# FREQUENCY OF CONGENITAL HEART DISEASES IN PEDIATRIC POPULATION WITH PNEUMONIA AT BACHA KHAN MEDICAL COMPLEX SWABI

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## ABSTRACT

Pneumonia continues to be a major contributor to the childhood morbidity and mortality, often exacerbated by underlying health conditions such as congenital heart diseases (CHDs). CHDs can complicate the clinical course of pneumonia leading to increased severity and worsened clinical outcome. Early identification of CHDs in children with pneumonia is essential for optimizing treatment and reducing complications. This descriptive cross-sectional study utilized a non-probability consecutive sampling approach to recruit a total of 169 children diagnosed with pneumonia. Echocardiography was done to detect CHDs by a consultant pediatric cardiologist. Statistical analysis was performed using SPSS version 23, with a statistical significance set at a p-value < 0.05. The study collected data from 169 children suffering from pneumonia in our Pediatric medicine unit. CHDs were detected in 10.7% of the children. The mean calculated age of the neonates was 6.67±3.3 years. The most common defect was Ventricular septal defect (VSD), found in 7 children (39%), followed by Atria septal defect in 4 children (ASD) (22%). Patent ductus arteriosus (PDA) was observed in 3 cases (17%), while TGA (transposition of great arteries) and CoA (Coarctation of aorta) were each identified in 3 children (11%). Our research concluded that CHD was found in 10.7% of children with Pneumonia, with strong links to respiratory distress, extended hospital stay, family history and rural residence, triggering need of focused and early screening of CHD in pediatric pneumonia, especially in rural populations.

**KEYWORDS:**

Congenital heart diseases, Children, Pneumonia

## INTRODUCTION

Pneumonia continues to be a major contributor to the childhood morbidity and mortality worldwide, especially in the middle- and low-income countries, where access to healthcare is often limited. The World Health Organization reports that pneumonia is responsible for almost 15% of the fatalities in children younger than five years of age, highlighting a critical need for early diagnosis and effective management[1]. Pneumonia causes inflammation and fluid accumulation in the lungs, which can be further complicated by underlying conditions such as congenital heart diseases (CHDs). CHDs are anatomical abnormalities of the heart present at birth, and they remain a significant global health burden, affecting approximately 1 in every 100 live births [2].

In children with CHD, respiratory infections such as pneumonia can exacerbate existing cardiac dysfunction, leading to increased severity of illness, prolonged hospital stays, and a higher risk of complications[3]. The occurrence of congenital heart diseases in pneumonia not only complicates the clinical course but also affects treatment outcomes, often requiring specialized and more aggressive therapeutic interventions[4]. Despite this, limited data are available on the frequency and impact of CHD in children presenting with pneumonia, particularly in resource-limited settings like Pakistan. Understanding the prevalence of CHD in children with pneumonia is essential for informing clinical decision-making and improving outcomes.

There is growing evidence suggesting that socioeconomic and environmental factors, such as access to healthcare, sanitation, and nutrition, may influence both pneumonia incidence and CHD prevalence[5]. Children from rural areas, for example, may face a higher risk due to reduced access to medical facilities and poorer living conditions [6]. Additionally, studies have shown that early detection and management of CHDs in children with pneumonia can significantly improve survival rates[7]. However, in many regions, CHDs often go undiagnosed until they present with severe symptoms, complicating the management of concurrent respiratory infections [8].

This study aims to determine the frequency of CHDs in kids suffering from pneumonia presenting to a teaching hospital in Pakistan. By assessing the prevalence of CHDs in this population, we hope to inform healthcare providers about the importance of early detection and provide evidence for the development of targeted interventions to alleviate the impact of childhood pneumonia linked to CHDs.

## MATERIALS AND METHODOLOGY:

This was descriptive cross-sectional research that was conducted at department of Pediatric Medicine, Bannu Medical College, Bannu. The data collection spanned from 26th February 2023 to 26h August 2023, taking a sample size of 169 children. The sample size was calculated by taking 12.5% frequency of CHDs in children with pneumonia as reference, taking confidence interval (CI) of 95%, and an absolute precision of 5% was applied utilizing sample size calculator of WHO [9]. Non-probability consecutive sampling was used to collect the data.

## OPERATIONAL DEFINITIONS:

Pneumonia: It was defined as a fever > 100°F, sudden onset of cough, tachypnea, and consolidation diagnosed on chest-X-ray.

