Original Article ISSN (O):2395-2822; ISSN (P):2395-2814

Prevalence of Congenital Heart Disease in Sick Neonates: An Echocardiographic Evaluation.

Sunil Kumar Sharma[1], Madhusmita Acharya[2], Suresh Chandra Sahoo[3], Pradipta Kumar Panda[4]

[1]Associate Professor, Department Of Cardiology VSSIMSAR, Burla, Odisha, India.
[2]Assistant Professor, Department Of Biochemistry VSSIMSAR, Burla, Odisha, India.
[3]Profesor and Hod, Department Of Cardiology, VSSIMSAR, Burla, Odisha, India.
[4]Consiltant Surgeon, Lifeline Diagnostic Sambalpur, Odisha, India.

Received: April 2018
Accepted: April 2018

ABSTRACT

Background: Congenital heart disease (CHD) is one of the major causes of mortality and morbidity in the paediatric population particularly in neonates and infants of both the developing and developed countries. Importance of congenital defects is more prominent in infants and delay in recognition may adversely effect survival. Objective: To find the prevalence and pattern of CHD in sick neonates in a tertiary care hospital VSSIMSAR Odisha India catering to economically backward area of our country. **Methods:** A prospective analysis of case of 8.856 patients (0-1 month) was conducted to ascertain the prevalence and spectrum of CHDs. **Results:** A total of 232 patients out of 8.856, were found having CHDs measuring a prevalence of 26.2/1000 among sick neonates. About 202 (91.3%) were the acyanotics and 20 (8.6%) were cyanotic heart patients. 4 (1.7%)were complex congenital heart disease Among the acyanotic heart diseases the most frequent lesion seen in 126 (62.7%) followed by ASD alone or in combination was detected in 76 cases (37.6 %) followed by PDA alone or in combination in around 74 cases(36.6%). Combined defects PDA and VSD in 40 cases (20.2 %). Valvular PS was observed in 3% of cases among the cyanotic heart diseases Tetralogy of Fallot was the most frequent cyanotic heart disease seen in 9 cases. **Conclusion:** Prevalence of congenital heart disease is very high among the sick neonates though figure of 26.2/1000 among the sick neonates could be an over estimation of the actual disease burden in our community because of high prevalence of sick children. The study heightened awareness among the treating physicians about the high prevalence of cardiac diseases in sick neonates and early recognition is essential to reduce the mortality and morbidity associated with these ailments.

Keywords: Sick neonates, Prevalence of congenital heart disease, echocardiography study.

INTRODUCTION

Congenital heart disease (CHD) is one of the major causes of mortality and morbidity in the paediatric population of both the developing and developed countries. CHDs are one of the major causes of infant mortality. The most cases are asymptomatic and discovered during routine neonatal checkups.[1] CHD is the most common congenital problem in children accounting for nearly 25% of all congenital malformations.[2] Early recognition of such diseases is of immense importance as clinical presentation and deterioration can lead to sudden collapse.[3] Incidence and prevalence of CHD vary worldwide, may be due to differences in genetic, environmental, and cultural values. In Asia, estimated prevalence is 9.3/1000 live births with relatively more pulmonary outflow obstructions and fewer left ventricular outflow tract obstructions, while estimated total CHD birth prevalence in Europe was significantly higher than in North America (8.2/1000 live births vs. 6.9/100 live births).[4]

Cardiac defects are grossly divided into Acyanotic and Cyanotic heart diseases, former being more common. Ventricular septal defect (VSD) (30-35%) and Tetralogy of Fallot (TOF) (5-7%) are most common among acyanotic and cyanotic CHDs respectively.[5] CHD has a wide spectrum of severity in infants: About 2-3 infants/1000 live births will develop symptom-related to cardiac defects during 1st year of life.[5] Prevalence studies of congenital cardiac disease and types of congenital defects are necessary to establish baseline rates, to know the time, person and geographical trends that may help to raise the awareness of early medical and surgical intervention. To evaluate the prevalence of different congenital heart disease in neonates hospitalised to cardiology paediatrics and Sick Neonatal Care Unit(SNCU) and Paediatric Intensive Care Unit(PICU) and sent for evaluation from different peripheral centres.

