Original Article

Profile of congenital heart disease in Pediatric population: two years' experience at a teaching hospital

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Abstract

Background: CHDs (Congenital heart defects) are a major morbidity and mortality cause in children with a substantial worldwide health burden. Therefore, this is significant for determining their spectrum as well as identifies treatable heart defects. **Aims:** To study the CHD's profile in a semi urban along with rural community between age group 0 to 12 years and study different forms and frequency of occurrence of congenital heart diseases in selected cases using echocardiography as diagnostic tool. **Methods:** In this retrospective study, case records of 154 cases of proven cases of CHD were analyzed in detail. The relative frequency of occurrence of each acyanotic and cyanotic CHD has been noted in selected cases. The study period was between January 2015 to December 2016. **Results:** Of 154 cases analyzed ventricular septal defect has been found the mainly diagnosis.42 cases were detected to have ventricular septal defect followed in frequency by tetralogy of fallot which was echocardiography diagnosis in 38 cases. PDA followed by ASD were the next common acyanotic congenital heart diseases detected. In cyanotic cases, TOF was followed by transposition pathology complex. Males outnumbered females. **Conclusion:** We observed that CHD's profile was comparable to the published literature in our population. CHDs are widespread in our set-up, and echocardiographic early CHD detection is a safe and reliable method to diagnose CHD in children, which significantly enhances the assessment of critically sick children.

Keywords: congenital heart disease (CHD), Tetralogy of Fallot (TOF), Echocardiography Ventricular septal defect (VSD).

Introduction

Congenital cardiovascular disease is described as cardio circulatory function or structure abnormality, even when present at birth much later. Congenital cardiovascular abnormality is mainly caused by an altered embryo development or structure failure to advance beyond an early fetal or embryonic growth stage. The aberrant flow pattern caused by an anatomical defect can significantly affect the functional and structural circulation development[(1)]. Because infants with these life-threatening cardiac abnormalities may not have signs initially or because the clinical sign may be ambiguous, critical physical conditions may not be diagnosed in most situations[(2)]. Birth is a significant incident between postnatal and fetal circulation, and the main variations are from the aquatic amniotic environment and placental gas exchanges to pulmonary ventilation and breathing. Air-breathing signifies a rapid decrease in pulmonary vascular resistance, whereas a substantial rise in pulmonary blood flow. Fetal structures, for example, ductus arteriosus, ductus venosus, and foramen ovalare no longer required and begin to close that were essential for fetal circulation.

Neonates with CHD (congenital heart disease) related to pulmonary or systemically dependent duct blood

flow or mixing physiology, including transposition of great vessels (TGV), are at great collapsing and compromising risk because they are not sufficiently transitive[3,4].

In so much as incidence is the most direct descriptive measure of the occurrence of a disease, which is the cause of the condition,' this is not unexpected that a number of congenital cardiac disease incidence (or population) studies have been tried in the past. Given the difficulties involved in accurate diagnosis of the clinical heart, the relative rareness and natural history of many of the heart problems, it is also no surprise that various truncations have occurred in previous studies, i.e. lack of a specific lesion diagnosis, data confined to autopsy or experience confined to a single hospital[5].

CHD in clinical terms may be divided in three important aspects

1. *Life-threatening CHD*

Structural cardiac diseases are probable and compromise cardiovascular collapse if early treatment is not given. Hypo-plastic left heart (HLHs)/mitral atresia, Aortis stenosis (AS), Coarction of aorta withinterrupted aortic arch (COA/IAA), transposition of great vessels (TGV), pulmonary atresia (PA), and Total anomalous pulmonary venous return (TAPVR) are included.

2. *Clinically significant CHD*

Structural cardiac defects with consequences on heart function, but when early intervention is unlikely to be necessary. In this specific group most prevalent areatrial septal defect (ASD), AVSD, ventricular septal defect (VSD) as well as Tetralogy of fallot (TOF) with good pulmonary artery anatomy.

3. *Clinically non-significant CHD*

Cardiac anomalies are anatomically described, although of negligible functional or clinical importance. They involve mild PS (pulmonary stenosis), ASD (atrial septal defect), and small VSD, only echocardiography identifiable as well as requiring no treatment.

Two forms of cardiac lesions depend on the duct.

