



ROLE OF CLINICAL EXAMINATION, CHEST RADIOGRAPH, ECG AND 2-D ECHO IN INITIAL EVALUATION OF NEW PEDIATRIC PATIENT WITH HEART MURMUR

Dr.Satyanarayan Meena

Department of Pediatrics Govt. Medical College & A.G. Hospitals, Kota - 324005, Rajasthan, India

Dr.Gopi Kishan Sharma*

Assistant professor Department of Pediatrics Govt. Medical College & A.G. Hospitals, Kota -324005, Rajasthan, India*Corresponding Author

Dr.A.L.Bairwa

Senior Professor and HOD Department of Pediatrics Govt. Medical College & A.G. Hospitals Kota -324005, Rajasthan, India

ABSTRACT

Background: Heart diseases constitute an important group of pediatric illness and major cause of childhood morbidity and mortality. Approach to a child with a murmur can be done by appropriate history, cardiac examination, and investigations like chest X-Ray, ECG and confirmed by Echocardiography. Objective To study the role of clinical examination, chest radiograph, ECG and 2-D echo in initial evaluation of new paediatric patient with heart murmur. **Methods:** This was Hospital based prospective study conducted in department of Pediatrics Jay Kay Lon Mother and Child Hospital and New Hospital Medical College Government Medical College. In this study 80 children with murmur were included. Detailed history was taken and clinical examination done. The clinical characteristics which differentiate pathological murmur from innocent murmur were noted. Chest X-ray and ECG were taken. It was later confirmed by echocardiography, which is the gold standard for diagnosis of CHD. **Results:** Out of 80 children having murmur, 73 (91%) children had cardiac disease which was confirmed by 2-D echo and 7 children did not have any cardiac lesion in our study. Out of total 73 children in our study having cardiac disease the distribution of acyanotic CHD, cyanotic CHD and acquired heart disease was 56.25%, 32.50% and 02.50% respectively. The sensitivity, specificity, positive predictive value and negative predictive value of history and clinical examination, chest X-ray, and ECG to diagnose cardiac disease were different but, the sensitivity, specificity, positive predictive value and negative predictive value of those three parameters (anyone positive) were 90.41%, 71.42%, 97.05% and 41.66% respectively with P-value was 0.0006 (statistically significant) Conclusion: We have concluded that history and clinical examinations or chest X-ray or ECG, if use as a single parameter, are not as strong and as accurate as echocardiography to diagnose cardiac diseases. (congenital and acquired)

KEYWORDS : Murmur Clinical Examination, Chest Radiograph, ECG and 2-D Echo

INTRODUCTION

Heart diseases constitute an important group of pediatric illness and major cause of childhood morbidity and mortality. They may be symptomatic or asymptomatic. Late diagnosis of heart disease in children carries a high risk of mortality and morbidity. To avoid this mortality and morbidity early diagnosis is important.

Heart diseases in children may be congenital or acquired. Congenital heart disease is the one present since birth. Some cases of congenital heart diseases are asymptomatic and are diagnosed on routine health visits [1].

Acquired heart diseases in children are less frequent than adult. An acquired cardiac disease represents a diverse group of heart diseases which occurs after birth. Acquired heart diseases, though known to have global distribution, their relative burden and pattern of its distribution vary among regions across the world even within the particular geographical area [2].

It is important to mind that children with congenital heart diseases are at increased risk of poor growth. The factors which play a role in poor growth may be feeding difficulties, excessive caloric requirement and the cardiac lesions on growth and development with chronic acquired heart diseases also at increased risk of poor growth [3].

AIMS AND OBJECTIVES

To study the role of clinical examination, chest radiograph, ECG and 2-D echo in initial evaluation of new pediatric patient with heart murmur.

MATERIALS AND METHODS

Study place: Department of Pediatrics Jay Kay Lon Mother and Child Hospital and New Hospital Medical College, Government Medical College, Kota.

Study period: March 2019 To September 2019

Study design: Hospital based prospective study

Study population: Children of either sex of less than 18 years of age having heart murmur were enrolled for study

Sample size: 64

$N = 4pq/d^2$

Where

n = sample size

p = prevalence of the disease (0.8%)

$q = 1 - p$

d = error (10%)

80 children were included in this study

INCLUSION CRITERIA

1. Children with cardiac murmurs
2. Age less than 18 year

EXCLUSION CRITERIA

1. Cardiac failure due to severe anemia
2. Cardiac failure in PEM
3. Arrhythmias with no structural heart disease

Study was conducted after taking permission from institutional ethical committee. An informed consent was taken before enrolling the child into the study.

92 Children enrolled were analysed as per inclusion and exclusion criteria. 12 cases were excluded by exclusion criteria, out of them 10 cases had CHF with severe Anemia and 2 had PEM with CHF. 80 cases were included in our study. Demographic profile age, sex, religion and address were recorded. All children were interviewed for detailed history including presenting features, past history, family history and birth history from the parents and patients (in children above 8

years). Anthropometric parameters weight measured by EASY CARE BABY CUM CHILD SCALE weighing machine and length recorded for children less than 2 year of age by infantometer and height recorded for children more than 2 years of age by stadiometer with standard methodology.