Name & Address of Corresponding Author
Dr. Madhusmita Acharya
Assistant Professor
Department Of Biochemistry,
Vssimsar, Burla, Odisha, India -768017.

MATERIALS AND METHODS

We prospectively studied all sick neonates hospitalized to SNCU PICU paediatric cardiology inpatient department of our hospital, sick neonates sent by paediatrician to our college for evaluation and treatment were included in the study during the period of March 2009 to December 2018. For the diagnosis of CHD, a definition proposed by Mitchell et al. 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.[6] 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, 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), Echocardiography was performed by two cardiologists and in doubtful cases were evaluated by both in one setting and in complex cases help of paediatric cardiologist taken. Echocardiography was done as per standards laid down by the American Society of Echocardiography,[7] using the M-mode, two-dimensional and colour Doppler, pulse and continuous wave echocardiogram. Written consent was obtained from parents and/or attendants from all enrolled patients following all ethical commitments Prevalence all kinds of CHDs we observed were computed. The different types of CHDs considered for the present investigation as mentioned below:

1. Congenital heart disease PFO, ASD, VSD, PDA, Aorto PulomanryWindow, Valvular Aortic and Pulmonary Stenosis, Coracation of Aorta, Endocardial Cushion Defect alone or incombination.
2. Cyanotic CHD: Tetralogy of Fallot, Tetralogy of Fallot-like conditions associated with pulmonary stenosis or atresia, total anomalous pulmonary venous connection, persistent truncus arteriosus, Ebstein's anomaly, Hypoplastic left heart syndrome, aortic arch interruption, univentricular heart etc. transposition of great arteries, dextrocardia, double outlet right ventricle.
3. Complex CHDs (various types of CHDs existing together including a rare type of CHDs)
4. Other cardiac findings on echocardiography: Persistent pulmonary hypertension of newborn.

RESULTS

Total no 8.856 patients (0-1 month) were screened to ascertain the prevalence and spectrum of Congenital Heart disease. All the neonates were sick and had complain and features suggestive of presence of heart disease. About 232 neonates out of 8.856, were found having CHDs measuring a prevalence of 26.2/1000 among sick neonates. Out of total 232 about 202 (91.3%) were the acyanotic heart disease, and 20 (8.6%) were having cyanotic heart disease. Only 4 neonates (1.7%) were detected having complex congenital heart disease.

Table 1: Acyanotic and Cyanotic Heart Disease (Single Defect)

Nature of defects	No with percenatage
VSD	58(28.1%)
ASD	44(21.7%)
PDA	2O(9.9%)
PS	3(1.4%)
ENDOCARDIAL CUSHION DEFECT	3(1.4%)
COARCTATION OF AORTA	2(0.99%)

Table 2: Combined Congenital Defect

Nature of defect	No and percentage
VSD PDA	40(19.8%)
VSD ASD	18(8.9%)
VSD ASD PDA	8(3.9%)
ASD PDA	6(2.9%)
VSD ASD PS	2(0.99%)

Among the acyanotic heart diseases Ventricular Septal Defect alone or in combination with other lesion was the most frequent lesion seen in 126 (62.7%) out of which muscular VSD constituted around 28 cases. ASD alone or in combination was detected in 76 cases (37.6 %) followed by PDA alone or in combination in around 74 cases (36.6%) ASD II was the most frequent ASD with sinus venosus ASD Ostium Primum ASD was seen in one case each. Observed in followed by Combined defects were very common observation in the present study with combined PDA and VSD observed in 40 cases (19.8 %) Combined VSD and ASD defects were observed in 18 cases (8.9 %). Valvular PS was observed in 3% of cases (1.4%) and Endocardial cushion defect were observedin 3 cases (1.4%) Coarctation of Aortain 2 cases (0.99%). Among the cyanotic heart diseases Tetralogy of Fallot was the most frequent cyanotic heart disease seen in 10 cases (4.34%). Total anomalous venous connection was observed in 4 cases (1.7%) TricuspidAtresia in 3 case (1.3%) and Pulmonary atresia in 2 case (0.86%) Transposition of great artery was observed in 2 cases (0.86%) and it was very difficult to identify the pulmonary artery. One case of DORV VSD PS was observed. 4 cases of complex congenital heart disease and 6 cases of Persistent pulmonary hypertension of newborn were observed in this series. Neonates were very sick and there was really difficulty in detail analysis of these cases.

