Original Article

Spectrum of Congenital Heart Diseases in Children at a Tertiary Care Centre: A Cross-Sectional Study

Ms. Sakshi Satish Rane[1], Dr. Abhijeet Asaram Shinde[2], Prof. Dr. Sunil Natha Mhaske[3]

[1]Final Year MBBS Student, [2]Assistant Professor, Department of Paediatrics, [3]Dean & Professor Paediatrics, DVVPFs Medical College & Hospital, Ahmednagar-414111, Maharashtra, India

Abstract:

Introduction: A gross anatomical anomaly of the heart or intrathoracic great vessels that is actually or potentially functionally significant is referred to as congenital heart disease (CHD). One of the main reasons for newborn mortality is CHDs. A significant hospital-based study from India estimates that 3.9 out of every 1000 live babies are affected by congenital heart disease. Thus, we conducted this research with the aim to study the prevalence, age-wise distribution, and clinical spectrum of congenital heart disease (CHD) in a tertiary care medical college hospital in Maharashtra. **Methodology:** This was a retrospective, descriptive, cross-sectional study carried out from March 2020 to March 2022 at a tertiary care hospital and medical college. The study included records of all discharged live births (CHD patients) as well as all in and outpatients between the ages of 0-18 years. For the diagnosis of CHD, a definition proposed by Mitchell et al. was applied. **Results:** CHD was detected in 9 out of 645 live births in the hospital during the study period. 168 children were diagnosed to be having some type of CHD. Ventricular septal defect was the most common heart lesion 43 (25.6%). Maximum number of cases were seen in 0-3 years age group (86.3%). **Conclusion:** However, it is a serious problem, which requires immediate attention for the improvement of diagnostic and therapeutic facilities which is accessible to the common man.

Key words: Congenital heart disease, Heart anomaly, Ventricular septal defect

Introduction:

A gross anatomical anomaly of the heart or intrathoracic great vessels that is actually or potentially functionally significant is referred to as congenital heart disease (CHD). One of the main reasons for newborn mortality is CHDs.[1] The majority of CHD cases are asymptomatic and found during normal neonatal checkups; in around 90% of instances, there is no clear cause that can be assigned to multifactorial problems. [2] Children with CHD account for almost 25% of all congenital deformities, making it the most prevalent congenital condition. Early diagnosis of these disorders is crucial since clinical worsening and presentation might cause a rapid collapse. [3]

The two main categories of cardiac defects are acyanotic and cyanotic heart disorders, with the former being more prevalent. The most prevalent conditions in acyanotic and cyanotic CHDs, respectively, are tetralogy of Fallot (TOF) (5-7%) and ventricular septal defect (VSD) (30-35%).[4,5] Due to home deliveries and early discharges of mothers and their newborns from hospitals without a proper neonatal assessment pertinent to the cardiovascular system by a trained and experienced individual, the incidence of CHD is underreported. [6] Infants with CHD can have a wide range of severity: During the first year of life, about 2-3 infants out of every 1000 live births will exhibit symptoms associated to cardiac abnormalities.[7]

Congenital heart diseases (CHD) affect between 3.7 to 17.5 out of every 1000 live births, making them quite frequent.[8] A status report on CHD in India states that CHD may be responsible for 10% of newborn mortality at the moment.[9] A significant hospital-based study from India estimates that 3.9 out of every 1000 live babies are affected by congenital heart disease.[10]

Corresponding Author: *Ms. Sakshi Satish Rane*

Email ID: *sakshi9rane@gmail.com*

Address: *2/B, 501, Dahisar Shivdutta CHS, C.S. Complex Road no 2, Dahisar (East), Mumbai-400068, Maharashtra, India.*

ISSN No. *: (p) 2348-523X, (o) 2454-1982*

DOI: 10.46858/vimshsj.9403

Date of Published : *30th January 2023*

The prevalence of CHD in community-based research from India ranges from 0.8 to 5.2/1000 patients. As a result, the prevalence of CHD varies depending on location and country.[11]

Thus, we conducted this research with the aim to study the prevalence, age-wise distribution, and clinical spectrum of congenital heart disease (CHD) in a tertiary care medical college hospital in Maharashtra.

Methodology:

This was a retrospective, descriptive, cross-sectional study carried out from March 2020 to March 2022 at a tertiary care medical college hospital.

