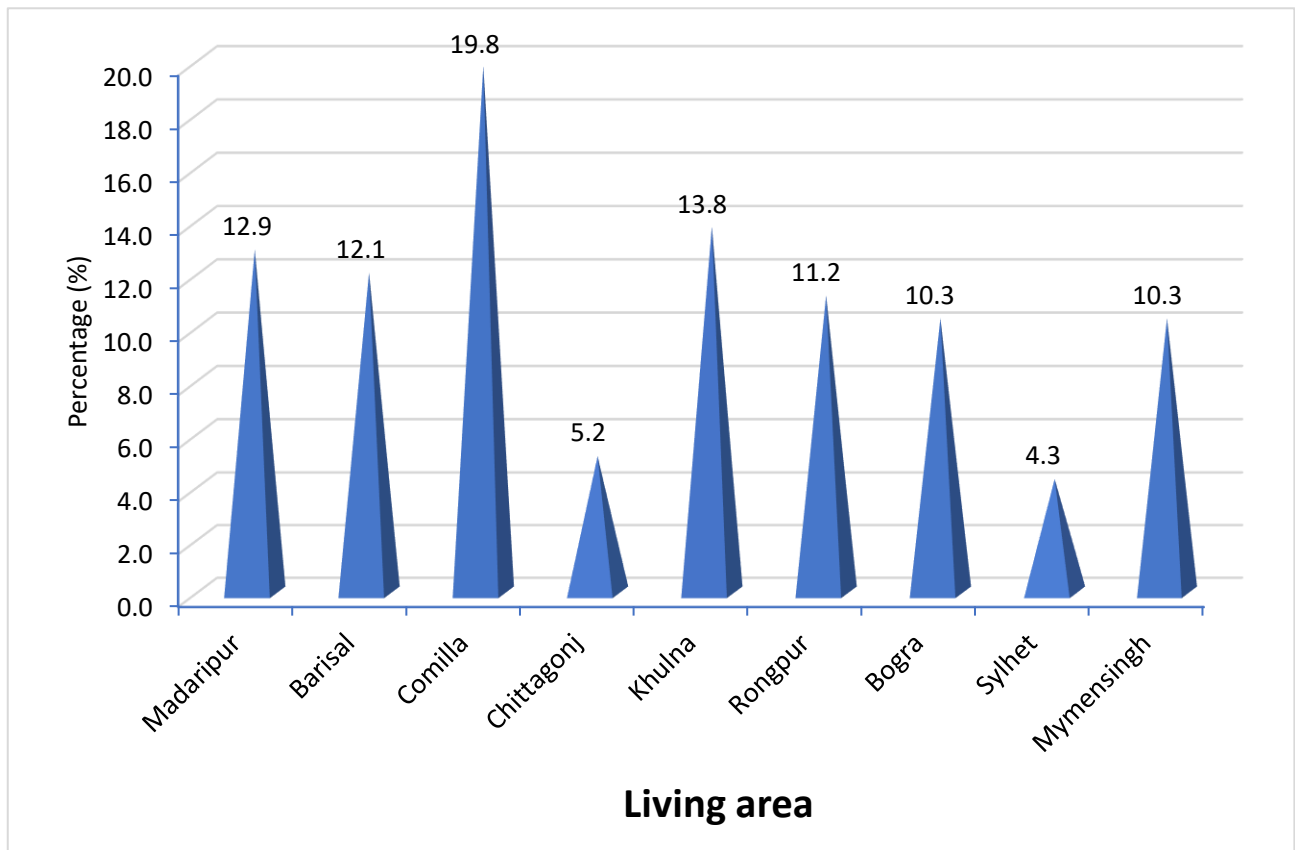


Figure-2: Pie diagram showing the gender distribution of the CHD patient

Table-5: Distribution of the study participants according to area of living (n=116)

Living area	Frequency	Percent (%)
Madaripur	15	12.9
Barisal	14	12.1
Comilla	23	19.8
Chittagonj	6	5.2
Khulna	16	13.8
Rongpur	13	11.2
Bogra	12	10.3
Sylhet	5	4.3
Mymensingh	12	10.3
Total	116	100.0



Discussion

Congenital heart disease is the most common birth defect and contributing a large portion in the infant mortality. The prevalence and pattern of CHD has regional variation worldwide. This variation may be due to different ethnicity and genetics and different environmental exposure. This population-based study was conducted to identify prevalence of Congenital heart disease in Bangladesh as we do not have national data registry for congenital heart disease. A total of 6146 children underwent Echocardiographic assessment in this study. 116 cases were found to have congenital heart diseases. The overall prevalence of CHD was found 18.9 per 1000 live births. Study conducted from China found prevalence of CHD was 9.3 out of every 1,000 live births.⁸ Prevalence of CHD in Paediatric population of central India was found 27.7 out of every 1,000-study population conducted by Pradeep et al⁹ Analyzing 114 studies from all over the world, a meta-analysis showed the highest CHD prevalence in Asia is 9.3/ 1000 live birth.¹⁰ Whereas Prevalence of CHD in Iran's ranges from 4.2 to 8.6per thousand live births^{11,12}

