



Original Article

Incidence and Clinical Significance of Cardiac Murmur in Neonates in a Tertiary Hospital

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Abstract

Background: Congenital cardiac defect is the major cause of mortality and morbidity in our country but maximum cases are undetected due to lack of skill, shortage of man power, modern equipment in peripheral hospitals. But simply observing murmur can give us the clue for underlying congenital heart diseases. **Objectives:** The purpose of this study is to determine the incidence and clinical significance of cardiac murmur in neonates in a tertiary level hospital in Rajshahi. **Methods:** This cross-sectional descriptive study was done in neonates (age ≤ 28 days) in Rajshahi Medical College Hospital from January 2014 to December 2015. **Results:** during this study period total 4120 neonates were admitted in neonatal ward and only 52 cases were presented with cardiac murmur clinically. Incidence rate of murmur was 1.26%. Among 52 cases 40 cases were having pathological murmur and 12 cases were having innocent murmur. After doing echocardiogram 34 cases were showing structural cardiac defect out of 40 pathological murmur and 4 cases were showing structural cardiac defect out of 12 innocent murmur. Total cases of structural cardiac defect (congenital heart disease) were 38(34+4). So, incidence of congenital heart disease was 9.22/ 1000 live births. **Conclusion:** Congenital cardiac defect is the major cause of mortality and morbidity in our country but maximum cases are undetected during neonatal period but simply observing murmur can give us the clue for underlying congenital heart diseases in 73.08% cases (38 were congenital heart disease out of 52 cases). If congenital heart disease is early detected and properly managed many valuable lives of neonates can be saved and their growth and development will be smooth.

Key words: murmur, congenital heart diseases, ASD, VSD, TOF

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Introduction

Congenital heart disease (CHD) is one of the most common congenital malformations affecting 6/1000 live births. They account for 10% of infant deaths and about 50% of deaths from malformations.¹ If a murmur is heard during neonatal examination there is a 54% chance of

there being an underlying cardiac malformation.² A cardiac murmur may be the first sign of a serious structural cardiac disease, especially in the neonate. Many studies have been carried out worldwide, showing incidence of CHD in different parts of the world is 5-10/1000 live birth. But in Bangladesh, a mere study was done in this respect.

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A cross sectional study found that the prevalence rate of CHD in neonates was about 7.8/1000 live births.³ In a study Lardhi found that the incidence rate of neonatal murmur was 1.37% (87 out of 6333) among which 42.5% (37 out of 87) had a structural cardiac malformation.⁴ Beebe S.A et al. found that 57% of neonates dying from cardiovascular malformations after discharge from hospital had had a murmur before discharge.⁵ Therefore this study was taken to detect cardiac murmur in neonate (within 28 days of life) which helps us to seek appropriate management in very early life of our children to smooth their growth and development.

Materials and Methods

This was a cross-sectional descriptive study, conducted in the neonatal unit of Rajshahi Medical College Hospital. Study period was 2 years from January 2014 to December 2015. Total 4120 neonates were admitted in neonatal ward during this study period. Among them 52 neonates had cardiac murmur and fulfilled the selection criteria (inclusion and exclusion criteria). Inclusion criteria: age-0-28 days of life and presence of murmur. Exclusion criteria: age- more than 28 days, neonates having emergency surgical abnormalities, syndromic babies and diagnosed cases of congenital heart disease. All mothers of selected babies were interviewed and filled up a prescribed questionnaire. Few relevant information was taken which includes: age, sex, history of present complaints, physical findings including murmur. All the findings and investigation reports were recorded and analyzed.

Results

We examined total 4120 neonates during this study period among them only 52 (1.26%) neonates were presented with cardiac murmur. So, incidence rate of cardiac murmur in neonates was 1.26%. Most of the neonates having murmur presented within 1st week of life (46.15%). Mean age of all the neonates was (11.81± 8.49) days, ranging from 1 day to 28 days. Murmur was detected more in the male (30=58%) than female baby (22=42%). Male: female ratio was 1.36:1. Preterm babies (<37 weeks of gestation) were more prone to develop cardiac murmur (61.54%).

