

Assessment of the prevalence of congenital heart diseases in children: an observational study

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Abstract

Background: Early detection of congenital heart disease is of paramount importance to improve the quality of life of children and prevent morbidity and mortality. Early detection among school children is a novel approach which is time saving and cost effective. **Aim:** to determine the prevalence of congenital heart diseases in children in a tertiary care hospital. **Material and methods:** This Prospective observational study was done in the Department of Paediatrics, Vardhman Institute of Medical Science, Pawapuri, Nalanda, Bihar, India, for 13 months. Total number patients studied were 22,500, sample included all children aged (0-15 years) were included in this study. Clinical Examination, 2D Echocardiography and color Doppler were considered for diagnosis of CHD. Clinically suspected cases were subjected for 2D Echocardiography and color Doppler. **Results:** During the study periods we observed 22,500 new patients aged between (0-15 years), including OPD and IPD, of these 80 children were diagnosed to be having some type of CHD, with a prevalence of 1.88 per 1000 patients. ASD was the most common heart lesion (46.25%). Maximum number of cases were seen in 0-1 year age group (n=58, 72.5%). Atrial Septal Defect (ASD)-46.25%, Ventricular Septal Defect (VSD)-16.25%, Patent Foramen Ovale (PFO)-12.5%, Patent Ductus Arteriosus (PDA)-7.5%, VSD+ASD-7.5%, Dextrocardia+ Bicuspid Aortic Valve+ Aortic Regurgitation-2.5%, Partial Anomalous Pulmonary Venous Connection (PAPVC)-2%, Pulmonary Stenosis (PS)-2%, PDA+ASD+Pulmonary Arterial Hypertension (PAH)-2.5%, of total cases. **Conclusion:** Prevalence of congenital and rheumatic heart disease was 1.88 per 10,000. VSD and ASD were the most common types of congenital heart disease.

Keywords: Congenital heart disease, Prevalence, Pattern, children.

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Introduction

Congenital heart diseases (CHD) refer to structural or functional heart diseases, which are present at birth. Some of these may be discovered later. These are primarily seen in neonates, infants and children; although in our country it is not uncommon to see adults with uncorrected CHD. The burden of congenital heart disease in India is likely to be enormous, due to a very high birth rate. This heavy burden emphasizes the importance of this group of heart diseases.[1] Congenital heart diseases (CHD) are relatively common with a prevalence ranging from 3.7 to 17.5 per 1000 live births. According to a status report on CHD in India, 10% of the present infant mortality may be accounted for by CHD. According to a large hospital based study from India, the incidence of congenital heart disease is 3.9/ 1000 live births. In community based studies from India the prevalence of CHD ranges from 0.8-5.2/1000 patients.[2] CHDs are one of the major causes of infant mortality. In 90% of the CHD cases, there is no identifiable cause that can be attributed as multifactorial defects, and the most cases are asymptomatic and discovered during routine neonatal check-ups. [3]

A population-based registry study from the Metropolitan Atlanta Congenital Defects Program (MACDP) reported that overall prevalence of CHD was 6.2 per 1000 births from 1968 through 1997.[4] A recent study showed that the prevalence of CHD in

screening cases with no risk indicators and in those with maternal risk indicators was low (6.9 per 1000 and 5.6 per 1000, respectively) and similar to the expected overall prevalence of 8.0 per 1000 live births in the general population.[5] In China, CHD is relatively common with a prevalence ranging from 1.5 to 6.9 per 1000 live births. The prevalence of CHD was 6.9 per 1000 live births (138 cases of CHD among 20 082 live children aged less than 1 year) in 1987 in Shanghai.[6] In 2005, the prevalence of CHD was 4.6 per 1000 live births among 19 432 children aged 0–2 years in Beijing.[7] Early detection of congenital heart disease is of paramount importance to improve the quality of life of children and prevent morbidity and mortality. Early detection among school children is a novel approach which is time saving and cost effective. Hence present study was planned to detect early and manage the cases of congenital heart disease among children.

Material and methods

This Prospective observational study was done in the Department of Pediatrics, Vardhman Institute of Medical Science, Pawapuri, Nalanda, Bihar, India, for 13 months, after taking the approval of the protocol review committee and institutional ethics committee.

Inclusion Criteria

All children aged (0-15 years) attending the pediatric outpatient department (OPD) and in patient department (IPD) admitted in the pediatric wards were included and studied in the study period.

Exclusion criteria

Preterm babies with diagnosed case of congenital heart disease were excluded from the study.