General physical examination was done from head to toe for any dysmorphic and coarse facies, cataract, webbing of neck, cleft palate, signs of cyanotic heart disease (polycythaemia, clubbing, periorbital puffiness, prominent veins and any congenital malformations), any chest deformity, any subcutaneous nodules, joint swelling, chorea, rashes, etc and cardiac systemic examination done with appropriate methods and following investigations e.g.CBC, X-ray chest, ECG and confirmed by 2-D Echo done.

RESULTS

A total of 92 children having murmur enrolled were analysed as per inclusion and exclusion criteria out of them 10 children had CHF with severe Anemia and 2 had PEM with CHF were excluded.

The following results were found in our study:-

Table 1: 2-D Echo findings children with cardiac murmur

Type of disease	No. of children	Percentage
Acyanotic CHD	45	56.25%
Cyanotic CHD	26	32.50%
Acquired	2	02.50%

[P-value < 0.0001]

Table 2: Gender wise distributions of cardiac diseases.

Type of ACHD	No. of children	Percentage
VSD	22	48.88%
ASD	16	35.55 %
ASD with VSD	4	08.88 %
Others	3	06.66 %
Total	45	100%

[M: F ratio 1.96:1] and [P-value = 0.413]

Table 3: Distribution of heart disease as per acyanotic CHD, cyanotic CHD and acquired heart disease

Cardiac disease in 2-D Echo	No. of children	Percentage
Present	73	91
Absent	7	9
Total	80	100

Table 4: Distribution of ACHD confirmed by 2-D Echo

Gender	No. of children	Children with cardiac diseases	Percentage
Male	53	47	64.38%
Female	27	26	35.62%
Total	80	73	100.00%

Table 5: Distribution of cyanotic CHD confirmed by 2-D Echo

Type of cyanotic CHD	No. of children	Percentage
TOF	7	26.92 %
TGA	6	23.07%
Single ventricle physiology	5	19.23 %
Others	8	30.76%
Total	26	100,00%

Table 6: Association of history and clinical examination with cardiac diseases

History and clinical examination/ECG findings / chest X-ray findings with 2-D Echo findings	2-D echo positive Cardiac disease			
	Yes	No	Total	
	Yes	66	2	68
	No	7	5	12
	Total	73	7	80

Sensitivity = 65.75%, PPV=96.00%, AUC = 0.686

Specificity = 71.42%, NPV = 16.66%

[P-value = 0.096] LR + = 2.301; LR- = 0.479

Table 7: Association of chest X-ray findings with 2-D Echo finding

X-ray findings suggestive of cardiac disease	2-D echo positive Cardiac disease			
	Yes	No	Total	
	Yes	50	1	51
	No	23	6	29
	Total	73	7	80

Sensitivity = 68.49 %, PPV=98.03%, AUC = 0.771

Specificity = 85.71%, NPV = 20.68%

P-value = 0.008, LR + = 4.795; LR- = 0.368

Table 8: Association of ECG findings with 2-D Echo findings

History and clinical examination suggestive of cardiac disease	2-D echo positive Cardiac disease			
	Yes	No	Total	
	Yes	48	2	50
	No	25	5	30
	Total	73	7	80

Sensitivity = 71.23%, PPV =98.11%, AUC = 0.78

Specificity = 85.71%, NPV = 22.22%

P-value = 0.005, LR + = 4.986; LR- = 0.336

Table 9: Association of history and clinical examination/ECG findings / chest X-ray findings with 2-D Echo findings

ECG findings suggestive of cardiac disease	2-D echo positive Cardiac disease			
	Yes	No	Total	
	Yes	52	1	53
	No	21	6	27
	Total	73	7	80

Sensitivity = 90.41%, PPV =97.05%, AUC = 0.809

Specificity = 71.42%, NPV = 41.66%

P-value = 0.0006, LR- = 0.134; LR+ = 3.164

Family history and clinical examination, ECG findings and chest X-ray findings were suggestive cardiac disease in 68 cases. And out of those 68 cases, 66 cases confirmed their cardiac disease by 2-D echo.

DISCUSSION

A total of 92 children having murmur enrolled were analysed as per inclusion and exclusion criteria and out of them 10 children had CHF with severe Anemia and 2 had PEM with CHF were excluded.

In this study 80 children with murmur were included. Out of 80 children having murmur, 73 (91%) children had cardiac disease which was confirmed by 2-D echo and 7 children did not have any cardiac lesion in our study.

A study done by Amaral FT et al [4] found that 210 (90.12%) children had cardiac disease out of 233 children having murmur while rest 23 (9.88%) children had innocent murmur.

Out of 80 children, 53 were male and 27 were female. So the Male female ratio was 1.96:1 in our study. Among 73 children who had cardiac disease, 47 (64.38%) were male and 26 (35.61%) were female.