DISCUSSION

CHD is considered to be the most major congenital anomaly and a leading cause of mortality in the first

year of life.[8,9] However, little data is available from developing countries. The birth prevalence of CHD is estimated to be eight per 1000 live births.[2,10] The burden of CHD in India is likely to be enormous, because of a very high birth rate. It is estimated that over 180,000 children in India are born with CHD every year.[5] As only a very small proportion get required intervention, the number of young adults with CHD is steadily increasing. This heavy burden emphasizes the importance of detection of CHD very early in life in India. To know about the estimated index of CHDs in various population groups, several studies were carried out in past 40 years and during this period a notable improvement in diagnosis of CHD was made by the introduction of echocardiography.

One large study by Wanni KA, et al,[7] observed that Acyanotic heart disease formed the major chunk (88%), of the total CHD patients Similar observation was made by many other studies in CHD,[12,13] the most frequent type of CHD was VSD, and maximum number of cases of CHD was of the age group 1-12 months (46.7%), and including neonates. The frequency of the complex and rare types of CHDs was less when compared to the western data but similar to other Indian studies.[14,15] This could be due to the severity of the defects which might have led to the death of the patients before accessing the medical facilities and racial and genetic factors between us and them. The diagnosis of CHD may pass unnoticed in 30% of infants during the 1st weeks of life.[16]

The birth prevalence of major congenital heart defects in three studies compared to estimated averages from literature overall 9 per 1.000 birth and severe heart defects 2.5 per 1,000.[1-3] Various types of VSD is the most common types of congenital heart defects Incidence ranges from 5 to 50 per 1000 live birth and 0.3 per 1000 adults Various types of ASD constitute 6-10% of congenital heart defects in children,[5,6] the incidence ASD has been estimated to be 56 per 100000 live birts.[2] Isolated PDA accounts for 5-10 %of congenital heart defects.[4,5] No large study is available regarding the prevalence of different congenital heart defects in neonates as all the study in children included children of various age groups.

The present study on Sickneonates we observed a prevalence rate of 26 % which seems higher than other studies but may be explained by inclusion of more sick neonates We observed VSD in 28.2 percent of cases followed closely by ASD in about 21 % of cases VSD PDA 19.8 and PDA alone in 9.9 % of cases in sharp contrast to earlier study by Saxena et all who observed.[1-3,17] VSDs (restrictive and non restrictive) were the most common significant CHDs (43.9% and 20.7%, respectively) with a prevalence rate of 5.22 per 1000 live births. ASDs and PDAs consisted of 7.3% and 4.3% of the significant CHDs, with a prevalence rate of 0.59/1000 and 0.34/1000, respectively.[18-24] Higher prevalence of Multiple congenital defects were observed with combined VSD PDA observed in 19.8% of cases followed by combined VSD and ASD 8.9% of cases. VSD ASD and PDA were observed in 3.8% of cases. No study has demonstrated the presence of multiple defects and our study was unique in identifying higher prevalence of such combined lesion. Higher prevalence of combined lesion is possible because of higher frequency of small ASD PDA which closes later on in life. There was less prevalence of Pulmonary Stenosis being observed in 3/123 case Coarctation of Aorta was detected in 2 cases similar to the observation by Saxena et al where the prevalence of these lesionwas also low with two cases each of pulmonary stenosis, coarctation of aorta, and aortic stenosis.

