Pak Heart J

PRESENCE OF CONGENITAL HEART DISEASES IN SICK NEONATES REFERRED FOR ECHOCARDIOGRAPHY

Syed Najam Hyder[1], Tahmina Kazmi[2], Uzma Kazmi[3]

[1-3]Children Hospital and Institute of Child Health, Lahore-Pakistan

Address for Correspondence:

Syed Najam Hyder

Children Hospital and Institute of Child Health, Lahore-Pakistan

Email: drnajamhyder@gmail.com

Date Received: March 10,2018
Date Revised: June 26,2018
Date Accepted: Aug 27,2018

Contribution

SNH conceived, designed and did statistical analysis. TK did data collection. UK did review and final approval of manuscript. All authors contributed equally.

All authors declare no conflict of interest.

This Article May Be Cited As: Hyder SN Kazmi T Kazmi U. Presence of congenital heart diseases in sick neonates referred for echo-cardiography . Pak Heart J 2018; 51 (04):328-32

ABSTRACT

Objective: To analyze the importance of symptoms as a reason for referral to pediatric cardiologists in the diagnosis of congenital heart diseases (CHD) in the neonates.

Methodology: This is a cross sectional study on sick neonates referred for cardiac evaluation with echocardiography having clinical suspicion of congenital heart disease. The study was conducted at Cardiology Department Children Hospital, Lahore from 1st January to 31st December 2017. Data and echocardiography results were extracted from patients' documents.

Results: Out of 302 sick neonates referred for echocardiography with suspicion of congenital heart diseases 25.1% were found to have congenital heart disease in this study. There were 66% males with 92.1% neonates of less than 15 days of life. In our study 90.4% had poor perfusion and low oxygen saturation (≤ 94%) was found in 85.5% cases, Tachypnea in 92.4% of babies tachycardia in 92.4% and murmur was found in 19.5%.Surprisingly in high risk groups only 3.9% babies in our study had CHD. In this study the most common acyanotic heart disease found was ventricular septal defects i.e 6.6% followed by coarctation of aorta 2.6% and atrial septal defects 2.1% along with AVSD 2%. While in cyanotic heart disease TGA was the commonest disease ie 5% followed by pulmonary atresia with intact septum and pulmonary atresia with VSD 1.3% each. Arrhythmias in sick neonates could not be added in the study because they were treated first and then referred for echocardiography.

Conclusion: In sick babies in spite of high suspicion 25% found to have congenital heart disease. High risk groups had low incidence of congenital heart disease in this study. In acyanotic heart disease VSD found to be common followed by coarctation of aorta while in case of cyanotic heart disease TGA followed by pulmonary atresia intact septum and VSD found to be the commonest lesion.

Key Words: Congenital heart diseases, Echocardiography, Newborn

INTRODUCTION

Congenital heart defects have varying presentations, from defects that progress asymptomatically to those with significant symptoms and high mortality rates. Prevalence analyses show different, sometimes very conflicting results depending on the age of the population studied. Conflicting results also result from factors such as the inclusion of defects that may go completely unnoticed on physical examination like the presence of a bicuspid aortic valve, or from the classification of ductus arteriosus sometimes as a defect, sometimes as a persistence that can still be considered physiological.

Common manifestations of CHD include heart murmur, cyanosis, heart failure, arrhythmia, respiratory distress and some others, which depend on the type of heart disorder and its severity. Cyanosis is one of the most important clues to diagnose CHD, which its central form is a presentation of decreased arterial oxygenation.[1]

Neonates with polycythemia may appear to be cyanotic due to high amounts of non-saturated hemoglobin. Besides, neonates with severe anemia may look pink despite improper arterial saturation. Heart disorders with low systemic output and acidosis such as those in which there is an increased pulmonary flow, lead to respiratory distress.[2,3] Despite this fact, 50% of CHD neonates have no murmur at early stages of their life.[4] Hepatomegaly is helpful but not diagnostic. Assessing pulse and peripheral perfusion is vital.[5] Echocardiography is the best non-invasive tool in assessing CHD with a high accuracy rate. Other diagnostic tools include CT-scan, MRI and heart catheterization.[6]

The present investigation was performed to highlight the importance of clinical signs and symptoms to diagnose congenital heart diseases and to evaluate echo findings.[6]