Ethical clearance was obtained from the institutional ethics committee before starting the study. Simple convenience non-probability sampling technique was used for data collection. The study included records of all discharged live births (CHD patients) as well as all in and outpatients between the ages of 0-18 years. Sample size was calculated using the formula N=z2 pq/d2 where, p=prevalence, q=p-1, N=sample size, z=1.96 at 95% confidence interval (CI), d=maximum tolerable error. Estimated sample size was 168

For the diagnosis of CHD, a definition proposed by Mitchell et al.[12] was applied, that is, any gross structural abnormality of the heart or intrathoracic great vessels that is actually or potentially of functional significance excluding the systemic great arteries and veins. Any patient having the signs and symptoms like shortness of breath, difficulty in feeding, excessive sweating, bluish discoloration of lips and tongue, failure to thrive, clubbing, palpitation, feeling of impending doom, fainting, light headedness, rapid breathing, discrepancy in pulse, cyanosis, heart murmur, abnormal chest X-ray, or strong family history, recurrent chest infections, high blood pressure, swelling of abdomen and feet, chest and abdomen pain, and arrhythmias and loss of consciousness, etc. were evaluated further and those suspected of cardiac disease were subjected for chest X-ray, electrocardiogram (ECG), followed by echocardiography.

Echocardiography was done as per standards laid down by the American Society of Echocardiography.

The following age groups were considered: Newborns (1-30 days), infants (1-12 months), toddlers and preschool children (2-5 years), school children (6-12 years), and adolescents (>12 years).

The study excluded CHDs with associated syndromes, and those having acquired type of CHDs or if any information required for data collection could not be obtained.

Data was collected for each patient using hospital records. Demographic and clinical data was collected in a pre-structured proforma. Prevalence, age and sex specific frequency of all kinds of CHDs we observed were computed. The different types of CHDs considered for the present investigation were: VSD, atrial septal defect, TOF, patent ductus arteriosus (PDA), pulmonary stenosis, aortic stenosis, transposition of great arteries, dextrocardia, double outlet right ventricle, tricuspid artesia, hypoplastic left heart syndrome, single ventricle, Ebstein anomaly, and complex CHDs (various types of CHDs existing together including a rare type of CHDs).

All the data was tabulated in Microsoft Excel and Statistical analysis was done using SPSS program (version20). Categorical data are expressed as frequency and percentage. Continuous data (if any) are expressed with mean and standard deviation. Chi-square test was used to compare two categorical data. A P-value of <0.05 was considered statistically significant.

Results:

CHD was detected in 9 out of 645 live births in the hospital during the period March 2020 to March 2022. During this period, we saw 7426 new patients between 0 to 18 yrs (OPD and IPD), of these, 168 children were diagnosed to be having some type of CHD. These patients were subjected to a detailed history and thorough clinical examination, investigations such as X-ray chest, ECG all leads, and subsequently echocardiography.

A total of 168 patients had CHD, with males 102 (60.7%), and females 66 (39.3%). This amounts a prevalence of 2.26/1000 population, details of which are shown in the table.

Table 1: Spectrum of Age wise Distribution of Congenital Heart Diseases

Age group	0-3 yr		4-6 yr		7-9 yr		10-12 yr		13-15 yr		Total	%
Gender	M	F	M	F	M	F	M	F	M	F		
VSD (subaortic 85%)	19	15	1	2	1	1	1	1	1	1	43	25.6
ASD	10	8	0	0	0	0	0	0	0	0	18	10.7
PDA	25	11	1	1	1	0	0	0	0	0	39	23.2
Complex anomalies	9	5	1	0	0	1	0	0	0	0	15	8.9
AV septal defects	11	9	0	0	0	0	0	1	0	0	21	12.5
ASD+PDA	2	0	0	0	0	0	0	0	0	0	2	1.2
TOF	3	1	1	0	0	0	0	0	0	0	5	3.0
PS	1	1	0	1	0	0	0	0	0	0	3	1.8
AS	3	2	1	0	1	0	0	0	0	1	8	4.8
Ebsteins anomaly	0	1	0	0	0	0	0	0	0	0	1	0.6
TGA+VSD+PS	1	1	0	0	0	1	0	0	0	0	3	1.8
Peripheral PS	2	0	0	0	1	0	0	0	0	0	3	1.8
Bicuspid aortic valve	0	1	1	0	0	0	1	0	0	0	3	1.8
Truncus arteriosus	1	0	0	0	0	0	0	0	0	0	1	0.6
TAPVC	0	1	0	0	0	0	0	0	0	0	1	0.6
Dextroversion	0	0	0	0	0	0	0	0	0	0	0	0.0
Sinus venosus	0	0	0	0	0	0	0	0	0	0	0	0.0
DORV+PS	1	0	0	0	0	0	0	0	0	0	1	0.6
Single ventricle	0	0	0	0	0	0	0	0	0	0	0	0.0
VSD+PDA	1	0	0	0	0	0	0	0	0	0	1	0.6
Total	89	56	6	4	4	3	2	2	1	1	168	100%

AV septal defects:atrio ventricular septal defects, PS: pulmonary stenosis, AS: aortic stenosis, TGA: transposition of great arteries, TAPVC: total anamolous pulmonary venous connection, DORV: double outlet right ventricle.

