

# Study of prevalence of underlying congenital heart disease in children with recurrent respiratory tract infections

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## ABSTRACT

**Background:** Recurrent respiratory tract infections are common cause of morbidity globally. Some congenital heart diseases that cause increased pulmonary blood flow is a common predisposing factor for a recurrent Respiratory tract infection (RTI), the rate of recurrent RTI is estimated to be 1.3 episodes per child per year

**Objectives:** The present study helps to determine the underlying congenital heart disease in children with recurrent respiratory tract infections in children seen in a tertiary hospital.

**Materials & Methods:** The present study was conducted in Prathima Institute of Medical Sciences, over a 6 months period. Children diagnosed as recurrent respiratory tract infections were evaluated echocardiographically for Congenital Heart Disease. Certain features in children with recurrent RTI and Congenital Heart Disease were compared to those without Congenital Heart Disease.

**Results:** Out of 370 admissions in PICU from June 2016 to December 2016, a total of 40 children presented with recurrent RTI of which 28(72.5%) were males, 12(27.5%) were females, 4 cases had Congenital heart disease which are acyanotic, out of these 2 cases are large size Atrial Septal Defect, one case is Patent Ductus Arteriosus, one case is perimembranous Ventricular Septal Defect. The prevalence of Congenital Heart Disease was 10%. Most of the patients 25 (62.5%) were in the low socio economic class, 13 (32.5%) were in the middle class, 2(5%) were in the high socio economic class. Out of the 4 children with Congenital Heart disease, one child(25%) born out of consanguinous marriage.

**Conclusion:** The children with congenital heart disease were more likely to have murmur and heart failure compared to those without congenital heart disease. Prevalence of Congenital Heart Disease in children with recurrent RTI in this study is high, evaluation of children with recurrent RTI for Congenital Heart Disease is therefore recommended.

**Keywords:** Congenital heart disease, recurrent respiratory tract infections, pneumonia

## INTRODUCTION

Lower respiratory tract infection such as, Pneumonia is a major cause of morbidity and mortality worldwide. This is even more in developing countries and in under 5 years of age<sup>1</sup>. In a study of recurrent respiratory tract infections caused mostly by bacterial, viral, fungal and other agents are important causes of infections. Several predisposing factors for recurrent Respiratory Tract Infections have been identified, these includes malnutrition, congenital or acquired immune deficiency states, some Congenital heart disease that cause increased pulmonary blood flow is a predisposing factor for recurrent Respiratory Tract Infections. Ventricular septal defect (VSD), atrial septal defect (ASD), patent ductus arteriosus (PDA) are common acyanotic Congenital Heart Disease in childhood predisposes to recurrent Respiratory Tract Infections. Left to Right shunt causes increased pulmonary blood flow and pulmonary edema<sup>2</sup>. Pulmonary edema leads to congestive heart failure and becomes a nidus of infection for the lower respiratory tract. Thus pneumonia and Congestive Cardiac Failure may be the early signs of underlying Congenital Heart Disease. Previous reports identified Congenital Heart Disease is one of the underlying cause of recurrent pneumonia that is when there are 2 or more episodes in a year. Age of onset of the severity of symptoms in children with Congenital Heart Disease dependent on size of the defects. Large sized Ventricular Septal Defect and Patent Ductus Arteriosus present early and have more severe disease including Pneumonia<sup>3,4,5</sup>.

## MATERIALS AND METHODS

Patients presenting to the PICU of Prathima Institute of Medical Sciences with Recurrent Respiratory Tract Infections between June 2016 to December 2016, were recruited for the study. Recurrent Respiratory Tract Infections was diagnosed when recurrent pneumonia >2 episode in a year or 3 episodes in any time period in between radiological clearance. Recurrent respiratory tract infection >6 episodes in the preceding year (>3 years) >8 episodes (<3 years).