METHODOLOGY

This is a cross sectional study based on echocardiographic findings conducted in echocardiography department at Children Hospital, The Institute of Child Health Lahore from 1st January to 31st December 2017 in sick neonates referred with suspicion of CHD from the nursery ward. Pediatricians responsible for newborn care were trained and instructed to request an assessment from pediatric cardiologists whenever a congenital heart disease was suspected, that is, clinical conditions such as persistent dyspnea or cyanosis were detected and included all signs and symptoms that could result from a congenital heart disease. Respiratory distress, pneumonia, septicemia, and reasons for ordering echocardiography (murmur, cyanosis, tachycardia, arrhythmia, chromosomal abnormalities, multiple congenital abnormalities, cardiomegaly, dextrocardia, asphyxia, neonate of diabetic mother, etc) were recorded.

After checking saturation by pulse oximetery and assessing other clinical signs , the newborns underwent transthoracic echocardiography were recorded by using 6S probe on GE vivid E-95 model of echocardiography machine. 2-D, M mode and Doppler (pulsed, continuous-wave, and color flow mapping) studies were carried out to record cardiac defect, dimension, function and regurgitations respectively by consultant pediatric cardiologist. Echocardiographic data was collected on a predesigned proforma containing information regarding name, gender, age, weight and associated malformation. The result of this study was used as a parameter for the diagnosis of cardiac malformation. The protocol was duly approved by the hospital's Research Ethics Committee. Whenever a heart disease with significant hemodynamic or clinical consequences was detected.

PFO, PDA, PPHN , septal hypertrophy along with right or left ventricular hypertrophy or dysfunction was excluded from the study group considering not part of congenital heart disease because it can be also normally associated at early age or with hypoxia or pneumonia in neonates.

Similarly in case of more than one cardiac lesion as VSD and PDA, VSD and ASD it was included in major category of VSD. Those babies who were referred after diagnosis of congenital heart diseases for management were also excluded from the study.

Categorical variables applied to compile the results in SSPS version- 22 used to find the frequencies and percentages. In this investigation, incidence of CHD and association between clinical symptoms and each parameter was assessed.

RESULTS

Total of 302 sick children were included. There were 66% male and 34% female. Age was divided into four group's i.e 0 -7 days,8 -14 days, 15 -21 days and more than 21 days. About 89% (n=169) neonates were below 15 days of life, 10.9% (n=70) neonates belong to more than 15 days of life (Table-1).

Five clinical parameters were assessed in this study as the main reason for referral to the cardiologist that are poor perfusion, oxygen saturation, tachypnea, tachycardia and murmur. Because of sickness more than one symptom were found in these neonates, therefore they are added in more than one categories. In our study 90.4% (n=274) had poor perfusion, low oxygen saturation (≤ 94%) found in 85.5% (n=258) cases, tachypnea in 92.4% (n=279) of babies tachycardia in 92.4% (n=268) and murmur found in 19.5% (n=59) (Table-2).

Out of 302 sick neonates referred for echocardiography with suspicion of congenital heart diseases 25.1% (n=76) were found to have congenital heart disease in this study (Table-3). Surprisingly in high risk groups only 3.9% (n=3) babies in our study had CHD. High risk groups were included a

meconium aspiration syndrome, birth asphyxia 1, ANN-2&3, IDM, syndromic babies and other group included cleft lip and palate, omphalocele ,imperforate anus and bladder extrophy (Table-4).

Regarding congenital heart disease we divided it into two categories acyanotic and cyanotic heart disease .In this study the most common acyanotic heart disease found was ventricular septal defects (n=20) i.e 6.6% followed by coarctation of aorta 2.6% and atrial septal defects 2.1% along with AVSD 2% (n=6) . While in cyanotic heart disease TGA was the commonest disease ie 5% (n=15) followed by Pulmonary atresia with intact septum and pulmonary atresia with VSD 1.3% (n=4) each (Table-5). Arrhythmias in sick neonates could not be added in the study because it was treated first and then referred for echocardiography.

