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Acute Lower Respiratory Tract Infection (ALRTI) In Children with Congenital Heart Disease (CHD)

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Abstract

Introduction: Congenital heart disease is one of the most common occurring congenital disorders in infants and children. As the cardiac and respiratory system work alongside each other, the respiratory tract infections in children with CHD is common. Recurrent respiratory infections in CHD leads to poor growth and immunity thereby worsening the existing compromised cardiac functions. Hence diagnosing, treating and preventing ALTRI in CHD children is imperative. This study aimed to find out the clinical profile of ALTRI in children with CHD in the age group 1month to 14 years and evaluate the various types of ALRTI in these children.

Materials and Methods: A prospective, observational and descriptive study was carried out including 150 children with CHD of age group 1 month to 14years having ALRTI over a period of 36 months.. A uniform study questionnaire involving detailed history and clinical examination was applied to obtain relevant clinical and laboratory data of each child. Final outcome was studied and statistically analyzed.

Results: Males of age group 1month-1 year with difficulty in breathing, fever, cough and failure to thrive were found to be in majority. Crepts, chest retractions, tachypnoea, tachycardia and wasting were significant clinical findings. Bronchopneumonia(80%) and bronchiolitis(16.6%) were found to be majority of the ALRTI in the CHD children. Isolated ventricular septal defect(31.3%) and isolated atrial septal defects(26.6%) were the most common CHD in the study population. The study showed favorable outcomes with 57.3% of the study population discharged and 36% being referred to cardiac centres for surgical correction.

Discussion and Conclusion: Acute Lower Respiratory Tract Infection (ALRTI) is the most common risk factor of morbidity in children with CHD, the most common being bronchopneumonia and the most common cardiac defect being isolated VSD. Early management of ALRTI and correction of cardiac defects is important for optimal growth and development of the child. Integrated approach for early detection and management of the ALRTI and CHD is necessary in our country.

Keywords: Acute lower respiratory tract infection, Congenital heart disease, Children, Clinical Profile.

Introduction

Congenital heart defects are known by a number of names including congenital heart anomaly, congenital heart disease, heart defects, and congenital cardiovascular malformations.[1]

Heart defects are among the most common birth defect, occurring in 1% of live births (2-3% including bicuspid aortic valve). [2] The congenital heart disease includes abnormalities in heart structure that occur before birth. Such defects occur in the fetus while it is developing in the uterus during pregnancy.

For congenital heart defects that arise without a family history (de novo), the recurrence risk in offspring is 3-5%[3]. This risk is higher in left ventricular outflow tract obstructions, heterotaxy, and atrioventricular septal defects.

Congenital heart disease (CHD) is the most frequently occurring congenital disorder, responsible for 28% of all congenital birth defects. The birth prevalence of CHD is reported to be 8-12/1000 live births . Considering a rate of 9/1000, about 1.35 million babies are born with CHD each year globally.[4]

Major proportion of CHD have significant problems involving other organ system, specific gene and chromosomal disorder. Function of the respiratory and cardiovascular system have a close relationship. Children with CHD are more vulnerable to recurrent respiratory tract infection. They have an anatomical defect that causes hemodynamic disturbances of circulation, and it ultimately puts them at higher risk to suffer from recurrent respiratory tract infection and heart failure. [5]

In children, CHD leads to characteristic signs and symptoms, such as poor growth, feeding difficulties, respiratory distress, exercise intolerance,fatigue and is associated with circulatory, neurohormonal and molecular abnormalities.[6] Congenital heart disease (CHD) is frequently associated with ventricular dysfunction, volume or pressure overload.

Respiratory tract infections (RTI) in children are one of the most common reasons for consulting pediatricians. RTIs are usually manifested by a combination of rhinitis, cough, sore throat, wheeze, and fever. Unlike adults, children with a respiratory illness deteriorate more rapidly, and respiratory arrest needing resuscitation is usually the primary event. There are a number of reasons why children are more vulnerable to RTIs. [7,8]

The syndromes of LRTI include bronchiolitis, exacerbations of asthma or wheezing, croup and pneumonia. Although working definitions exist, there is an overlap among the syndromes. Although some respiratory viruses are more strongly associated with specific syndromes, many viruses have been shown to cause each syndrome. It is often difficult to differentiate between viral and bacterial pneumonia.

Acute Lower Respiratory Tract Infection (ALRTI) is the most common cause of death in children under five. Children with CHD are at risk for increased morbidity from viral lower respiratory tract infections because of anatomical cardiac lesions that can worsen an already compromised respiratory status. Respiratory tract infection in children with CHD results from increased pulmonary blood flow. These patients also have other contributing factors that place them at increased risk for infection with respiratory.