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Methodology

Total number patients studied were 22500, sample included all children aged (0-15 years) attending the pediatric outpatient department (OPD) and in patient department (IPD) admitted in the pediatric wards were included and studied in the study period. Clinical Examination, 2D Echocardiography and color Doppler were considered for diagnosis of CHD. Clinically suspected cases were subjected for 2D Echocardiography and color Doppler. Descriptive data are presented as percentages. Descriptive statistics was calculated for CHD prevalence per 1000 patients.

Results

During the study periods we observed 22,500 new patients aged between (0-15 years), including OPD and IPD, of these 80 children were diagnosed to be having some type of CHD, with a prevalence of 1.88 per 1000 patients. Pattern of CHD in this study was Acyanotic Congenital Heart Disease (ACHD)-80 cases.

Acyanotic heart diseases were present in 80 children, no cyanotic heart diseases was seen. ASD was the most common heart lesion(46.25%). Maximum number of cases were seen in 0-1 year age group(n=58, 72.5%). Atrial Septal Defect(ASD)-46.25%, Ventricular Septal Defect(VSD)-16.25%, Patent Foramen Ovale(PFO)-12.5%, Patent Ductus Arteriosus(PDA)-7.5%, VSD+ASD-7.5%, Dextrocardia+ Bicuspid Aortic Valve+ Aortic Regurgitation-2.5%, Partial Anomalous Pulmonary Venous Connection(PAPVC)-2%, Pulmonary Stenosis(PS)-2%, PDA+ASD+Pulmonary Arterial Hypertension(PAH)-2.5%, of total cases. No case of cyanotic congenital heart diseases (CCHD) was found during the study period. 2 girl child aged 10 years was diagnosed with ASD during our routine outpatient check-up, confirmed with 2D Echocardiography, operated for ASD closure in next 15 days in Cardiac centre.

Table 1: Pattern of Congenital heart diseases in the study

Pattern of Congenital heart diseases	Number of patients	Percentage
ASD	37	46.25
VSD	13	16.25
PFO	10	12.5
PDA	6	7.5
VSD+ASD+PAH	6	7.5
Dextrocardia+BAV+MildAR+TrivialAR	2	2.5
PAPVC	2	2.5
PS	2	2.5
PDA+ASD+PAH	2	2.5

Table 2: Spectrum of Age and sex wise distribution of Congenital Heart diseases

Age group	Male	Female	Total	Percentage
0-1 years	28	30	58	72.5
1-5 years	5	5	10	12.5
5-15 years	5	7	12	15

Discussion

The term congenital is derived from the Latin word ("con" means together and "genitus" means born) referring to "present at birth". CHD is known as a defect in "cardiocirculatory" structure or function that is existent from birth, although it may be discovered later.[8] CHD remains the leading cause of death in children with malformation.[9] Large majority of these structural abnormalities of heart occur as an isolated anomaly, but around 33% have associated anomalies.[10] Etiology of CHD is multifactorial and a large collection of environmental and genetic causes have a role in its pathogenesis.[11] Malformations of the cardiovascular system are also associated with significant medical morbidity, which requires use of costly medical facilities.[12] As a group, congenital heart disease (CHD) constitute a significant proportion (upto 25% in some studies) of congenital malformations that present in the neonatal period. Recent studies from India and other developing countries have shown a decline in prevalence of rheumatic fever and rheumatic heart disease.[13] Congenital malformations and in particular CHD's are likely to become important contributors to infant mortality in the near future. Hence, it is important to determine the exact prevalence and case burden of congenital heart disease so that appropriate changes in health policies can be recommended.[14] Knowledge of the epidemiology of congenital heart disease is the basis on which investigative efforts will emerge to identify the causes of cardiac dysmorphogenesis and afford opportunities to prevent them.[15] In