Table 1: Age Groups in Study Population (n=302)

	Frequency (n)	Percentage (%)	Valid Percent	Cumulative Percent
7 days	184	60.9	60.9	60.9
15 days	85	28.1	28.1	89.1
21 days	20	6.6	6.6	95.7
>21 days	13	4.3	4.3	100.0
Total	302	100.0	100.0	

Table 2: Clinical Presentations of Study Population (n=302)

Clinical Features	Frequency (n)	Percentage (%)	Cumulative percentage
Poor perfusion	274	90.4%	90.4%
O_2 Saturation (= 94%)	258	85.5%	85.5%
O_2 Saturation (=96%)	44	14.6%	14.6%
Tachypnea	279	92.4%	92.4%
Tachycardia	268	88.7%	88.7%
Murmur	59	19.5%	19.5%

Table 3: Age Distribution and Congenital Heart Diseases of Study Population (n=302)

		Age groups				Total
		7 days	15 days	21 days	>21 days	
CHD	Yes	46	24	3	3	76
	No	138	61	17	10	226
Total		184	85	20	13	302

Table 4: CHD in High Risk Groups (n=302)

High risk groups	Frequency (n)	Percentage (%)	CHD
MAS	46	15.2%	1
ANN-1	21	7%	0
ANN-2&3	36	11.9%	1
IDM	5	1.7%	0
Syndromic babies	22	7.3%	1
Others	14	4.6%	0

CHD= Congenital heart disease, MAS = Meconium aspiration syndrome, ANN= Asphyxia Noe-natorium, IDM =Infant of Diabetic Mother.

Table 5: Echocardiographic Findings of Study Population (n=302)

Acyanotic heart diseases	Frequency (n)	Percentage (%)	Cyanotic heart diseases	Frequency (n)	Percentage (%)
VSD	20	6.6%	TGA	15	5%
ASD	06	2%	TOF	02	0.7%
AVSD	06	2%	PA+IVS	04	1.3%
PS	04	1.3%	PA+VSD	04	1.3%
COA	08	2.6%	EBA	01	0.3%
HCMP	04	1.3%	MA(HLHS)	02	0.7%
Total	48		Total	28	

VSD=Ventricular septal defect,ASD= Atrial septal defect,AVSD= Atrioventricular septal defect, PS =Pulmonary stenosis, COA=Coarctation of aorta, HCMP =Hypertrophied cardiomyopathy, TGA=Transposition of great artery, TOF =Tetralogy of Fallot, PA+IVS=Pulmonary atresia with intact septum, PA+VSD=Pulmonary atresia with ventricular septal defect, EBA=Ebstein anomaly, MA= Mitral atresia.

DISCUSSION

According to Mitchell et al's definition, congenital heart disease is a gross structural malformation of the heart or great intrathoracic vessels with a real or potential functional importance.[7] Therefore this definition excludes anomalies such as bicuspid aortic valve without valve dysfunction, mitral valve prolapse, and persistent left superior vena cava, anomalous origin of the left subclavian artery, mild valve regurgitation, and functional alterations without a structural component. This definition was adopted in this study, and cases of patent ductus arteriosus, an anomaly that could still be considered functional in the first few hours of life when this study was conducted, were also excluded.

Results from different studies show that the incidence of congenital heart diseases ranges from 4/1000 to 50/1000 live births.[8] As our study also showed that congenital heart disease were present in 25% of sick neonates with high clinical suspicion. This wide variation shows how difficult it is to obtain data both at the moment of study sample selection and when establishing epidemiologic definitions such as incidence and prevalence.[9]

The selection of the population in which the study is conducted is also a source of significant differences in epidemiological calculations. Thus, if on one hand 20% of the children with congenital heart diseases are estimated to die within their first year of life, and, therefore, studies after this age could underestimate the real prevalence of congenital heart diseases, on the other hand approximately 30% of congenital heart diseases are believed to be unrecognized in the first few weeks of life, a factor that could also underestimate the real prevalence of this condition in newborns.[10,11]

The real importance of echocardiographic studies in the diagnosis of congenital heart diseases is unquestionable.[12] Early studies on incidence showed rates of approximately 8:1000 to 9:1000 live births which may have increased mildly after echocardiographic studies became available, and as malformations without evident hemodynamic consequences were recognized.[10,13,14]

In Brazil, Guitti demonstrated a congenital heart disease prevalence of approximately 5.5:1000 live births.[15] In this important study, although only 18% of the patients were younger than one month of age when data were analyzed, frequencies of 44.2% or 74.8% (if cases of ventricular septal defect were included) of malformations were observed that could have been diagnosed in the nursery in the first few weeks of life. Similar results were reported by Miyagueetal, with a higher frequency of congenital heart disease in neonates and infants as demonstrated in our study.[16] Several studies show that congenital heart defects are more likely to be diagnosed when echocardiography is requested because of fetal heart failure than because of maternal factors. Ventricular septal defect is the most frequent defect in most of the studies conducted to date with mild variations of frequency in the different reports as also documented in our study.[17,18]

This study demonstrated a high prevalence of congenital heart diseases when data from live births of a general tertiary care hospital were analyzed, which certainly will call attention to the need to implement services for the treatment of these newborns or for the creation of a local referral center for this purpose. We should point out the importance of the pediatrician in identifying early manifestations of congenital heart diseases, as well as in detecting heart murmurs that could go unnoticed on the physical examination of newborns.