Pneumonia was diagnosed on typical history, physical findings, confirmed on chest radiographic findings of pneumonic infiltrates in either or both lung fields. The biodata of each patient was documented which includes age, gender, socioeconomic status, birth history, neonatal history, developmental history and family history. Each patient was examined clinically and findings noted. Other parameters like duration of hospital and outcome were obtained. Ethical approval was given by the Institutional Ethics committee. A chest X ray was done for each patient. The radiograph was read by the radiologist. All cases of recurrent Respiratory Tract Infections underwent transthoracic 2 Dimensional(2D) and Doppler echocardiography<sup>6,7</sup> done by the cardiologist. Any congenital heart disease so found was noted. The type and size of the defects were noted. The size of the patent ductus arteriosus was also noted. Here measurements were noted to evaluate the impact of defect size on pneumonia. Heart failure was diagnosed when the patient fulfilled the clinical diagnostic criteria of heart failure outlined below<sup>3</sup>.

1. Significant tachycardia (>160 beats/min in infancy, 140 beats/min at 2 years, 120 beats/min at 4 years and >100/min above 6 years). when fever was present, a 10 beats/min for every one degree centigrade rise in temperature was allowed for.
2. Significant tachypnea for age (>60 cycles/min in newborn, >40 cycles/min < 24 months, >30 cycles/min in 2-5 years, >28 cycles/min in 5-10 years and >25 cycles/min in 10 years)
3. Cardiomegaly (displaced apex beat with a central trachea or cardiothoracic ratio >60% in <5 years and >50% in > 5 years)
4. Tender hepatomegaly of at least 3cm size below the right costal margin.

Fulfillment of at least three of the four criteria was diagnostic of congestive heart failure was made by a senior registrar consultant. The patients with RTI were treated with antibiotics, those who also had heart failure treated with diuretics.

## RESULTS

Over the study period 40 patients confirmed as recurrent Respiratory Tract Infections. The 40 patients with Respiratory Tract Infections were analysed for the study and consisted 28(70%) males and 12(30%) females. The majority of the patients 21(52%) were < 1 year. The age distribution of the patients are shown in Table 1. Of the 40 patients with recurrent RTI 4 had congenital heart disease, giving prevalence of 10%. All the cases were acyanotic congenital heart disease. Out of 4 patients all of them had pulmonary hypertension and 2 patients had pulmonary artery hypertension (50mmHg). Children with small size ASD with patent foramen

ovale were not included in this study because they have no correlation with recurrent RTI.

The distribution of the congenital heart diseases are shown in Table 3. Out of them 2 patients with Atrial Septal Defect had large size defects (15-18mm). The Ventricular Septal Defect patient had moderate size defect. The Patent Ductus Arteriosus patient had small size defect. The mean age presentation of Congenital heart disease is 13 months. [Table 1]

Most of the Congenital Heart Disease patients 3(75%) had murmurs. The mean duration of admission 12 days with a range of 2-20 days. The mean duration of admission of patients with congenital heart disease is 12 days. Mean duration of hospital admission in children with CHD and with out CHD shown in column Figure 1. 2 of the children with congenital heart disease had surgery. Those who had surgery were Ventricular Septal Defect and Patent Ductus Arteriosus.

Most of the patients 25 (62.5%) were in the low socio economic status, 13 (32.5%) were in the middle status, 2(5%) were in the high socio economic status. The age and socio economic status distribution shown in Table 2.

Out of 40 patients, 13 children had NICU admissions in view of preterm, low birth weight, meconium aspiration syndrome, respiratory distress. Children with congenital heart disease in this study, no significant relation with NICU admission.

Children with congenital heart disease in this study had no significant maternal illness (like fever with rash, drug intake, gestational diabetes) during pregnancy with no history of previous abortions. Out of 4 children with congenital heart disease in this study, one child (25%) born out of consanguineous marriage, it has no statistical significance because small sample size.

Children with congenital heart disease in this study had no significant chromosomal anomalies, syndromic presentation, not effected by TORCH group of infections, no significant family history and sibling deaths, weight at birth was normal, with normal developmental milestones.