Maximum neonates who were presented with murmur were the offspring of non-consanguineous parents (48= 92.31%) and came from low socioeconomic family (30=57.70%). Physical examination revealed tachycardia and tachypnea in the most of the patients. A major portion of the patients presented with feature of heart failure like- hepatomegaly, forehead sweating, crepitation etc. All murmurs were systolic in nature without radiation. Most of the murmur was best heard at the pulmonary area (34.61%) and at the left 3rd and 4th intercostal area adjacent to sternum. X-Ray of 21.15% neonates revealed normal findings but 78.85% neonates presented with abnormal X-Ray findings- cardiomegaly (30.77%), feature of pneumonia (32.69%), plethoric (40.38%) and oligoemic lung field (11.54%). About 26.92% (14 out of 52 cases) neonate's echocardiogram finding was normal. 23.08% (12 out of 52 cases) presented with VSD and 21.15% (11 out of 52 cases) neonates presented with ASD. PDA detected in 11.54% (06 out of 52 neonates) cases and TOF in 7.69% (4 out of 52 neonates) cases. Among the 52 cases 40 cases (77%) were having significant (pathological) murmur and 12 cases (23%) were having innocent murmur. Echocardiogram detected 14 cases (26.92%) as normal cardiac anatomy and 38 cases (73.08%) with cardiac defect. Among the innocent murmur echocardiogram detected cardiac defect in 4 cases (4 out of 12 cases) that means 33.33% neonates of innocent murmur having cardiac defect and echocardiogram also detected cardiac defect in 34 cases out of 40 cases of pathological murmur that means 85% neonates of pathological murmur having cardiac defect. Echocardiogram detected 38 patients having structural heart defect among them congenital cyanotic heart disease was 08 (21.05%) and acyanotic heart disease was 30 (78.95%).

In our study we found statistically significant relationship between clinically suspected murmurs and echocardiogram findings (p value is 0.001) that means clinical suspicion was able to differentiate between innocent murmur due to normal heart and significant murmur due to structural heart defect. So, we should carefully

examine and investigate all neonates who presented with cardiac murmur to evaluate structural cardiac defect. After sensitivity, specificity predictive value and validity test, the sensitivity was 89%, specificity was 57%, positive predictive value was 85%, negative predictive value was 66.66% and accuracy or validity was 80.76%. Here specificity and negative predictive value rate is 57% and 66.66% respectively. These rates are lower than the expected value. It may be due to the lack of my skill, experience and doing echocardiogram from various investigation centers. [According to Robertson's Text Book of Neonatology 4th edition- if physical examination is done by a pediatric cardiologist accuracy will be higher than a trainee doctor in case of innocent murmur. Even an adult cardiologist may misclassify up to 33% innocent murmur.⁶

Table-1: Presenting features (N=52)

Features	No. of neonates	Percentage
Murmur	52	100%
Fever	24	46.15%
Cyanosis	08	15.38%
Pallor	12	23.08%
Plethora	04	7.69%
Respiratory distress	37	71.15%
Hepatomegaly	26	50.00%
Splenomegaly	03	5.77%
Hypotonia	02	3.85%
Forehead swelling	14	26.92%
Tachycardia (>140/min)	50	100%
Tachypnoea (>60/min)	39	75.00%
Crepitation	26	50.00%

Table- 2: Precordium examination findings (N=52)

Findings	Number	Percentage
Apex beat in 4 th left ICS	42	80.77%
Apex beat in 5 th left ICS	10	19.23%
Thrill	18	34.61%
Left parasternal heave	03	5.77%
Palpable P ₂	00	00%
Systolic murmur	46	88.46%
Diastolic murmur	00	00%
Continuous murmur	06	11.54
Radiation	00	00%

Table-3: Echocardiogram finding

Findings	No of patient	Percentage
Normal findings	14	26.92%
VSD	12	23.08%
ASD	11	21.15%
PDA	06	11.54%
Endocardial cushion defect	01	1.92%
TOF	4	7.69%
Severe PS with VSD	1	1.92%
Tricuspid atresia with Single ventricle	2	3.85%
TGA+ASD	1	1.92%
Total	52	100%

Fig-1: Distribution of significant and innocent murmur

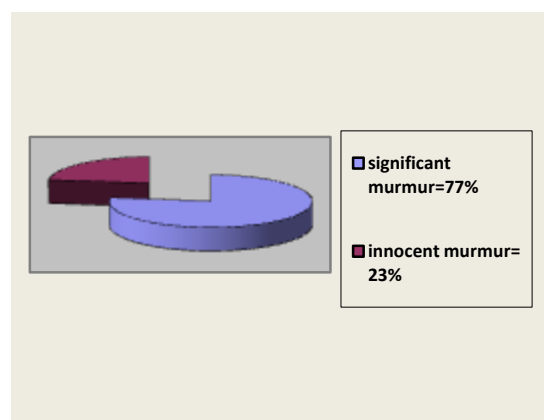
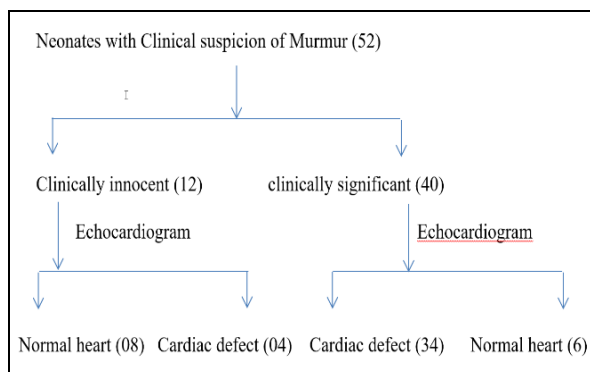