Out of 116 cases 64(55.2%) were female & 52 were male (44.8%) with a ratio of 1.2:1. A study conducted by Parvar SY, Ghaderpanah R, Naghshzan A. in the Southern Iran on 8145 neonate where they found male to female ratio 2.6¹³. Qazi and Saqib in their study, 276 (55.5%) children were male with male to female ratio of 1.24.¹⁴ Whereas Wannani et al¹⁵ in their study found 52.4 % male patients with CHD. Sex predilection in occurrence of Cardiac disease as male to female ratio was found almost equal in a study conducted among children in Enugu by Chinawa et al.¹⁶

In this study age from 0 to 18 years were included and CHD were found mostly in 1 to 5 years (39.7%) while study conducted in central India found more than half (300/497, 60.4%) of all the CHD patients had presented in first year of life.⁹

Distribution of type of CHD In this study were Acyanotic CHD 98(84.5%) and Cyanotic CHD were

14(12.08%) and other lesions include 4(3.43%). More than half of the patients (63.6%) in study of Pradeep et al had acyanotic CHD, followed by cyanotic (25.5%) and obstructive (9.6%) lesions.⁹ A recently conducted review of trends and pattern of congenital heart disease in Nigeria over five decades also found acyanotic congenital heart disease is the most common type with VSD to be more prevalent¹⁷. The most common CHD detected in this study was atrial septal defect 33 (28.45%), followed by patent ductus arteriosus 28(24.14%) ventricular septal defect 26 (22.41%), AV canal defect 4 (3.45%), tetralogy of Fallot 12 (10.34%), and DORV with VSD with PS & Truncus arteriosus were 1 each (0.86%). Some combined lesions like VSD with ASD 2(1.72%) and ASD, VSD with PDA 1(0.86%) And other Congenital heart diseases were HCM 2(1.72%), DCM1(0.86%). Dextrocardia 1(0.86%).

In a meta analysis conducted by Yingjuan Liu et al¹⁸ on global birth prevalence of congenital heart defect 1970-2017 found prevalence of ASD was higher in Asia than Europe and USA. Globally the prevalence of ASD was significantly negatively correlate with Gross national income. The data therefore indicate a potentially higher exposure to genetic or environmental factors predisposing to ASD in lower-income countries, particularly in Asia, than in high-income Western countries.¹⁸

But Most common acyanotic CHD reported was VSD by Meshram and Gajimwar¹⁹ (20.7%), Kapoor and Gupta et al²⁰ (21.3%), and Wannani et al¹⁵ 31.9%). Second most common CHD was ASD (19.7%) was found by Meshram and Gajimwar¹⁹. PDA was the third most common CHD in Pradeep et al^{9j} study. They found atrioventricular septal defect in 2% patients similar to Meshram et al¹⁹

Significantly higher rates of CHD was found in Comilla 23(19.8%) district, followed by Khulna 16 (13.8%) and Madaripur 15 (12.9%) respectively.

Congenital heart disease awareness was found to be very low among the parents and caregivers. Similar observation were reported by Mukul, et al²¹

and McLaren, et al²² and also Marijon, et al.²³. These reflects the need for more focus on health education of CHD among health workers, parents and care giver for early detection and timely intervention to save lives.

Conclusion

This is the only conducted data on prevalence of CHD in Bangladesh. Our observation is that, high burden of CHD in this region which reflecting continued increase in the reported birth prevalence of CHD. In our country hospital-based data of incidence of CHD was also found high. ASD was the most common Acyanotic CHD while TOF was the commonest cyanotic CHD. Higher Prevalence of ASD correlates with Asian CHD data. More than one third of the patients had presented in their first to fifth year of life. This study on prevalence of CHD will help to know the exact burden of CHD in different parts of Bangladesh and will help to strengthen health care services.

Ethical Clearance:

Ethical approval to conducted the study was obtained from University Institutional review board

Funding:

University research grand (Bangabandhu Sheikh Mujib medical university, Dhaka; Bangladesh)

Conflict of Interest:

None declared

Author Contributions:

- Prof Zahid Hussain conceived and designed the article, and did critical appraisal
- DR Tahmina Karim did the article searching, critical appraisal, data extraction, data analysis, interpretation of results, and write up of the manuscript & review of the manuscript.
- Prof Md Tariqul Islam was involved in the study design, critical appraisal, interpretation of results, and review of the manuscript.
- All other authors took part in data collection and read and approved the manuscript.

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