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Clinical and Echocardiographic Evaluation of Neonates with Heart Murmur

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Abstract

Background and objectives: Congenital heart disease is the most common form of heart disease in children affecting 7-8 per 1000 live births. Affected babies are mostly asymptomatic at birth. Although most are not pathologic, a murmur may be the sole manifestation of the heart disease. *Materials and methods:* This is a prospective observational study performed on new-borns delivered, admitted in NICU, attended OPD & neonatal follow up clinics at Kamineni Hospital, L.B. Nagar, Hyderabad during 16 months period. Total of 1120 neonates were evaluated during the study period of 16 months. Once the murmur was heard, murmur was reconfirmed by senior resident/consultant pediatrician and clinical diagnosis was made based on history and clinical examination. Echocardiography was done in all neonates with murmur for confirmation of the diagnosis. Neonates with gestational age < 28 weeks were excluded from the study for PDA. *Results:* Out of 1120 babies examined, 48 babies (4.28%) found to have murmur. While out of 48 babies with murmur, 27 (56.25%) were male & 21 (44.75) were female babies. Out of total 817 term babies examined, 32 babies (3.91%) had murmur. Total 303 preterm babies examined, 16 babies (5.2%) were found to have murmur. History of consanguinity was present in 11 babies (22.92%) out of total 48 babies with murmur. Majority of babies (87.5%) had no significant family history. Maximum no. babies (41.66%) were presented without any maternal risk factor. The most frequently associated risk factor was polyhydramnios 20.83% (10 cases). No. of murmurs detected in the first 24 hrs of birth are least. 32 out of 48 were asymptomatic. Total 16 cases were diagnosed clinically as VSDs out of which 10 confirmed by echocardiography. Clinically 12 cases were diagnosed as PDA, but 13 was the no. diagnosed on echocardiography as PDA. The total number of ASDs diagnosed clinically were 7 in all, of these 3 were diagnosed and confirmed by ECHO. Out of 14 acyanotic congenital heart diseases 4 were diagnosed clinically. 5 out of 5 functional murmurs were detected by clinical examination. 2 out of 3 complex cyanotic congenital heart diseases were diagnosed as complex cyanotic congenital heart disease but could not specify the lesion by clinical examination. *Conclusion:* Although clinical evaluation could determine the presence or absence of heart disease in most neonates, the lesion-specific diagnosis was not quite satisfactory. Echocardiography is necessary for neonates with a clinically diagnosed heart disease or possible heart diseases, and may be unnecessary for those with innocent murmurs diagnosed by paediatricians.

Keywords: Echocardiographic; Neonates; Heart Murmur.

Introduction

CHD remains the leading cause of death in children with malformation [1]. Incidence of congenital heart disease detectable by routine clinical examination has been estimated to be 7.5 per 1000 live births [2].

Hearing murmur is the most common means of recognizing the presence of heart disease in an infant [2]. The clinical diagnosis depends on antenatal history, perinatal and postnatal history, and physical examination. Recent advances in ultrasonic imaging allow a clear depiction of the cardiac anatomy and physiology. Being non-invasive, it avoids many of the inherent risks associated with cardiac catheterization. Echocardiography thus remains the mainstay of diagnostic imaging for the sick neonate with a heart disease [3].

In present study we tried to correlate clinical examination and echocardiography in neonates with heart murmur. However, there is scarcity of data on correlation of clinical and echocardiography in neonate with heart murmur.

Aims and Objectives

Primary Objective

- To study the clinical profile of neonates with heart murmur.

Secondary Objective

- To study correlation between clinical and echocardiographic diagnosis of neonates with heart murmur.

Materials and Methods

Study population

- All neonates with heart murmur delivered in Kamineni hospital & attending outpatient department (pediatrics) of Kamineni hospital, L.B. Nagar, Hyderabad.

Inclusion criteria

- All neonates (< 28 days) with murmur, delivered/admitted in the hospital.
- All neonates attending the OPD & detected to have murmur.