CONCLUSION

In sick babies in spite of high suspicion 25% found to have congenital heart disease. The main reason for referral was detection of poor perfusion, low saturation, tachypnea and tachycardia and murmur. High risk groups had low incidence of congenital heart disease in this study. In acyanotic heart disease VSD found to be common followed by coarctation of aorta while in case of cyanotic heart disease TGA followed by pulmonary atresia intact septum and VSD found to be the commonest lesion.

REFERENCES

1- Mahle WT, Newburger JW, Matherne GP, Smith FC, Hoke TR, Koppel R, et al. Role of pulse oximetry in examining newborns for congenital heart disease: a scientific statement from the American Heart Association and American Academy of Pediatrics.Circulation 2009;120(5):447-58.

2- Rivera IR, Silva MA, Fernandes JM, Thomaz AC, Soriano CF, Souza MG. Congenital heart diseases in the newborn: from the pediatrician's request to the cardiologist's evaluation. Arq Bras Cardiol 2007;89(1):6-10.

3- Arlettaz R, Bauschatz AS, Mönkhoff M, Essers B, Bauersfeld U. The contribution of pulse oximetry to the early detection of congenital heart disease in newborns. Eur J Pediatr2006;165(2):94-8.

4- Cloherty JP, Stark AR. Manual of neonatal care.3rded.Philadelphia: Lippincott Williams & Wilkins; 1991. p.250-6.

5- Bakr AF, Habib HS. Combining pulse oximetry and clinical examination in screening for congenital heart disease. PediatrCardiol 2005;26(6):832-5.

6- Zeynab AM. Evaluating the findings of echocardiography in neonates born in Imam Hosein Hospital during 1998-99. Pejuhande J 2001;5(6): 9-15.

7- Mitchell SC, Korones SB, BerendesHW. Congenital

heart disease in 56,109 births.Incidence and natural history. Circulation1971;43(3):323-32.

8- Hoffman JIE, Kaplan S. The incidence of congenital heart disease. J Am CollCardiol 2002;39(12):1890-900.

9- Hook EB. Incidence and prevalence as measures of the frequency of birth defects. Am J Epidemiol 1982;116(5):743-7.

10- Cabo JM. Social problems of the cardiopathic child. In: Sanchez PA. Pediatric cardiology. Barcelona: Salvat; 1986.

11- Abu-Harb M, Hey E, Wren C. Death in infancy from unrecognized congenital heart disease. Arch Dis Child 1994;71(1):3-7.

12- Tubman TR, Shields MD, Craig BG, Mulholland HC, Nevin NC. Congenital heart disease in Down's syndrome: two year prospective early screening study. BMJ 1991;302(6790):1425-7.

13- Hoffman JI, Christianson R. Congenital heart disease in a cohort of 19,502 births with long-term follow-up. Am J Cardiol 1978;42(4):641-7.

14- Hoffman JIE. Natural history of congenital heart disease. Problems in its assessment with special reference to ventricular septal defects. Circulation 1968;37(1):97-125 .

15- GuittiJCS. Epidemiological aspects of congenital heart diseases in Londrina, Paraná. Arq Bras Cardiol 2000;74(5):395-9.

16- Miyague NI, Cardoso SM, Meyer F, Ultramari FT, Araújo EH, Rozkowisk I, et al.Epidemiological study of congenital heart diseases in childhood and adolescence. Analysis of 4,538 cases. Arq Bras Cardiol 2003;80(3):269-73.

17- Allan LD, SharlandGK, Milburn A, Lockhart SM, Groves AM, Anderson RH, et al. Prospective diagnosis of 1,006 consecutive cases of congenital heart disease in the fetus. J Am CollCardiol 1994;23(6):1452-8.

18- Strauss A, Toth B, Schwab B, Fuchshuber S, Schulze A, Netz H, et al. Prenatal diagnosis of congenital heart disease and neonatal outcome --a six years experience. Eur J Med Res 2001;6(2):66-70.