The systemic circulation depending on ductus (also known as obsolete lesions on the left-hand side) involves HLHS (Hypoplastic left heart syndrome) and its variations, serious AS, serious COA form, IAA, and its variations. Ductal patency is necessary to keep the perfusion on the entire body, or even on the lower sides, where a child suffers progressive acidosis when the duct is restricted. As a result, leg pulses and perfusion declines form due to renal impenitent, are impalpable and oliguria gradually impaired. Other kinds include pulsing ductus-dependent circulation (also known as right-sides blocked lesions), including critical univentricular PS/PA heart, PS/PA, TA, critical PS, PA, and its variants, TOF, and severe Ebsteins anomaly. Intact ventricular septum TGA (TGA/IVS) serves as a duct-dependent lesion, while large ASD is more crucial for circulatory blending. Many of these CHDs have increasing cyanosis without an adequate supply of oxygen. Since the fetal physiology of the newborns is acclimated chronically to hypoxia in the uterine life, they may tolerate fewcyanosis degree than older children or babies. The CHD variety is vast due to several defects combinations that might affect different cardiac levels, veins or major arteries, septum, ventricle, and atrium. Cyanotic CHD categories are classified into reduced pulmonary fluid with right-to-left shunting lesions (PA, ventricular or atrial shunting ATAs), poor mixing lesions (trans positional physiology), and intra-cardiac mixing lesions from right to left shunt(TAPVR, truncus arteriosus, and single ventricular physiology). Certain CHD develops throughout fetal life when the cardiac structures' growth depends on the flow. Therefore, fetuses with mild left-sided obstructive lesion can proceed over time to coarctation / HLHS; likewise, a late phenomenon that begins as severe pulmonary stenosis is shown as pulmonary atresia having undamaged ventricular septum. PPHN is another common ailment connected with other high-risk newborn aspects that may not easily distinguish between CHD as discussed above[6, 7].

The most useful way to diagnose CHD is an echocardiogram. More comprehensive cardiac anatomy identification is available with a two-dimensional, multidimensional image (containing the short and long subcostal axis, the apical four chambers,

and the short and long parasternal axis along with suprasternal axis) that delineates the whole anatomy in different areas. Echocardiography may be conducted using M mode to evaluate the systolic ventricular function, quantify chamber dimensions along with wall thickness. M-mode echocardiography is very beneficial for the measurement of wall thickness as well as chamber dimensions as it is very beneficial for systolic ventricular function assessment.

Pulsed or continuous wave Doppler techniques may be utilized for measuring pressure gradients across the stenotic or regurgitation valve fluid. Different sorts of Doppler waves can quantify abnormal cardiac physiology. They may also be used to determine reduced flow in the descending aorta as observed in COA. Color flow is a useful tool for determining rebounding flow direction and shunting of the valve, accentuating the flow of defects or constricted valves, and discovering anomalous turbulent flows, including coronary arteriovenous fistula and vascular collateral[8].

Methods

Aims and Objectives

1. To study the CHD profile in a semi-urban and a rural community between age group 0 to 12 years.
2. To study different forms and frequency of occurrence of acyanotic and cyanotic congenital heart diseases in selected cases.

Materials and Methods Source of Data

The source of data is from case sheets of patients with echocardiographically proven congenital heart disease. The patients were referred for confirmation or exclusion of diagnosis CHD suspected from history along with physical examination.

Study Design

This is a retrospective observational study carried out at the department of noninvasive cardiology and a teaching hospital and referral center. The population covered is mainly semi-urban and rural. The study period was from January 2015 to December 2016. Case records of the children below 12 years who have been diagnosed as having CHD by echocardiography were analyzed in detail with consideration of age, sex, clinical features (reason for referral) and complete Echocardiography diagnosis. Echocardiography was done using Esaote imagic agille model 2011.High frequency probe was used. All echocardiography examinations were recorded and interpreted by experts with adequate training and experience.

Inclusion Criteria

a) Age group newborn to 12 years of age.

b) Patients with proven diagnosis of congenital heart disease (CHD) on echocardiography examination.

Exclusion criteria

Acquired heart diseases (rheumatic fever, myocarditis, etc.)

Throughout the study period of 2 years, total 154 cases have been enrolled in this study that fulfilled inclusion criteria. After inclusion in the research, observations were noted in a prescribed proforma in every case a thorough analysis has been done. As this is a descriptive study after discussing with the statistician no statistical methods are applicable only ratios and percentages were used for evaluation.

Results

Within the study period of 2 years, 154 children aged 0–12 years who presented to us for various complaints have been diagnosed as having CHD through echocardiographicassessment.Table 1 presented the age distribution of such cases. The maximum cases which we studied were in the age group of 0 to1 year. As shown in Table 2 number of males was 91 and females 63. One interesting observation about this was that all the 3 cases diagnosed as Ebsteins anomaly were females. TOF and VSD, the most common cyanotic and acyanotic heart diseases were more common in males than females.

Cases Distribution as per the diagnosis of CHD

As shown in table 3, VSD has been the most common acyanotic heart disease existing in 42 of 154 cases. (28%) This was followed in frequency by Patent ductus arteriosus and atrial septal defect detected in 12 and 10 percent resp. Among cyanotic CHD, tetralogy of Fallot (38 and 25%) was the most frequent diagnosis, followed by other complex lesions. Those were transposition

Table 1: Age distribution of 154 cases of CHD

Age group	No of cases	Percentage
0-1 year	78	51
2-5 years	44	29
6-12 years	32	20
Total	154	100

Table 2: Sex Distribution of cases

Sex	No of cases	Percentage
Male	91	59
Female	63	41
Total	154	100

pathology (7%), TAPVC (3%), tricuspid atresia (3%) Ebsteins anomaly (2%), HLHS, followed by DORV.