Exclusion criteria

- Neonates with gestational age < 28 weeks.
- Unable to do echocardiography for any reason.

Type of study

- Prospective observational study.

Duration of study

- 16 Cumulative months.

Method of collection of data

- The study population included was all neonates with heart murmur, delivered in Kamineni hospital/admitted in NICU or attending Pediatric OPD & neonatal follow up clinic. Antenatal, birth & family history were noted in detail and if symptoms were present the details were collected. Once the murmur was heard, murmur was reconfirmed by senior resident/consultant pediatrician and clinical diagnosis was made based on history and clinical examination. Echocardiography was done in all neonates with murmur for confirmation of the diagnosis.

Observations

A total of 1120 neonates were examined during the study period of 16 months. Out of total 1120 neonates 758 were inborn and 362 were outborn babies. Out of 758 inborn babies, murmur was detected in 20 babies (2.63%). Out of 362

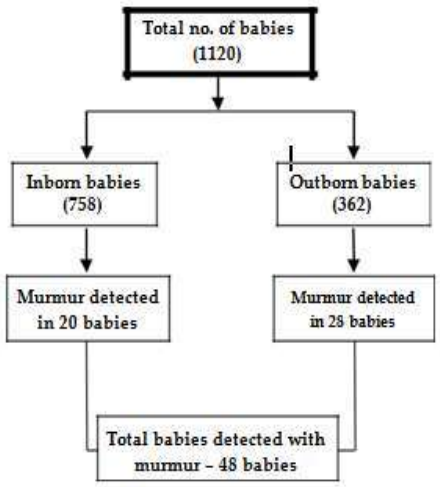

Fig. 1: Study design

outborn babies murmur was detected in 28 babies (7.73%). Out of 1120 babies examined, 48 babies (4.28%) found to have murmur.

Out of 586 male babies examined during the study period, 27 babies (4.6%) had murmur. Out of total 534 female babies examined, 21 babies (3.9%) had murmur.

While out of 48 babies with murmur, 27 (56.25%) were male & 21 (44.75) were female babies. Slight increase in percentage of male babies was seen.

Out of total 817 term babies examined, 32 babies (3.91%) had murmur. Total 303 preterm babies examined, 16 babies (5.2%) were found to have murmur. In preterm babies, percentage of CHD was higher than the term babies. History of consanguinity was present in 11 babies (22.92%) out of total 48 babies with murmur. Out of 48 neonates with murmur, 25 (52.08%) were born to primigavida mothers while 16 (33.33%) were born to second gravid and 7 babies in multigravida. The percentage of the babies with murmur decreased as the gravidity progressed.

Majority of babies (87.5%) had no significant family history. 3 babies out of 48 had history of sudden infant death, 2 babies had family history of congenital heart disease & 1 had a h/o hereditary disease (Down syndrome) in family. Maximum no. babies (41.66%) were presented without any maternal risk factor. The most frequently associated risk factor was polyhydramnios 20.83% (10 cases), followed by other conditions like intrauterine infection 14.58% (7 cases), diabetes 12.5% (6 cases) and oligohydramnios 6.25% (3 cases). While 2 babies (4.16%) had multiple risk factors (one had diabetes & intrauterine infection while another diabetes & Polyhydramnios).

No. of murmurs detected in the first 24 hrs of birth are least. No. of murmurs detected between 48-72 hrs is maximum (62.50%), followed by 14.58% & 10.42% in 1st and 2nd week respectively.

32 out of 48 were asymptomatic. Remaining 16 babies were presented with clinical features. Few clinical features were overlapping. Some clinical features were due to associated conditions. Most common presentation was respiratory distress (11 babies), followed by bounding pulses (9 babies). Cyanosis & dysmorphic features were present in 4 babies each. Edema was present in 1 baby, which was not of cardiac origin.

Most of the murmurs heard with maximum intensity were either in upper or lower sternal border & only in 2 babies murmur was heard in apical area (one with ASD+PDA & other with ASD+VSD).

Maximum babies (41.66%) had grade 3 murmur, followed by grade 4 (31.25%), grade 2 (10.41%) & grade 1 (6.25%) in order.