Table 4: Relation between clinically suspected murmur and echocardiogram finding (N= 52)

Clinically suspected murmur	Total N (%)	Echocardiogram finding		P value *
		Structural heart defect	Normal heart	
Significant	40 (76.92%)	34 (65.38%)	06 (11.54%)	0.001
Innocent	12 (23.08%)	04 (7.69%)	08 (15.38%)	
Total	52 (100%)	38 (73.07%)	14 (26.93%)	

Flow diagram-1: Reclassification of murmur after echocardiogram



Discussion

There is a popular believe that murmur in neonatal period has no importance, it is a physiological phenomenon.⁷ But it is not true at all. Murmur in neonatal period may be the first sign of underlying serious structural cardiac defect. About 50% neonates revealed congenital cardiac defect that were presented with murmur. We should carefully reveal these cardiac murmurs to prevent the unwanted death of children because 57% of neonates would die from cardiovascular malformation after discharge from hospital that had a murmur before discharge.

Maximum neonates did not present any feature of congenital heart diseases although they having structural cardiac defect. They were remaining asymptomatic. Detection of a murmur during

physical examination may guide us to detect the heart problem before the development of life threatening complications. About half of these murmurs in the neonates are due to an underlying cardiovascular malformations.⁸

In our study we had found the incidence rate of cardiac murmur was 1.26%. Till date, numerous studies were done in worldwide describing the incidence of cardiac murmur in the neonates varies from 0.6% to 77.4%. Ainsworth et al. had shown in their study that the incidence of murmur in neonates was 0.6%. In another study Lardhi had found that the incidence of cardiac murmur in neonates was 1.37%. These variations may be due to the examiners' skills and experience, the timing and frequency of examination; the conditions under which examination took place and the size of population studied.

Cardiac murmur includes both pathological and innocent. In our study pathological murmur was 76.92% (40 out of 52) and innocent murmur was 23.08% (12 out of 52). Rein et al. found that murmur in 76% cases was due to underlying structural cardiac defect and murmur of 24% cases was innocent.⁹

Our study revealed that 58% babies (30 out of 52) were male and 42% babies (22 out of 52) were female who presented with murmur. Male female ratio was 1.36:1. Sharmin et al. found the very close result in their study in Rajshahi Medical College Hospital. In their study male female ratio was 1.30:1.¹⁰ Hussain M et al. also found the similar result in Dhaka Shishu Hospital. They found the male female ratio was 1.43:1.¹¹

The incidence of congenital heart diseases in our study was 9.7/1000 live birth which was more close to the result of many studies. But the incidence of congenital heart diseases (CHD) varies from about 4/1000 live birth to 50/1000 live births.¹² This wide variation was primarily due to variations in the ability to detect trivial cardiac lesions.¹³ But in our country there was a very few significant study was done till now.

Our study had shown that acyanotic congenital heart diseases were more common than cyanotic congenital heart diseases. In our study, the rate of

acyanotic heart diseases was 78.95% (30 out of 52) and cyanotic heart diseases was 21.05% (8 out of 52). Manzoor Hussain et al. had shown that the rate was 78.5% and 21.5% respectively.¹⁴ Rahman et al. had found 84.4% acyanotic CHD in their study.¹⁵ Similar result was found by Begum NNF et al.¹⁶

In our study, the most frequently diagnosed acyanotic heart disease was VSD (23.08%-12 out of 52) then ASD (21.15%-11 out of 52) and PDA (11.54%-6 out of 52) which were similar to other study results. Hussain et al. had found that incidence of VSD was 32.70% then ASD (incidence was 21.20%).¹¹ In another study which was done in Dhaka Shishu Hospital had shown that VSD was the commonest acyanotic lesion and TOF was the most common cyanotic lesion¹⁴. But this differs from Rahman et al.¹⁵, Fatema et al.¹⁶ and Siddique et al.¹⁷ They had found that ASD was the commonest lesion followed by VSD.

All the available data regarding cardiac murmur and congenital heart disease in neonates are from developed countries. A very few publications are available from Indian subcontinent.^{18,19} So, we should study more regarding this aspect.