CHD is one of the underlying cause for recurrent LRTI, which when detected early and treated appropriately can prevent the child from developing irreversible and untreatable conditions such as pulmonary hypertension, Eisenmenger syndrome, thromboembolic phenomenon and sudden death .It is important to identify children with recurrent LRTI and screen them for any underlying CHD using through physical and clinical examinations.

Recurrent ALRTI in children with CHD are usually found in children under 1 year of age due to the fact of low immunity and small size of respiratory tract. Early detection and appropriate management of CHDs can provide a child ample time for catch up growth, reduce the mortality and morbidity risk associated with each episode of LRTI.

Hence the present study was done at our tertiary care centre to assess the clinical profile of ALRTI in children with CHD from age group 1 month to 14 years and to evaluate these ALRTI in children.

Materials And Methods:

Study design, setting and population: A prospective observational descriptive hospital based study was carried out in a total of 150 children admitted in pediatric ward in a tertiary care hospital in a metropolitan city over a period of two years after meeting inclusion and exclusion criteria. The inclusion criteria are cute lower respiratory tract infection in children with congenital heart disease in the age group of 1month to 14 years of age. Children not fitting in this age group and those having

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acquired heart diseases and respiratory conditions were excluded.

Ethical consideration:

This study was started after obtaining approval from Institutional Ethics Committee (IEC) and informed written consent from the parents/ legal guardian.

Study tool:

A uniform study questionnaire involving detailed history and clinical examination was applied to obtain relevant demographic, clinical and laboratory data of each child.

Demographic details such as age, gender, religion and residential address of the children enrolled in the study were noted.

Detailed history was taken from the informants of the study subjects regarding the symptoms, past history, family history, history of recurrent admissions and Immunization history. Clinical examination including general examination and detailed systemic examination of all study subjects was conducted.

All relevant blood investigations such as CBC, RFT/LFT, ABG, Blood cultures, sputum/ gastric lavage culture sensitivity were done. Relevant radiological investigations such as X-ray chest, 2d Echocardiography, cardiac CT, cardiac MRI were done as per indications.

Anthropometric measurements performed in this study included weight, height and mid-upper arm circumference measurement. Tachycardia and tachypnoea was considered to be present if the heart rate and respiratory rate exceeded the upper limit of the range for that particular age respectively. Pallor ,cyanosis ,clubbing and added lung sounds on auscultation were noted along with various clinical examination findings.

Laboratory variables :

Chest xray findings: Bilateral symmetric hyperinflation (air trapping), parahilar, peribronchial infiltrates and diffuse interstitial markings s/o bronchiolitis, peribronchial thickening and poorly defined air-space opacities; bilateral inhomogeneous patchy areas of consolidation involving several lobes suggestive of bronchopneumonia and non-segmental, homogenous consolidation predominantly involving one lobe with air bronchograms s/o lobar pneumonia.

Results:

Majority of the patients 117(78%) were from the age group of 1 month - 1 year followed by 23(15.3%) from the age group of 1-5 years and 10 patients (6.6%) from the age group of 5-14 years. Majority of the patients were male 83 (55.3%) while female patients constituted 67(44.7%) of the study group. Majority of the patients had overlapping of symptoms. Among them the most common symptom was difficulty in breathing 145 (96.7%) followed by fever 126 (85%), cough 109(72.7%), failure to gain weight 100 (66.6%),suck-rest-suck cycle/ forehead sweating 80 (53.3%),recurrent hospital admissions in 74(49.3%),running nose in 68(45.3%),feeding difficulty in 65(43.3%),paroxysm activity (seizures) in 12 (8%), vomiting in 7 (4.6%), 4(2.6%) were found to have altered sensorium, bluish discoloration in 4(2.6%) and diarrhea in 3 patients (2%).There was overlapping of signs among the patients. Majority of the patients 137 (91.3%) had crepts while 132 (88%) patients had chest retraction. Tachypnea in 130 (86.7%) and tachycardia in 128(85.3%) were the most common signs found for vital abnormality. Fever was found in 126 (84%) patients, 94 (62.7%) patients had systolic murmur,failure to thrive in 90 (60%) and cyanosis was found in 21 (14%) patients. Hepatomegaly was found in 15 (10%), oedema in 10(6%), clubbing in 5 (3.3%) and syndromic features/associated congenital anomaly in 5 (3.3%).Thirty nine (26%) patients had normal weight while 111 (74%) patients were underweight as per weight for age (WfA). Eight five patients (56.7%) had stunting as per height for age (HfA) and 126 (84%) patients had wasting as per weight for height (WfH). Anemia was observed in 58 patients(38.6%) leucocytosis in 26 patients(17.3%) and thrombocytosis was seen in 20(13.3%) patients. Bronchopneumonia on chest xray was seen in 120(80%) patients, 25 (16.6%) had bronchiolitis and 5 (3.3%) patients had lobar consolidation. Eighty nine (59.3%) patients had cardiomegaly on chest xray.