our study the prevalence of CHD was 1.88 per 1000 patients. In a hospital based study, Smitha et al found the prevalence of CHD in newborn for 5 years in Mysore from 6.6 to 13.06/1000.[16] However, in a recent study from Kanpur², again a hospital based study, the prevalence of CHD was found to be 26.4/1000. Both these studies found VSD as the commonest heart lesion. But our study found ASD as the commonest heart lesion followed by VSD as the second common lesion. Prevalence was more in females than in males, which was comparable to study by Bhardwaj R et al.[17] Kapoor R et al found a prevalence of 26.4 per 1000 patients which is higher than found in the present study.[2] This may be due to the fact that present study was community based and the said author study was hospital record based study. Wannu KA et al found a prevalence of 1.12 per 1000 patients.[3] This was also a hospital record based study and that may be the reason for their higher prevalence. In our study ASD was the most common heart lesion(46.25%) and followed by Ventricular Septal Defect(VSD)-16.25%. They both together constituted more than 62.50% of the congenital heart disease among school children. Similar findings were reported by Kapoor R et al and Wannu KA et al.[2,3] In our study maximum number of cases were seen in 0-1 year age group(n=58,72.5%) which was comparable to study by Kapoor R and Gupta S[2] where the maximum number of cases were seen in 0-3 year age group(n=233,82.9%). Because of our study and screening done maximum cases were detected in early age group (0-1 year), so early

screening and diagnosis of CHD is important in the prognosis and treatment of congenital heart disease.

Conclusion

The prevalence of CHD in our study was 1.88/1000 patients. ASD was the commonest lesion and CHD was more common in females, maximum number of cases with CHD was seen in 0-15 year age group in this study population. So the diagnosis of CHD should be kept in mind while doing routine cardiac examination in all age groups of children, earlier the diagnosis better is the prognosis. Innocent murmurs may not be innocent always, recommendations for universal screening has to be considered for timely interventions and better outcomes.

References

1. Saxena A. Congenital heart disease in India: a status report. *Indian J Pediatr.* 2005;72:595-8.
2. Kapoor R, Gupta S. Prevalence of congenital heart disease, Kanpur, India. *Indian Pediatr.* 2008;45:309-11.
3. Wann KA, Shahzad N, Ashraf M. Prevalence and spectrum of congenital heart diseases in children. *Heart India.* 2014;2(3):76-9.
4. Botto LD, Correa A, Erickson JD. Racial and temporal variations in the prevalence of heart defects. *Pediatrics* 2001;107: E32.
5. Stumpflen I, Stumpflen A, Wimmer M, Bernaschek G. Effect of detailed fetal echocardiography as part of routine prenatal ultrasonographic screening on detection of congenital heart disease. *Lancet* 1996;348:854-57.
6. Liu WT, Ning SB, Hua BJ et al. The incidence and its characteristics of congenital heart disease in Yangpu and Xuhui districts of Shanghai. *Chin J Pediatr* 1995;33:347-49.
7. Wang HS, Yuan X, Xi YS et al. Prevalence study of congenital heart disease in 19432 children aged 0-2. *Chin J Child Health Care* 2001;9:236-38.
8. Webb GD, Smallhorn JF, Therrein J. Congenital heart disease. In: Braunwalds Heart disease, 7th edn, Zipes, Libby, Bonow, Braunwald(Eds). Philadelphia:Saunders 2005;pp.1489-547.
9. Bernstein D. Congenital heart disease. In: Nelson Textbook of Paediatrics, 17th edn. Behrman, Kleigman, Jenson (Eds). Philadelphia:Saunders,2004;pp.1499-502.
10. Noonan JA, Ehmke DA. Associated non cardiac malformations in children with congenital heart disease. *J Pediatr.* 1963;63:468-71.
11. Billett J, Majeed A, Gatzoulis M, et al. Trends in hospital admissions, in-hospital case fatality and population mortality from congenital heart disease in England, 1994 to 2004. *Heart.* 2008 Mar;94(3):342-8. Epub 2007 Jul 23.
12. Fixler DE, Pastor P, Chamberlin M, et al. Trends in congenital heart disease in Dallas County births, 1971-1984. *Circulation* 1990;81(1):137-42.
13. Jose VJ, Gomathi M. Declining prevalence of rheumatic heart disease in a rural school children in India:2001-2002. *Indian Heart J* 2003;55:158-60.
14. Vaidyanathan B, Krishna Kumar R. The global burden of congenital heart disease. *Congenital Cardiology Today* 2005;3:1-8.
15. Alabdulgader AAA. Congenital heart disease in 740 subjects: epidemiological aspects. *Ann Trop Paediatr* 2001;21(2):111-8.
16. Smitha R, Karat SC, Narayanappa D, Krishnamurthy B, Prasanth SN, Ramachandran NB. Prevalence of congenital heart disease in Mysore. *Indian J Hum Genet* 2006;12:11-16.
17. Bhardwaj R, Kandoria A, Marwah R, Vaidya P, Singh B, Dhiman P, Sood A, Sharma A. Prevalence of congenital heart disease in rural population of Himachal A population-based study. *Indian Heart J.* 2016;68(1):48-51.

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