

**EVALUATION OF CARDIAC MURMURS IN NEONATES**B. S. Chakravathy<sup>1</sup>, S. Prathimadevi<sup>2</sup>**HOW TO CITE THIS ARTICLE:**

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**ABSTRACT: BACKGROUND:** Cardio vascular malformations are the most common congenital malformations. Early recognition of congenital heart disease is important in the neonatal period, as many of them may be fatal if undiagnosed. **AIM:** To study the epidemiology of neonatal cardiac murmurs. To identify clinical characteristics which differentiates pathological murmur from functional murmurs to assess the reliability of clinical evaluation in diagnosing congenital heart disease? **METHODS:** The study population included all neonates admitted in a Hospital in Visakhapatnam to the NICU, postnatal ward, attending pediatric OPD and were detected to have cardiac murmurs. It was a cross sectional study over a period of 16 months. A clinical diagnosis was made based on history and clinical examination. Then Chest X ray and ECG were done in symptomatic infants. Echo cardiography was done in all neonates for confirmation of diagnosis, the neonates were again examined daily till they were in hospital and during the follow up visit at 6 weeks. **RESULTS:** A total of 61 neonates were included and was conducted over a period of 16 months. The incidence of cardiac murmurs among intramural neonates was 13.5 for 1000 live births. Most frequent symptom was fast breathing in 10[16.4%] cases. VSD was the most common diagnosis clinically in 19[31.47%] babies. The most frequent diagnosis was acyanotic complex congenital heart disease, Only intra mural neonates were considered for the incidence of murmurs and the incidence of cardiac murmurs among them babies was 13.5 for 1000 live in 23[37.7%] cases followed by 10[16.4%] cases each of VSD and ASD respectively. Overall in our study 73.77% [45 cases] of the murmurs were diagnosed correctly and confirmed by Echocardiography. **INTERPRETATIONS & CONCLUSIONS:** 1. It is possible to make clinical diagnosis in many cases of congenital heart diseases. 2. The functional murmurs could be differentiated from those arising from structural heart disease. 3. By evaluation of these infants only based on murmurs few congenital heart diseases be missed.

**KEYWORDS:** Neonate, cardiac murmurs, Clinical Evaluation, Echocardiography.

**REVIEW OF LITERATURE:****Incidence and prevalence of congenital heart disease**

Cardio vascular malformations are the most common group of congenital malformations. The prevalence at live birth was 5.3 cases per 1000 live births.<sup>[1]</sup> up to six in every 1000 live born babies have a cardiovascular malformation<sup>[2]</sup> which present in infancy, but most are asymptomatic at birth<sup>[3,4,5]</sup> The prevalence of structural heart disease in the first year of life confirmed by noninvasive imaging is 6 to 8 per 1000 live births. When diagnosed solely by means of clinical examination the prevalence is 8 to 10 cases per 1000 live births. The prevalence has been constant throughout the world over many years. <sup>[6]</sup> Congenital heart disease was defined by Mitchell et al <sup>[7]</sup>

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As “a gross structural abnormality of the heart or intra thoracic great vessels that is actually or potentially of functional importance”

A community –based survey of congenital heart disease was carried out on a random sample of 11,833 children below 15 years in Delhi, Congenital heart disease was diagnosed in clinical history and /or clinical examinations with a prevalence of 4.2/1000[4.6/1000 in boys and 3.7/1000 in girls].

Cardiac lesion	percent
Ventricular septal defect	46%
Atrial septal defect	18%
Patent ductus arteriosus	14%
Fallots tetralogy	10%
Aortic stenosis	4%
Pulmonary stenosis	4%

In the above study in concurrence with the several other studies it was observed that ventricular septal defect was the commonest lesion <sup>[8]</sup>. Going by the crude birth rate of 22.17/1000 in 2010 census data of India, the total live births are estimated at nearly 28 million per year and with a believed incidence rate of 8/1000 live births, nearly 180,000 children are born with CHD each year in India. Of these, nearly 60,000 to 90,000 suffer from critical CHD requiring early intervention. Approximately 10% of present infant mortality in India may be accounted for by CHD alone <sup>[9]</sup>. Cardiac infants who are sick constitute 2.7/1000 live births <sup>[10]</sup>.