Cyanotic heart defects were much less compared to acyanotic heart disease 8.6 % of total cases Tetralogy of fallot physiology subset was most common followed by TAPVC in. 3 cases Tricuspid atresisa and pulmanry atrsia in 2 cases each in contarst to saxena et al who observed that among the major cyanotic CHDs, transposition of great arteries and hypoplastic left heart syndrome were the most common (seven and five cases; There were three cases each of atrioventricular septal defects with pulmonary atresia and Tetralogy of Fallot (0.15/1000). Complex congenital heart disease was very low0.12 %. Frequency of the complex and rare types of CHDs was less and compared to the other Indian studies.[25,26] This could be due to the severity of the defects which might have led to the death of the patients before accessing the medical facilities.

CONCLUSION

The magnitude of the CHD problem is considerable and is largely unrecognized, understated, and underestimated. Congenital malformations and in particular CHDs are important contributors to infant mortality. However, Recent advances in cardiovascular diagnostics particularly echocardiography and therapeutics have increased the survival of infants and children with CHDs Echocardiography with Doppler is the gold standard for the diagnosis of CHD in newborns with a very high sensitivity and specificity.[27,28] There is encouraging results of treatment for most of the CHD from our country and should prompt more clinicians to take up the challenge of detecting these lesion early so that these sick neonates can be managed early. Hence, it is important to determine the exact prevalence and case burden of CHD very early as echocardiography and expert interpretation are easily available so that appropriate changes in health policies can be recommended.