Ventricular septal defect was the most common heart lesion 43 (25.6%). Acyanotic heart diseases were present in 107(63.7%) children; 61 (36.3%) had cyanotic heart diseases. Maximum number of cases were seen in 0-3 years age group (n=145, 86.3%).

Most common lesion among the acyanotic heart diseases (n = 107) was isolated VSD, that is, 43 patients representing 25.6% seconded by PDA in 39 (23.2%). Among the cyanotic heart diseases (n = 61), TOF was seen in 5 patients (8.19%), seconded by the transposition of the great vessels (n=3) (1.64%). The ages at diagnosis were also different, out of total 168 patients diagnosed as CHD; 145 (86.3%) patients were between 0-3 years, 10 (5.95%) were infants between 4 to 6 years, 7(4.17%) were between 7-9 years, 4 (2.38%) were 10-12 years school children and 13-15 years were 2 (1.19%) in number.

Discussion:

Congenital heart disease (CHD) makes up a sizable fraction of congenital abnormalities that manifest in the newborn period (up to 25% in certain studies).[13] Rheumatic fever and rheumatic heart disease prevalence have declined, according to recent studies from India and other developing nations. [14] In the near future, congenital abnormalities, especially inparticular CHDs, are projected to have a significant role in infant mortality. Therefore, it is crucial to establish the precise prevalence and case burden of congenital cardiac disease in order to suggest the proper modifications to health policies.

The incidence of CHD per 1000 live births is only reported in one study, by Khalil et al. [10] The incidence was 3.9/1000 live births, which they discovered while studying 10964 live births. All significant studies conducted in India have only considered one age group, i.e., either infants or school-age children. The former could overlook numerous tiny Tetralogy of Fallot, ductus dependent, or VSD lesions that manifest after birth. Additionally, it ignores the prevalence of CHD.Other research on the frequency of CHD in the population focuses primarily on school-age children, which automatically omits all lesions with a severe severity. [15] Consequently, they don't give the whole story. Our observation of prevalence cannot be compared to earlier studies, because we included all mild, moderate and severe CHDs in age groups ranging from 0 to 18 years.

Several research were conducted over the past 40 years to learn about the estimated CHD prevalence in various population groups, and throughout this time, the development of echocardiography significantly improved CHD diagnosis. [16] All children up to age 18 with CHD who were born at our hospital, had referrals from other hospitals, or visited our hospital for a variety of reasons were included in our study. The significant prevalence of CHDs reported from other Indian states is in conflict with our analysis. According to the other research, the majority (63.7% of all CHD patients) belonged to the acyanotic group.[17,18]

The most common kind of CHD was VSD, and the age range 0-3 years (86.3%) saw the highest percentage of cases. When compared to western data, the frequency of the complex and rare forms of CHDs was lower, but it was similar to other Indian research.[19,20] This may be a result of the severity of the problems, which may have caused patients to pass away before obtaining the medical facilities, as well as genetic and ethnic differences between us and them. Better peripheral health services may be the reason why the current prevalence of CHDs is lower than in past research.[21]

Many CHD cases would have gone undiagnosed, including newborns, especially those delivered at home, who die without medical attention, as well as those who are asymptomatic with mild to moderate degrees of CHD, or those identified at peripheral/private centres, which could increase our erroneously low prevalence. In the first few weeks of life, 30% of infants may go undiagnosed with CHD.[22]

Conclusion:

The present study's finding indicates that the prevalence of CHD is a serious problem, which requires immediate attention for the improvement of diagnostic and therapeutic facilities which is accessible to the common man. More congenital heart disease prevalence studies are required to establish baseline rates, to identify the time, individual, and geographic trends that may serve to increase awareness of early surgical and medical intervention.