1) Total 16 cases were diagnosed clinically as VSDs out of which 10 confirmed by echocardiography. However, the other 6 lesions diagnosed clinically as VSD were VSD with PDA (3 cases), VSD with ASD (2 cases) & one case was diagnosed as PFO with increased PAH. The clinical diagnosis of VSD had a sensitivity of 100% & specificity of 84.21%.

2) Clinically 12 cases were diagnosed as PDA, but 13 was the no. diagnosed on echocardiography as PDA. 12 lesions were diagnosed correctly on clinical examination. One lesion diagnosed on

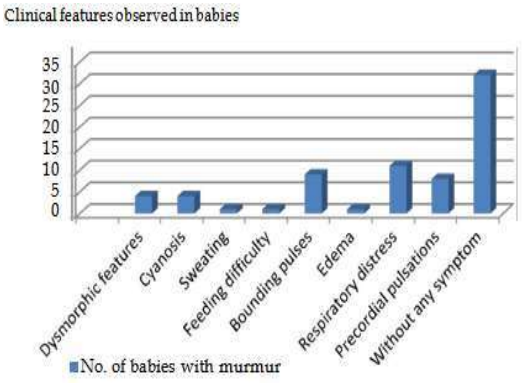

Fig. 2: Clinical features observed in study population

Table 1: Comparison of clinical and echocardiographic diagnosis.

Congenital heart diseases	Clinical Diagnosis	Echocardiographic diagnosis	Sensitivity of clinical diagnosis	Specificity of clinical diagnosis
VSD	16	10	100%	84.21%
PDA	12	13	92.31%	100%
ASD	7	3	100%	91.1%
Acyanotic complex heart disease	5	15	26.67%	96.97%
Functional	5	5	100%	100%
Cyanotic complex heart disease	3	2	66.67%	100%

echocardiography as PDA, was diagnosed clinically as having ASD. The clinical diagnosis of PDA had a sensitivity of 92.31% & specificity of 100%.

3) The total number of ASD's diagnosed clinically were 7 in all, of these 3 were diagnosed and confirmed by ECHO. However, 4 more clinically diagnosed ASD cases had following diagnosis on echocardiography.

ASD with PDA (in 2 cases)

PFO with increased PAH (1 case)

ASD with TR with severe PPHN (1 case)

The clinical diagnosis of ASD had a sensitivity of 100% & specificity of 91.11%.

4) Out of 14 acyanotic congenital heart diseases 4 were diagnosed clinically. The clinical diagnosis of acyanotic complex congenital heart disease had a Sensitivity of 28.57%, Specificity 98.60%.

5) 5 out of 5 functional murmurs were detected by clinical examination. Clinical diagnosis of functional murmur had 100% sensitivity as well as specificity.

6) 2 out of 3 complex cyanotic congenital heart diseases were diagnosed as complex cyanotic congenital heart disease but could not specify the lesion by clinical examination.

The various lesions complex cyanotic congenital heart diseases detected echocardiographically were

a) DORV with TGA

b) Tricuspid regurgitation with pulmonary atresia - right ventricle diminutive. Sensitivity of clinical diagnosis of complex cyanotic heart disease is 66.67% while specificity is 100%.

Discussion

Congenital heart disease is one of the most common congenital malformations. Many present with this problem in the neonatal period. 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 an 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 is the prognosis. Therefore this study was done to evaluate the murmurs in the neonatal period.

In this study all neonates with murmur both preterm (>28 weeks of gestation) and term neonates were included. A clinical diagnosis was made based on the clinical characteristics which were later confirmed by echocardiography. A total of 48 neonates were included in the study. The study was conducted over a period of 16 months.

Total of 48 babies (4.28%) out of 1120 babies were detected to have murmur, which is comparable with 4.06% in Md. Mahbubul Houque et al. [4] study, 3.8% in Farrer et al. [5] & 3.1% in Mehrdad Mirzarahimi [6] study.