REFERENCES

1. Hoffman JI Kaplan S The incidence of congenital heart disease JAm CollgCardiology,2002:39 (12)1890-1900.
2. Van der Vinde D Konings EE Slager MA et al Birth prevalence of congenital heart disease worldwide : A systemic review and met analysis J Am Col Cardiology 2011 :58 (21) 2241-2247.
3. Dickinson DF Arnold R Wilkinson JL CongenitalHeart Disease among 160480 livebirth in children in Liverpool ongenital heart disease among 160 480 livebirth in chldren in liverpool 1960 to 1969 Implicationfor surgical treatment BrHeart Journal1981 :46 ;55-62.
4. PennyDJVick GW 3rd Ventricular Septal Defect Lancet 2011;377(9771)1103-1112.
5. HoofmanJIKaplansThe incidence of congenital heart disease J Am Col Cardiology 2002;39(12):1890-1900.
6. Ferencz C Loffedo CA Rubin JD .Magee CA: Epidemiology of congenital heart diseaseThe Baltomore-Washsington infant study 1981-1989Mount Kesco ,NY FUTURE PUBLISHING COMPANY,INC 1993.
7. Kisslo J, Byrd BF, Greiser EA, Gresser C, Gillam LD, Ivy W, et al. Recommendations of continuous quality improvement in echocardio-graphy. J Am Echocardiogr 1995;8:1-28.
8. K Aburawi EH. The burden of congenital heart disease in Libya. Libyan J Med 2006 8;1:120-2.
9. Uehl KS, Loffredo CA, Ferencz C. Failure to diagnose congenital heart disease in infancy. Pediatrics 1999;103:743-7.
10. Wren C, Richmond S, Donaldson L. Presentation of congenital heart disease in infancy: Implications for routine examination. Arch Dis Child Neonatal Ed 1999;80:F49-53.
11. WanniKA,ShahzadN,AshrafM,AhmedK,JanM,RasoolS.Prevalenceandspectrumofcongenitalheardiseasesinchildren.Heartndia2014;2:79
12. Chadha SL, Singh N, Shukla DK. Epidemiological study of congenital heart disease. Indian J Ped.2001;68:507–10.
13. Misra M, Mittal M, Verma AM, Rai R, Chandra G, Singh DP, et al. Prevalence and pattern of congenital heart disease in school children of eastern Uttar Pradesh. Indian Heart J. 2009;61:58–60.
14. Ewer AK, Middleton LJ, Furmston AT, Bhoyar A, Daniels JP, Thangaratinam S, et al. and the PulseOx Study Group. Pulse oximetry screening for congenital heart defects in newborn infants (PulseOx): A test accuracy study.Lancet. 2011;378:785–94.
15. Singh A, Rasiah SV, Ewer AK. The impact of routine predischarge pulse oximetry screening in a regional neonatal unit. Arch Dis Child Fetal Neonatal Ed. 2014;99(4):F297–302.
16. Zhao QM, Ma XJ, Ge XL, Liu F, Yang WL, Wu L, et al. and the Neonatal Congenital Heart Disease Screening Group. Pulse oximetry with clinical assessment to screen for congenital heart disease in neonates in China: A prospective study. Lancet. 2014;384(9945):747–54.
17. Anita Saxena, Anurag Mehta, Mamta Sharma, Sudha Salhan, Mani Kalaivani, Sivasubramanian Ramakrishnan, and Rajnish Juneja birth prevelence of congenital heart disease:a cross sectional observational study from north indiaAnnals of peditrcardiol 2016 sept-dec 9(3)205-209.
18. Khalil A, Aggarwal R, Thirupuram S, Arora R. Incidence of congenital heart disease among hospital live births in India. Indian Pediatr. 994;;1:519–27.
19. Thakur JS, Negi PC, Ahluwalia SK, Sharma R, Bhardwaj R. Congenital heart disease among school children in Shimla hills. India Heart J. 1995;47:232–5.
20. Chadha SL, Singh N, Shukla DK. Epidemiological study of congenital heart disease. Indian J Ped.2001;68:507–10.
21. Misra M, Mittal M, Verma AM, Rai R, Chandra G, Singh DP, et al. Prevalence and pattern of congenital heart disease in school children of eastern Uttar Pradesh. Indian Heart J. 2009;61:58–60.
22. Bhat NK, Dhar M, Kumar R, Patel A, Rawat A, Kalra BP. Prevalence and pattern of congenital heart disease in Uttarakhand, India. Indian J Pediatr. 2013;80:281–5.
23. Sawant SP, Amin AS, Bhat M. Prevalence, pattern and outcome of congenital heart disease in Bhabha Atomic Research Centre Hospital, Mumbai. Indian J Pediatr. 2013;80:286–91.
24. Kumari NR, Raju IB, Patnaik AN, Barik R, Singh A, Pushpanjali A, et al. Prevalence of rheumatic and congenital heart disease in school children of Andhra Pradesh, South India. J Cardiovasc Dis Res. 2013;4:11–4.
25. Ewer AK, Middleton LJ, Furmston AT, Bhoyar A, Daniels JP, Thangaratinam S, et al. and the PulseOx Study Group. Pulse oximetry screening for congenital heart defects in newborn infants (PulseOx): A test accuracy study.Lancet. 2011;378:785–94.
26. Singh A, Rasiah SV, Ewer AK. The impact of routine predischarge pulse oximetry screening in a regional neonatal unit. Arch Dis Child Fetal Neonatal Ed. 2014;99(4):F297–302.
27. Sung RY, So LY, Ng HK, Ho JK, Fok TF. Echocardiography as a tool for determining the incidence of congenital heart disease in newborn babies: A pilot study in Hong Kong. Int J Cardiol. 1991;30:43–7.
28. Sands A, Craig B, Mulholland C, Patterson C, Dornan J, Casey F. Echocardiographic screening for congenital heart disease: A randomized study. J Perinat Med. 2002;30:307–12.

How to cite this article: Sharma SK, Acharya M, Sahoo SC, Panda PK. Prevalence of Congenital Heart Disease in Sick Neonates: An Echocardiographic Evaluation. Ann. Int. Med. Den. Res. 2018; 4(3):CD05-CD08.

Source of Support: Nil, **Conflict of Interest:** None declared