Limitations:

Our study was conducted for a short time period, had a limited sample size and was a hospital-based study. So, more extensive studies need to be conducted on a larger scale to substantiate our findings. The nature of convenience sampling further limits the generalization of these findings to the entire paediatric population of India.

Conflict of interest: None.

Funding: No special funding was received for this project.

References:

1. Wu W, He J, Shao X. Incidence and mortality trend of congenital heart disease at the global, regional, and national level, 1990–2017. Medicine. 2020 Jun 6;99(23).
2. Kuehl KS, Loffredo CA, Ferencz C. Failure to diagnose congenital heart disease in infancy. Pediatrics. 1999 Apr 1;103(4):743-7.
3. Aburawi EH. The burden of congenital heart disease in Libya. Libyan Journal of Medicine. 2006 Dec 1;1(2):120-2.
4. Van Der Linde D, Konings EE, Slager MA, Witsenburg M, Helbing WA, Takkenberg JJ, Roos-Hesselink JW. Birth prevalence of congenital heart disease worldwide: a systematic review and meta-analysis. Journal of the American College of Cardiology. 2011 Nov 15;58(21):2241-7.
5. Behrman RE, Vaughan III VC. Nelson textbook of pediatrics. WB Saunders company; 1983.
6. Ferencz C, Rubin JD, Mccarter RJ, Brenner JI, Neill CA, Perry LW, Hepner SI, Downing JW. Congenital heart disease: prevalence at livebirth: the Baltimore-Washington Infant Study. American journal of epidemiology. 1985 Jan 1;121(1):31-6.
7. Dickinson DF, Arnold R, Wilkinson JL. Congenital heart disease among 160 480 liveborn children in Liverpool 1960 to 1969. Implications for surgical treatment. Heart. 1981 Jul 1;46(1):55-62.
8. Bolisetty S, Daftary A, Ewald D, Knight B, Wheaton G. Congenital heart defects in Central Australia. Medical journal of Australia. 2004 Jun;180(12):614-7.

9. Saxena A. Congenital heart disease in India: a status report. The Indian Journal of Pediatrics. 2005 Jul;72:595-8.
10. Khalil A, Aggarwal R, Thirupuram S, Arora R. Incidence of congenital heart disease among hospital live births in India. Indian pediatrics. 1994 May 1;31(5):519-28.
11. Vashishtha VC, Kalra A, Kalra K, Jain VK. Prevalence of congenital heart disease in school children. Indian Pediatr. 1993.
12. Mitchell SC, Korones SB, Berendes HW. Congenital heart disease in 56,109 births incidence and natural history. Circulation. 1971 Mar;43(3):323-32.
13. Dolk H, Loane M, Garne E. The prevalence of congenital anomalies in Europe. Rare diseases epidemiology. 2010:349-64.
14. Jose VJ, Gomathi M. Declining prevalence of rheumatic heart disease in rural schoolchildren in India: 2001-2002. Indian heart journal. 2003 Mar 1;55(2):158-60.
15. Kapoor R, Gupta S. Prevalence of congenital heart disease, Kanpur, India. Indian pediatrics. 2008 Apr 1;45(4):309.
16. Sayasathid J, Tantiwongkosri K, Somboonna N. Unrecognized congenital heart disease among Thai children. Medical journal of the Medical Association of Thailand. 2009 Mar 1;92(3):356.
17. Smitha R, Karat SC, Narayanappa D, Krishnamurthy B, Prasanth SN, Ramachandra NB. Prevalence of congenital heart diseases in Mysore. Indian Journal of Human Genetics. 2006;12(1):11-6.
18. Bhat NK, Dhar M, Kumar R, Patel A, Rawat A, Kalra BP. Prevalence and pattern of congenital heart disease in Uttarakhand, India. The Indian journal of pediatrics. 2013 Apr;80:281-5.
19. Suresh V, Rao AS, Yavagal ST. Frequency of various congenital heart diseases: analysis of 3790 consecutively catheterised patients. Indian Heart Journal. 1995 Mar 1;47(2):125-8.
20. Pai BV, Varkey GC. Spectrum of congenital heart disease in a general hospital (study of 200 cases). The Indian Journal of Pediatrics. 1974 Oct;41:317-21.
21. Ashraf M, Chowdhary J, Khajuria K, Reyaz AM. Spectrum of congenital heart diseases in Kashmir, India. Indian pediatrics. 2009 Dec 1;46(12).
22. Abu-Harb M, Hey E, Wren C. Death in infancy from unrecognised congenital heart disease. Archives of disease in childhood. 1994 Jul 1;71(1):3-7.