**Table 1: Age group and gender distribution of the study population**

Age in months	Male	Female	Total	Percentage of population (%)
<12 months	15	6	21	52.5%
12-23 months	7	2	9	22.5%
24- <36 months	1	2	3	7.5%
>36 months	5	2	7	17.5%

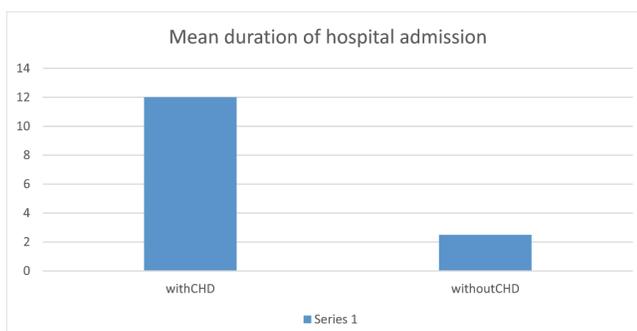
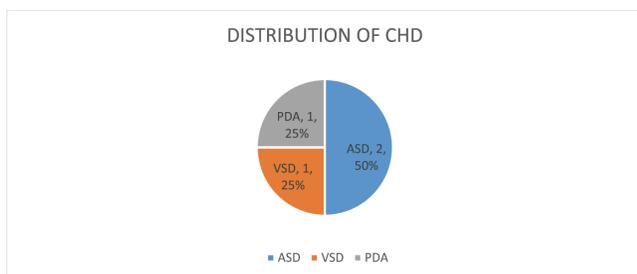
**Table 2: Socio economic characteristics of children with recurrent RTI and congenital heart disease**

Characteristics	With out CHD	CHD
Male	27	1
Female	9	3
High SES	2	0
Middle SES	13	0
Low SES	21	4

**Table 3: Distribution of congenital heart diseases in patients with recurrent RTI**

Type of CHD	Number	Percentage (%)
Ventricular septal defect	1	25
Atrial septal defect (size >15mmHg)	2	50
Patent ductus arteriosus	1	25

**Figure 1: Showing distribution of CHD**



**Figure 2: Showing mean duration of Hospital admission**

**DISCUSSION**

In this study ten cases of recurrent Respiratory Tract Infections had underlying Congenital Heart Disease. It shows the importance of a congenital heart disease as a pre disposing factor for causation of recurrent pneumonia in children. Causing left to right shunting of blood and thus increased pulmonary blood flow. Ventricular Septal Defect and large

Patent Ductus Arteriosus are known to present early with symptoms and they are most likely to predispose the children to pneumonia<sup>4</sup>. The children with congenital heart disease developing heart failure were higher than the children with out congenital heart disease .The size of the defect plays a major role in the proneness to heart failure and pneumonia. It did not reach statistical significance because of small sample size.The children with pneumonia and congenital heart disease having a murmur is quite high compared to those with out congenital heart disease. The murmurs may also have been flow murmurs from hyperdynamic circulation.Most of the congenital heart disease that predisposes to pneumonia and heart failure produces a murmur because of turbulent blood flow across the defects. Small size defects are reported to be diagnosed on examination of the infants when a systolic murmur heard<sup>8</sup>.

The presence of murmur should be evaluated thoroughly to exclude innocent murmurs which are not uncommon in children. In clinical practice the findings of cardiomegaly and increased pulmonary vascular markings on chest radiograph in children with pneumonia were indicators to evaluate further for possible Congenital Heart Disease. This is not always simple, because in the evaluation of the child, the clinical features of cough, respiratory difficulty and tachypnea are the same symptoms , bronchopneumonia present with fine crepitations heard in the lung fields should be differentiated from the coarse crepitations with bronchopneumonia by auscultation of chest. The Finding of pulmonary infiltrates on chest radiograph of broncho pneumonia and pulmonary edema are the same sometimes. It Suggests pneumonia may be confused with pulmonary edema,where the usual finding is mostly increased vascular markings<sup>9</sup>.

Features of both conditions co- exist when Congenital Heart Disease and pneumonia occurs together (tachypnea, respiratory difficulty, cough, crepitations, pulmonary infiltrates which may further compound the situation.Thus it may difficult to identify children underlying Congenital HeartDisease, who present with Respiratory Tract Infections clinically.The presence of Congestive Cardiac Failure and murmur(which were mostly systolic) were pointers for the presence of underlying Congenital Heart Disease.

**CONCLUSION**

The prevalence of Congenital Heart Disease in children with recurrent respiratory tract infections is 10%.The children with Respiratory Tract Infections and Congenital Heart Disease more likely to have murmur ,heart failure and stay longer in the hospital compared to children without Congenital Heart Disease. Heart failure and murmur are possible pointers for the Congenital Heart Disease in children with recurrent Respiratory Tract Infections.

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