Out of total 73 children in our study having cardiac disease the distribution of acyanotic CHD, cyanotic CHD and acquired heart disease was 56.25%, 32.50% and 02.50% respectively.

N. SREEMAN et al, concluded that the distribution of acyanotic CHD, cyanotic CHD and acquired heart disease

heart disease was 78%, 8% and 14% respectively in their study [5].

Among acyanotic CHD, VSD (48.88%) was most common which was also most common worldwide acyanotic CHD which is VSD and incidence of ASD was 35.55%, ASD with VSD 08.88%, and others was 06.66%. these findings are similar to most of other studies like Wannika et al and Bhat et al where most common acyanotic CHD was VSD [6,7]. Mishra et al have found that a commonest lesion were ventricular and atrial septal defects [8]. According to a meta-analysis of the prevalence of CHDs worldwide, ventricular septal defects are the most predominant type, followed by Atrial Septal defects and Patent Ductus Arteriosus [9].

In the cyanotic group of children, TOF (26.92 %) was the commonest lesion in our study, followed by TGA (23.07%), Single ventricle physiology (19.23%), and others was 30.76%. Khurshid Ahmed Wani et al also showed that TOF was the commonest cyanotic heart disease, followed by TGA similar to our study [10]. A study conducted in a tertiary care cardiac hospital of Karachi by Najma Patel et al showed a very differing pattern, with TOF being the commonest lesion (24%), followed by VSD (21%) [11].

In our study history and clinical examination were suggestive of cardiac disease in 50 children and out of them 48 children had confirmed cardiac disease by 2-D echo. So sensitivity, specificity, positive predictive value and negative predictive value of history and clinical examination to diagnose cardiac disease were 65.75%, 71.42%, 96.00% and 16.66% respectively with P-value=0.096. Study conducted by Isabel Haney et al showed sensitivity was 82 (24) % and specificity was 72 (24) % of clinical assessment of heart murmurs in differentiating pathological from innocent murmurs [12]. Aungkana Gengsakul et al in their study found that the physical examination by pediatric residents and pediatric cardiologists showed a sensitivity of 39% and 94% and the specificity of 98% and 97%, respectively [13].

We have concluded positive chest X-ray for cardiac disease if we found cardiomegaly or abnormal cardiac silhouette. In our study after evaluation of chest X-ray findings in all cases, positive findings were found in 51 cases. So sensitivity, specificity, positive predictive value and negative predictive value of chest x ray to diagnose cardiac disease were 68.49%, 85.71%, 98.03% and 20.68% respectively with P-value was 0.008 (statically significant). G.M. Satou et al in their study stated that Sensitivity of the CXR to identify cardiac lesion was 58.8% with 95% confidence interval (CI) [32.9, 81.6], the positive predictive value was 62.5% [35.4, 84.8], the Specificity was 92.3% [84.0, 97.1] and the negative predictive value was 91.1% (82.6, 96.4) [14].

Akbar Molaie, Babak Abidinia et al in their study stated that the diagnostic accuracy, sensitivity, specificity, positive and negative predictive value of chest X-ray, were 61%, 80%, 53%, 86%, and 42%, respectively [15].

In our study, out of 80 cases, ECG findings were suggestive of cardiac disease in 53 cases. And out of those 53 cases, 52 cases were confirmed their cardiac disease by 2-D echo. So sensitivity, specificity, positive predictive value and negative predictive value of ECG to identify cardiac disease were 71.23%, 85.71%, 98.11% and 22.22% respectively with P-value was 0.05.

Kirk Easley et al, Concluded that ECG is a poor screening tool for identifying LVH in children and the sensitivity rate was <20% for detecting increased LV mass and the specificity rate was 88% to 92% [16].

In our study we found that the history, clinical examination,

ECG findings and chest X-ray findings (anyone positive from all three) were suggestive of cardiac disease in 68 cases. Out of those 68 cases, 66 cases were confirmed their cardiac disease by 2-D echo. So sensitivity, specificity, positive predictive value and negative predictive value of those three parameters (anyone positive) were 90.41%, 71.42%, 97.05% and 41.66% respectively with P-value was 0.0006 (statically significant). Yi et al in their study reported that the sensitivity and specificity of pediatrician's clinical examination, CXR and ECG were 89-93% and 60-64 % respectively [17]. The result of this study shows good sensitivity (90.41%) and positive predictive value (97.05%) of all three parameters for predicting cardiac disease.

CONCLUSION

We have concluded that history and clinical examinations or chest X-ray or ECG, if use as a single parameter, are not as strong and as accurate as echocardiography to diagnose cardiac diseases (congenital and acquired).

While the result of our study shows good sensitivity (90.41%) and positive predictive value (97.05%) of all three parameters (used in combination) for predicting cardiac disease. These parameters can provide important diagnostic investigations at peripheral level in comparison to 2D echo. So cardiac disease can be predicted by these screening parameters and once suspected, one should go for confirmation by 2 D echocardiography.

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