**INTRODUCTION:** Congenital heart disease is one of the most common congenital malformations. Many present in the neonatal period with these problems. The common clinical features with which neonates present are heart murmur, cyanosis, congestive cardiac failure, along with abnormal chest X ray findings and abnormal ECG findings. Diagnosis is based on the clinical suspicion of finding a cardiac murmur. Congestive cardiac failure, poor pulses and cyanosis. However it may be functional murmur without any underlying heart disease.

Nearly 55% of the babies with congenital heart disease may be missed by routine neonatal examinations. As many would be asymptomatic at birth. The study is done to evaluate the significance of cardiac murmurs, among neonates born in a hospital in Visakhapatnam, Visakhapatnam district and the role of clinical evaluation in assessing the neonatal cardiac murmurs.

**MATERIALS AND METHODS:** Visakhapatnam district is located in the eastern corner of Andhra Pradesh, a hospital based cross section study was conducted in a major hospital in Visakhapatnam, Visakhapatnam district of Andhra Pradesh during 2012-2014. Over a period of 16 cumulative months, written informed consent was obtained from the mothers of neonates.

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**Method of Collection and Study Procedure:** The study population included all neonates admitted to the NICU, postnatal ward, attending Pediatric OPD were detected to have cardiac murmurs. Birth details of the neonates were noted and if symptoms were present, the details were collected. Once the murmur was detected, the day of identification of murmur and the characteristics on examination were noted. A Clinical diagnosis was made on history and clinical examination. Then Chest X ray and ECG were done in symptomatic infants. The usefulness of these investigations in aiding the diagnosis was noted. Echocardiography was done in all neonates for confirmation of the diagnosis. These neonates were again examined daily till they were in hospital and during the follow up visit at 6 weeks and the timing of disappearance of murmurs were noted.

**RESULTS:** A total of 61 neonates were included in the study. The study was conducted over a period of 16 months. Total number of live births during the study period was 4505. Only intra mural neonates were considered for the incidence of murmurs and the incidence of cardiac murmurs among these babies was 13.5 for 1000 live births. Out of 61 babies 32 were males [52.5%] and 29[47.5%] are female. There were 18[29.5%] preterm babies and 43[70.5%] term babies in the study. the most frequent associated risk factor was polyhydramnios 12[19.7%] cases followed by other conditions like diabetes, 2 cases [3.3%] IUI, 4 cases [6.6%] and oligo hydramnios, 3 cases [4.9%]. The most frequent symptom with which the neonates have presented was fast breathing in 10 cases [16.4%], cyanosis in 8 cases [13.1%], feeding difficulty 7 cases [11.5%]. Dysmorphic features were seen in 8[13.1%] babies. 8 neonates [13.1%] had bounding pulses

Clinical diagnosis revealed that 5 [8.9%] murmurs as functional, and, the remaining 56[91.8%] murmurs, due to an underlying structural heart disease.

VSD was the most common diagnosis clinically in 19[31.47%] babies. The next common diagnosis was for cyanotic complex heart disease in 13[21.3%] cases, followed by PDA in 11 [18%] cases with ASD and complex congenital heart disease constituting 6[9.8%] and 7[11.5%] of the cases respectively.

The usefulness of chest X rays in diagnosing congenital heart disease 20[47.6%] neonates out of 61 had X-rays done and it aided 9[31%] cases of neonates in the diagnosing congenital heart disease with X rays.

ECG was done on 10[16.39%] babies and was helpful in 3[30%] symptomatic neonates for diagnosis.

The most frequent Echo diagnosis was acyanotic complex congenital heart disease in 23[37.7%] cases followed by 10[16.4%] cases each of VSD and ASD respectively. Complex congenital heart disease was present in 7[11.5%] of the cases. The least common lesion was ASD in only 3[4.9%] neonates. 8[13.11%] of cases were diagnosed as functional murmurs.

Murmurs had disappeared 15[24.5%] neonates before discharge. Diagnosis of the murmurs that disappeared at discharge is as follows 7 PDA, 1ASD-VSD, 1 ASD-PDA, 1 PDA –mild tricuspid regurgitation, 2 PFO and 3 transient TR.