Congenital Heart diseases: It was defined as presence of any of the following:

Atrial septal defect:

ASDs (Atrial septal defects): A congenital anomaly present in the atrial septum that facilitates left to right blood flow

VSDs (Ventricular septal defects): A defect characterized by an abnormal gap in the inter ventricular, leading to blood flow from left to right ventricle.

PDA (Patent ductus arteriosus): A defect where ductus arteriosus remains open after birth, causing abnormal blood flow between the pulmonary artery and aorta.

TGA (Transposition of great arteries): A birth anomaly in where the aorta originates from the right ventricle of the heart while the pulmonary artery emerges from the left ventricle, leading to two separate circulatory systems and significant cyanosis.

CoA (Aorta Coarctation): The constricted aortic segment with reduction in the size of aorta to the half of its actual size to block blood flow.

Inclusion Criteria:

- Children of age range (1-12) Years Male & Female
- Children with pneumonia as explained in the operational definition

Exclusion Criteria:

Children already on medication

Children with broncho-pulmonary dysplasia

Children with asthma

## DATA COLLECTION:

The research was conducted with the permission from the Hospital Ethics Committee and an informed written consent was sought from the guardian of all the children in the study. Data was gathered through a detail history and clinical examination using a pre-designed proforma.

Echocardiography was performed on children suffering from pneumonia by a Consultant Pediatric Cardiologist to detect CHDs.

DATAANALYSIS:

Data were input and analyzed with SPSS version 23. Numerical data such as age was calculated as mean ±SD. For categorical data, like gender, area of residence and family history of CHDs, frequency and percentages were calculated. CHDs was stratified with respect to age, gender, socioeconomic status and area of residence. Chi square test was applied to determine the association between CHD and other variables and Significance level was set at a p-value of <0.05.

RESULTS:

This study included a cohort of 169 children, diagnosed with pneumonia. The calculated mean age of children was 6.67±3.25 years (Table 1).

**Table 1. Demographic features of the research population [n=169]**

| Characteristic | Frequency | Percentage |
|---|---|---|
| **Age** | | |
| Mean age: 6.67±3.25 years | | |
| **Gender** | | |
| male | 97 | 57.4% |
| female | 72 | 42.6% |
| **Area of Residence** | | |
| Rural | 110 | 65.1% |
| Urban | 59 | 34.9% |
| **Family history of CHDs** | | |
| Yes | 28 | 16.6% |
| No | 141 | 83.4% |
| **Socioeconomic condition** | | |
| Lower class | 90 | 53.3% |
| Middle class | 60 | 35.5% |
| Upper class | 19 | 11.2% |
| **Respiratory distress** | | |
| Yes | 125 | 74% |
| No | 44 | 26% |
| **Need of mechanical ventilation** | | |
| Yes | 50 | 29.6% |
| No | 119 | 70.4% |
| **Duration of hospital stay** | | |
| ≤5days | 95 | 56.2% |
| >5days | 74 | 43.8% |

CHDs were found in 10.7% of the children suffering from Pneumonia, as reflected in the Figure No 1.

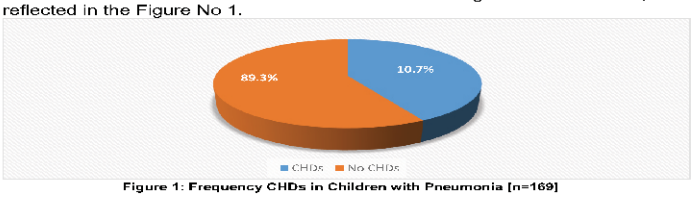


**Figure 1: Frequency CHDs in Children with Pneumonia [n=169]**

The most common defect was VSD, found in 7 children (39%). followed by ASD in 4 children (22%). PDA was observed in 3 cases (17%), while TGA and COA were each identified in 3 children (11%).

When CHDs were stratified by variables, showed a significant association with family history of CHDs (p=0.01), patient respiratory distress (p=0.02),duration of stay at hospital (p=0.01), and area of residence such as children fro rural area have more CHDs prevalence as compared to urban areas (p=0.04), as depicted in the Table No 2.