In our study we were able to detect about 73% cases of cardiac defect by detecting murmur clinically (38 out of 52 cases). Without detecting murmur routine neonatal examination cannot identify congenital heart disease in maximum cases.²⁰ But, with very carefully hearing murmur and doing an echocardiography we can detect underlying cardiac malformation in neonates up to 86% cases. Hoque et al.²¹ and Moss et al.²² had shown in their study that proper and careful echocardiography can detect underlying structural cardiac lesion up to 70% of clinically suspected cases with murmur. So, we should be very careful during detection of cardiac murmur in neonates.

Conclusion

Early diagnosis and timely referral to higher center can significantly improve the outcome of congenital heart disease. Examination of precordium of every neonate by a trained physician can help in the early diagnosis of congenital heart disease.

References

1. Abu-Harb M, Wyllie J, Hey E, Richmond S, Wren C. Presentation of obstructive left heart malformation in infancy. *Arch Dis Child Fetal Neonatal*.1994;Ed; 71:F179-83.
2. Sean B Ainsworth, Jonathan P Wyllie, Christopher Wren. Prevalence and clinical significance of cardiac murmurs in neonates. *Arch Dis Child Fetal Neonatal*.1999;80: 43–45.
3. Islam MN, Hossain MA, Khaleque MA, Das MK, Khan MRH, Bari MS, Bhuiyan MKJ. Prevalence of Congenital Heart Disease in Neonate in a Tertiary Level Hospital. *Nepal Journal of Medical sciences* 2013;2 (2): 91-5.
4. Amer Abdullah Lardhi. Prevalence and clinical significance of heart murmurs detected in routine neonatal examination. *Journal of the Saudi Heart Association*. 2010; 22, 25–27.
5. Beebe SA, Britton JR, Britton HL, Fan P, Jepson B. Neonatal mortality and length of newborn hospital stay. *Pediatrics*. 1996;vol-98: 231-5
6. Kopes-Kerr CP, Horton. hears a Who but no murmurs – does it matter? *Family Practice*. 2002;19: 422-25.
7. Hossain M H, Hasan MNA, Shirin M, Mamun M A A, Hossain M D, Clinical Significance of Cardiac Murmur in Neonate, *Bangladesh j child health*. 2010;34 (2):56-61
8. Wren C, Richmond S, Donaldson L. Presentation of congenital heart disease in infancy: implications for routine examination. *Arch Dis Child Fetal Neonatal*. 1999; 80: 49-53.
9. Rein AJT, Omophorion SI. Significance of a cardiac murmur as the sole clinical sign in the newborn. *Clin Pediatrics*; (2000) , vol-39: page-511-520
10. Sharmin L S, Haque M A, Bari M I, Ali M A. Pattern and Clinical Profile of Congenital Heart Disease in A Teaching Hospital, *TAJ*.June 2008; 21(1): 58-62
11. Hussain M, Hossain M, Amin SK, Molla MR. Pattern of congenital heart disease in Dhaka Shishu Hospital. *D S (Child) H J*; 1992; 8:42-46,
12. Hoffman J.I., Kaplan S. The incidence of congenital heart disease. *J Am Cardiol*. 2002; 39:1890–1900.
13. Roguin N, Du Z D, Barak M., Nasser N, Hershkowitz S. High prevalence of muscular ventricular septal defect in neonates. *J Am Coll Cardiol*. 1995, 26: 1545–1548.
14. Hussain M, Tahura S, Sayeed M A, Rahman M A, Rahman M A, Kar A K. *Bangladesh j child health*; 2010, 34 (2): 51-55

15. Rahman S, Ahmed MN, Rahmatullah KHI, Alam MS, The incidence of congenital heart diseases diagnosed by non- invasive technique- ten years study in Bangladesh. Ds (child), HJ. 1992;8: 5-15
16. Begum NNF. Atrial septal defect: analysis of 393 cases. Chest and heart journal; 2003;27(1), 31-35
17. Siddique FM, Kamal SMM, Huq KMHSS, Clinical presentation of congenital heart disease in hospitalized patients. Bangladesh heart journal. 1989;4:13-17
18. Poddar B, Basu S, Approach to a child with a heart murmur. Indian J Pediatrics. 2004; 71: 63-66.
19. Bansal M, Jain H. Cardiac murmur in neonates. Indian Pediatric journal. 2005;42:97-98.
20. Richmond S. And Wren C - Early diagnosis of congenital heart disease. Semin Neonatol.2001;6:27-35.
21. Hoque MM, Begum JA, Jahan R, Chowdhury MA, KA, Hussain M. Importance of cardiac murmur in diagnosing congenital heart disease in neonatal period. Bangladesh J Child Health. 2008;32:17-20
22. Moss S, Kitchiner DJ, Yoxall CW, Subhedar NV. Evaluation of echocardiography on the neonatal unit. Arch Dis Child Fetal Neonatal. 2003; 88:287-91.

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