5 neonates whose murmurs had disappeared at discharge did not follow up at 6 weeks. 10[16.3%] more neonates at follow up at 6 weeks did not have murmur. 33[54%] neonates did

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not come for follow up. The diagnosis of congenital heart disease in which the murmur persisted were 1 VSD, 1 PFO, 1 Congenital pulmonary valvular stenosis, 1 ASD, 1 Cor triatriatum with pulmonary venous obstruction. 1 Tricuspid regurgitation with mild pulmonary hypertension and Bicuspid aortic valve. 1 small right pulmonary artery with mild AR, along with two cases of VSD with ASD and their cases of large PDA-VSD.

Deaths occurred in 3 neonates and the cause of death was attributed to:

1. Birth asphyxia
2. Sepsis, apnea,
3. Preterm, RDS, PULMONARY HEMORRHAGE.

None of the deaths were attributed to complex heart diseases

**Note:** as the study involved only those neonates with murmur, there were 6 other congenital heart diseases without murmur. The diagnosis of these neonates have been noted and they are as follows:

1. Hypo plastic left heart syndrome
2. Tricuspid regurgitation
3. Corrected TGA
4. PDA in a neonate with Down syndrome
5. ASD
6. TGV

Sex	Frequency	Percent
Males	32	52.5
Females	29	47.5
<b>Total</b>	<b>61</b>	<b>100</b>

**Sex Distribution of the Study Population**

	Frequency	Percent
Diabetes	2	3.3
Iui	4	6.6
Sle	1	1.6
Polyhydramnios	12	19.7
Oligohydramnios	3	4.9

**Risk Factors Observed in The Study Population**

Symptoms	Frequency	Percent
Cyanosis	8	13.1
Fast breathing	10	16.4
Feeding difficulty	7	11.5
Sweating	1	1.6

**Symptoms observed in study population**

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Clinical features	Frequency	Percent
Dysmorphic features	8	13.1
Cyanosis	6	9.8
Pallor	5	8.2
Edema	1	1.6
Diaphoresis	1	1.6
Resp distress	15	24.6
Bounding pulses	8	13.1
Precordial pulsations	7	11.5
Clinical examination findings of the study population		

	Frequency	Percent
Asd	6	9.8
Vsd	19	31.47
Pda	11	18
Acyanotic complx	10	21.3
Complex cong heart disease	7	11.5
Functional	8	8.2
Diagnosis based on clinical examination		

Echo	Frequency	Percentage
ASD	3	4.9
VSD	10	16.4
PDA	10	16.4
Acyanotic complex	23	37.7
Complex cong heart disease	7	11.5
Functional	8	13.11
Echo diagnosis		

**DISCUSSION:** Congenital heart disease is one of the most common congenital malformations. Cardiac murmur is an important finding of congenital heart disease. However not all murmurs that are heard in a neonate is due to structural heart disease, so it is important to differentiate murmurs due to functional cause from a structural cause. Also it is important to know that all congenital heart disease need not present with a murmur. The earlier the congenital heart disease is diagnosed better the prognosis. Therefore this study was done to evaluate the murmurs in the neonatal period. In this study all neonates with murmur both term and pre term were included. A clinical diagnosis was made based on the clinical characteristics that later confirmed by echo cardiography, which is the gold standard for diagnosis of congenital heart disease.

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A total of 61 neonates were included in the study. The study was conducted over a period of 16 months.

Total number of live births during the study period was 4505 with 37 out of these intramural babies had murmur. The incidence of cardiac murmurs among the intra mural babies was 13.5 for 1000 live births. Ainsworth et al<sup>[11]</sup> in their study have shown an incidence of 6 in 1000 live babies having murmurs undergoing routine neonatal examination by junior paediatricians. About 50% of murmurs were due to underlying structural cardiac and this examination led to recognition of 37% of all heart disease diagnosed in infancy. Bansal et al<sup>[12]</sup> in their study have shown 23.81 per 1000 live births having murmur. Farrer et al<sup>[13]</sup> studied 8096 babies and found murmurs in 112 babies with a prevalence of 13.8 per 1000 live birth. The study conducted by Farrer et al<sup>[13]</sup> had a similar incidence of 13.8 per 1000 live births as against 13.5 per 1000 live births in our study. There were 23.8 per 1000 live births having murmurs in the study by. Bansal et al<sup>[12]</sup> the explanation for such higher incidence was not available.