In our study male babies had higher percentage (56.25%) of CHD than female babies. Similar percentage was noted in Khalil et al. [8] (51.16%) & Farrer et al. [5] (52.7%). Only in one study by Mehrdad MIrzarahimi et al. [6], higher percentage in female babies was noted.

In our study, the percentage of preterm babies with murmur was higher (5.21%) than term babies with murmur (3.91%). A. khalil et al. 8 study also showed same results with higher percentage in preterm babies (2.2% v/s 0.23%). Another study by Tanner et al also had higher percentage in preterm than term babies.

In our study the h/o consanguinity in babies with murmur was higher-22.92%. This high percentage of consanguinity might be because of high percentage of consanguineous marriages in south India (Andhra Pradesh/ Kerala/ Karnataka, etc). Ramegowda et al. [9] (South India) found 32% of the cases with CHD having h/o parental consanguineous marriages.

In a study done by S. Moss et al. [10], family history of congenital heart defect was found in 12 out of 82 babies with heart murmur i.e. in 14.6%. In our study this percentage was 4.17%. This might be because of change in study population and geographical area.

Table 2: Percentage of babies with murmur in various studies

Studies	No. of babies studied	Percentage of babies with murmur
In our study	1120	4.28%
Md Mahbubul Hoque et al.[4]	812	4.06%
Farrer et al.[5]	8096	3.8%
Mehrdad Mirzarahimi et al.[6]	2928	3.1%
Bansal et al.[7]	2603	2.3%

Table 3: Clinical features in various studies

Clinical Features	In our study	Md. Mahbubul Hoque et al[4]	Laohaprasitiporn D et al[11]
Cyanosis	8.33%	24.24%	16.4%
Sweating	2.08%	-	-
Respiratory distress	22.91%	48.48%	30.6%
Bounding Pulses	18.75%	-	-
Heart failure	-	3%	8.2%
Asymptomatic	66.66%	42.42%	44.8%

Table 4: Percentage of lesions diagnosed on echocardiography in various studies

Studies	PDA	VSD	ASD	Acyanotic complex heart diseases	Cyanotic complex heart diseases
Our study	27.08%	20.83%	6.25%	29.16%	6.25%
Bansal et al.[7]	-	65.63%	15.63%	-	
Md. Mahbubul Hoque et al.[4]	-	36.6%	31.8%		27.2%
Mehrdad Mirzarahimi et al.[6]	11%	17.6%	4.4%	5.5%	2.2%

(Few babies were presented with more than one clinical feature: that is why total percentage is > 100)

In our study 66.66% neonates were asymptomatic & only 33.33% of babies presented with clinical features like cyanosis, feeding difficulty, respiratory distress, edema, and sweating. Similar but less percentage (44.8% & 42.42%) was noted in Md. Mahbubul Hoque et al. [4] & Laohaprasitiporn D et al. [11] studies. The most frequent clinical feature noted was respiratory distress in 22.9% babies in our study & 48.48% in Md. Mahbubul Hoque et al [4] study & 30.6% in Laohaprasitiporn D et al. [11].

In our study 10.41% murmurs were functional (5 out of 48 neonates). Percentage of functional murmur ranged from 16-26% in most of the studies. Lowest- 2.4% in Laoharasitiporn D et al. [11] study & highest-48.4% in Mehrdad Mirzarahimi et al. [6] study.

In our study, Acyanotic complex congenital heart diseases were in 29.16% cases, followed by isolated PDA in 27.08% & isolated VSD in 20.83% cases. Bansal et al. [7] found VSD to be the most prevalent lesion counting nearly 65.3% cases followed by ASD. Md. Mahbubul Hoque et al. [4] found VSD in 36.6% & ASDs in 31.8% which is nearly same, followed by complex heart disease. Mehrdad Mirzarahimi et al. [6] Found VSD in 17.6% followed by PDA in 11% cases. More no. of PDA cases were diagnosed in our study which might be because of more no. of preterm babies compared to other studies. Combination of acyanotic CHD lesions were little higher compared to other studies.

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