Discussion

Over the years, the overall CHD birth prevalence has been raised significantly, in 1930 from 1 per 1,000 live births to 9 per 1,000 live births. Approximately 150 million births each year worldwide, which represents 1.35 million live births per year, with CHD, which is one of the leading public health concerns [9].

As from the report, the total rise in CHD birth prevalence over the years might be produced rather than an actual rise by variations in diagnostic tools as well as screening methods. Echocardiography has been widely incorporated into clinical practice in the 1970s, allowing asymptomatic patients and patients with minor abnormalities to also be diagnosed. This development likely explains the increase in overall CHD in the 1970s and some categories, like VSD, PDA, and ASD patients. The relative birth prevalence consistency estimates the complicated CHD subtypes further suggests a purely methodological rise[10, 11].

The CHD profile differs according to the investigated age group (Table 4). A common cardiac failure, such as septal ventricular defeat, arteriosus patent, and septal atrial defect, is simple and possibly correctional at a certain age. But autopsy investigations are more likely to have a significant and complicated CHD incidence. The autopsy collection of 270 patients reported in Kinare et al in 1981 shows a significant prevalence of several types of Left Heart Disorder such as aortic atresia, mitral atresia, and aortic coarctation. Similarly, newborn and infant hospital series had a greater prevalence of major CHD such as large artery transposition, pulmonary atresia, etc. In older children, ventricular septal abnormalities, patent ductus arteriosus, and atrial septal abnormalities are proportionally more common. In India, in neonates, CHD is becoming increasingly known since pediatricians who are the major health provider are maybe becoming sensitive. The rise might also be associated with echocardiography devices and qualified personnel, as echo forms the basis of CHD neonates' diagnosis. Neonates with CHD makeup around 10% of all CHD patients reported in 2004 at the ambulatory department of the All-India Institute of Medical Sciences in New Delhi, a rise of less than 4% in 1991. The most frequent ventricular septal defect remains in neonates. Patent ductus arteriosus is closely monitored. One-fifth of the neonates with CHD show the transposition of large arteries. Approximately 13% of patients have pulmonary atresia and its variations[12].

Table 4 shows compiled data including findings from previous studies[13-17].

Our study's most prevalent cardiac defect was ventricular septal defect, accounting for 28% of all CHD patients. This finding correlates with many previous studies on prevalence[18-20].

Table 3: Table showing relative frequency of occurrence of CHD in 154 cases

ECHO Diagnosis	Total (%)	0-1year	2-5 years	More than 5 years
VSD	42 (28)	22	11	9
ASD	16 (10)	5	8	3
PDA	18 (12)	12	4	2
VSD +PS	5 (3)	4	1	0
PS	2 (1)	0	0	2
Dextrocardia	3 (2)	2	1	0
TOF	38 (25)	21	13	4
TGV	10 (7)	5	4	1
TAPVC	4 (3)	3	1	
Dextrocardia with TA	1 (1)	1	0	0
TA	1 (1)	0	1	0
DORV	2 (1)	2		

Table 4: Profile of congenital heart diseases in India

Author/yr	Age group	No with CHD	Profile (% of all CHD)							
			ASD	VSD	PDA	TOF	TGA	HLH	COA	Patre
Present study	<12 years	154	16	42	18	38	10	3	2	
Bhardwaj R. 2014[13]	<18 years	661 (including 83 adults)	19	33	4	17	3		1	2
Thakur 1995[14]	5-16 years	70	38	32						
Vashishtha 1993[15]	5-15 years	44	11	41	4	14				
Kinare 1981[16]	<1 year	270		4	9	12	12	10	8	6
Shrestha 1980[17]	5-16 years	111	23	30	11	4				

ASD: Atrial septal defect, CHD: Congenital heart disease, CoA: Coarctation of aorta, HLH: Hypoplastic left heart, PAtre: Pulmonary atresia, PDA: Patent ductus arteriosus, TGA: Transposition of great arteries, TOF: Tetralogy of Fallot, VSD: ventricular septal defect.

A 4.1/1000 prevalence has been observed by Ashraf M et al.[12] The most common lesion has been 69 (31.2%) VSD (ventricular septal defect), followed by 36 (16.3%) PDO (patent ductus arteriosus). In 17 (7.8%) patients, TOF (Tetralogy of Fallot) has been the most common CHD[21].

Similar to other research, we observed that Fallot's tetralogy had been the most common kind of cyanotic CHD, with a 25 percent share of all congenital cardiac disorders[22]. The relatively high proportion of TOF cases as compared to acyanotic heart diseases may be explained as we are getting referrals from more critical indoor patients than outdoor patients.

Conclusion

While no novel data were available from this study, this research has been relevant to the spectrum in semi-urban and rural children (0-12 years) of various congenital heart diseases (CHD) so that we may estimate their burden, we should be aware of the echocardiographic diagnosis as well as management of every CHD including some complex cyanotic diseases also. In this research, in patients, the ventricular septal defect has been the most common diagnosis with congenital acyanotic heart disease as well as TOF in cyanotic CHD patients.

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