Our study revealed 8[13.11%] murmurs as functional among 61 neonates and the remaining 53[86.88%] as murmurs because of structural heart lesion. Farrer et al<sup>[13]</sup> out of 90 infants evaluated found 21[23.33%] were diagnosed having significant cardiac abnormality. In a similar study Bansal et al<sup>[12]</sup> found 28[45.9%] out of 62 babies having structural heart disease. There is a wide variation in the number of neonates having murmur and structural heart disease.

In our study 7[87.5%] cases of all the innocent murmurs disappeared by 6 weeks of life as confirmed by Echo cardiography. And Farrer et al<sup>[13]</sup> in his study demonstrated that 64% of innocent murmurs had disappeared in 15[24.59%] neonates before discharge.

Six infants with PDA were treated with ibuprofen for closure of PDA and the murmur disappeared in 4[66.62%] cases.

The most frequent Congenital heart disease detected in this study is acyanotic heart disease which accounted to 23 cases [37.7% ] but the most frequent single lesion diagnosed was PDA and VSD comprising of 16.4% each [10 lesions each] but Bansal et al<sup>[12]</sup> found VSD as the most common lesion amounting to 65.63% of the lesions. This high incidence could because preterm infants were not included in the above study. Ainsworth et al<sup>[11]</sup> in their study also found that the most common diagnosis was a ventricular septal defect, which was 37% [54/147] followed by PDA 23% [34 new born]. 7 [11.4%] of cases in our study had congenital heart disease. Similarly Ainsworth et al<sup>[11]</sup> reported seven new borns [5%] complex heart disease.

### CONCLUSIONS:

1. It is possible to make clinical diagnosis in many cases of congenital heart diseases.
2. The characteristics features of functional murmurs were.
  - No associated dysmorphisms
  - No cyanosis
  - All murmurs were systolic in nature.
  - No murmur was associated with thrill
  - All but one murmur disappeared at 6 weeks of follow up
3. By evaluation of these infants only based on murmurs few congenital heart diseases can be missed.

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## REFERENCES:

1. Wren Christopher Richardson Sam, Donaldson, Liam. Presentation of congenital heart disease in infancy, implications for routine examination. Archives of disease in childhood fetal & neonatal edition 1999;80[1] :49f-53f
2. Ferenz C, Rubin JD, McCarter RJ et al .Congenital heart disease, prevalence at live birth, Am J Epidemiol 1985;121:31-6
3. Grabitz RG, Joffres MR, Collins-Nakai RL. Congenital heart disease.Incidence in the first year of life. Am J Epidemiol 1988;128:381-8
4. Kidd SA, Lancaster PAL, McCredie RM. The incidence of congenital heart defects in the first year of life. J Pediatric Child Health 1993;29:344-9
5. Hoffman JIE, Incidence of congenital heart disease. I. Postnatal incidence. Pediatric Cardiol 1995;16:103-13
6. H. William Taeusch, Roberta A, Ballard, Christine A. Gleason .Avery's diseases of the newborn, 9<sup>th</sup> edition 2012
7. Mitchell SC, K orones SB, Berendes HW. Congenital heart disease in 56109 births. Circulation 1971;43:323-32
8. Chadha SL, Singh N, Shukla DK. Epidemiological study of congenital heart disease Indian journal of paediatrics. 2001;68:[6] :507-10.
9. Saxena Anita, common left to right shunts in children. Evaluation, management and timing of surgery. IAP journal Pediatrics.1997;5[2] :595-598
10. Dipak k. Guha, Aravind Salli, Swarnarekha Bhat, Aravind Shenoi.Guha's neonatology, principles and practice,3 rd edition,Jaypee brothers:2005
11. Sean B Ainsworth, Jonthan P wyllie, Christopher Wren Prevalence and clinical significance of cardiac murmurs in neonates. Arch Dis Child Fetal Neonatal Ed 1999;80:F43-F45
12. M. Bansal, H.Jain. Cardiac murmur in neonates. Indian paediatrics [letter to the editor] 2005;42:397-308
13. K F M Ferrer and J M Rennie Neonatal murmurs: are senior house officers good enough? Archives of Disease in childhood Fetal and Neonatal Edition 2003;88:F147-150.

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