### Table 2: Correlation of CHDs with other variables (n=169)

| Variable | CHDs | | P value |
|---|---|---|---|
| **Age** | **Yes** | **No** | |
| 1-5years | 11 | 93 | 0.24 |
| 6-10years | 7 | 58 | |
| **Gender** | | | |
| male | 11 | 86 | 0.30 |
| female | 7 | 65 | |
| **Area of Residence** | | | |
| Rural | 14 | 96 | 0.04 |
| Urban | 4 | 55 | |
| **Family history of CHDs** | | | |
| Yes | 10 | 18 | 0.01 |
| No | 8 | 133 | |
| **Socioeconomic condition** | | | |
| Lower class | 8 | 82 | 0.35 |
| Middle class | 6 | 54 | |
| Upper class | 2 | 17 | |
| **Respiratory distress** | | | |
| Yes | 15 | 110 | 0.02 |
| No | 3 | 41 | |
| **Need of mechanical ventilation** | | | |
| Yes | 9 | 41 | 0.05 |
| No | 9 | 110 | |
| **Duration of hospital stay** | | | |
| ≤ 5days | 4 | 91 | 0.01 |
| > 5days | 14 | 60 | |

Considering the relationship between pneumonia severity and the presence of CHDs, while a majority of children with mild pneumonia were without CHD, the presence of CHD is associated with a significant percentage of moderate and severe pneumonia cases, suggesting a potential impact of underlying heart conditions on pneumonia severity (Table 3)..

### Table 3: Summary of pneumonia Severity in relation to CHDs

| Pneumonia | Total (n=169) | Children with CHD (n=18) | Children without CHD (n=151) |
|---|---|---|---|
| Mild | 85 (50.3%) | 6 (33.3%) | 79 (52.3%) |
| Moderate | 85 (32.5%) | 7 (38.9%) | 48 (31.8%) |
| Severe | 85 (17.2%) | 5 (27.8%) | 24 (15.9%) |

## DISCUSSION

This study aimed to ascertain the frequency of CHDs in kids suffering from pneumonia presenting to a teaching hospital. Our findings indicate that 10.7% of the children diagnosed with pneumonia also had an underlying CHD, which is in alignment with the past researches that highlight a significant link of childhood respiratory diseases with congenital cardiac defects [10, 11].

The prevalence of CHDs in our study aligns with the findings of other research indicating that children with pneumonia exhibit a raised incidence of CHDs as compared to pediatric population in general [12]. Specifically, the most common defects identified were VSDs, followed by ASD and PDA. This pattern reflects the common occurrence of these defects in pediatric cardiology, as noted in recent literature [13].

Our results also suggest that a family history of CHDs significantly correlates with the presence of cardiac anomalies in the cohort studied (p=0.01). This finding reinforces the notion that genetic risk factors contribute the development of CHDs, as demonstrated in prior studies [14]. Additionally, a notable correlation was found between the area of the residence and the prevalence of congenital heart diseases, with higher rates reported in rural areas (p=0.04). This raises important questions about access to prenatal care and the availability of screening programs in these regions [15].

In terms of pneumonia severity, the data indicate that children with CHDs experienced a higher percentage of moderate to severe cases. Specifically, while 52.3% of children without CHD presented with mild pneumonia, only 33.3% of those with CHD fell into this category. This significant difference highlights how underlying cardiac conditions can exacerbate respiratory illnesses, resulting in increased morbidity [16]. The association between respiratory distress and the presence of CHDs (p=0.02) further emphasizes the need for vigilant monitoring and management of respiratory symptoms in this vulnerable population.

The duration of hospital stay was also significantly associated with the presence of CHDs (p=0.01), with children having CHDs staying longer in the hospital. This suggests that underlying cardiac conditions complicate the clinical management of pneumonia, necessitating more intensive care and extended hospitalization [17]. The need for mechanical ventilation, though not statistically significant (p=0.05), suggests a trend that warrants further investigation to understand the interplay between respiratory failure and cardiac anomalies in these patients.

## CONCLUSION

Our study highlighted the importance of screening for congenital heart defects in pediatric patients presenting with pneumonia. Given the significant associations found, including family history and respiratory distress, healthcare providers should maintain a high index of suspicion for underlying cardiac anomalies in children presenting with respiratory illnesses, particularly in rural populations where screening efforts need to be prioritized.

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| Conception & Planning of the Research | HN, MRK, IU |
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**CONFLICT OF INTEREST**

None Declared

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NIL

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.