Majority of the patients 120 (80%) suffered from pneumonia , while 25 (16.6%) were found to suffer

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from bronchiolitis and 5 patients(3.3%) had complicated pneumonia.

Out of the 120 patients who suffered from pneumonia, 78 (65%) presented with severe pneumonia according to the IMNCI clinical classification, while 29(24.16%) presented with pneumonia and 13 (10.8%) as no pneumonia. Majority of the patients 47(31.3%) were observed to have VSD , 40(26.6%) had isolated ASD, 25 (16.6%) had complex heart disease, 21 (14%) had cyanotic heart disease and 17 (11.3%) had isolated PDA.

Among the study population, 32 patients had cardiac valve involvement. The most common type of valve anomaly was Mitral regurgitation 21(14%) followed by Tricuspid regurgitation 6(4%),

Pulmonary regurgitation 4(2.7%) and Aortic regurgitation 1 (0.7%).In the study 86(57.3%)patients were discharged , 54(36%) patients were referred for surgical intervention to a cardiac centre whereas 10 (6.7%) patients died. Among these 10, 8(5.33%) died before any cardiac surgical intervention could have been done whereas 2(1.33%) died inspite of receiving cardiac surgical intervention.

Discussion And Conclusion:

In the present study, majority of the patients 117 (78%) were in the age group of 1 month - 1 year followed by 23(15.3%) from the age group of 1-5 years and 10 (6.6%) patients from the age group of 5-14 years. Eighty three (55.3%) patients were male while female patients constituted 67(44.7%) of the study group.

Similar findings were found in three studies.

Sadoh WE et al[9] in 2013 evaluated the contribution of CHD to pneumonia in children where he found 121 children with pneumonia of which 61(50.40%) were males and their mean age was 10.2 ± 10.93 months. Comparatively our study showed different mean age group which was 1.87±1.02 months.

In a study by Gabriela K et al[10] in 2015 which was a retrospective hospital-based study assessing the incidence, clinical characteristic and outcome of ALRTI children with CHD found that the incidence of ALRTI in children with CHD were more often in girls than in boys with a ratio of 1.37:1, and it occurred more frequently in children under 1 year of age (80%). The median of age was 6 months with the range of 1–156 month (one-month old–13 years old).

Similarly Chen J et al [11] in 2018 in his cross-sectional study found median age of the patients was 9 months (ranged from 1 days to 6 years old), with 54% of patients under 1 year of age. Of 1992 enrolled children, 1185 were boys and 807 were girls (gender ratio of 1.47: 1) which was similar to the present study.

The most common symptom of patients in our study was difficulty in breathing (96.7%) followed by fever(85%), cough (72.7%), failure to gain weight(66.6%),suck-rest-suck cycle/ forehead sweating (53.3%),recurrent hospital admissions(49.3%),running nose(45.3%),feeding difficulty(43.3%),paroxysm activity (seizures) (8%), vomiting (4.6%), altered sensorium (2.6%), bluish discoloration(2.6%) and diarrhoea (2%). This is concordant to the studies of Gabriela K et al[10] and Chen J et al[11].

Gabriela K et al[10] in 2015 in the retrospective hospital-based study observed almost all children who came to the hospital were complaining about breathing difficulty (98%), cough (75.2%), fever (85.2%), and runny nose (63.1%). Other symptoms were probably associated with other common diseases that the children have e.g. diarrhea (10.1%), seizure (4.7%), vomit (4.7%), breast feeding difficulty (3.4%), decreased level of consciousness (0.7%), and icteric (0.7%).

Chen J et al[11] in 2018 cross-sectional study showed cough in 1354 (68.0%) of the children, followed by fever (51.9%, 1033) and expectoration (29.0%, 578). Infants were found to have a higher proportion of virus infection than older children, with those from 6 to 12 months of age having the highest proportion (67.4%). Infants identified with viruses had fever, cough, runny nose, expectoration and diarrhea than infants that were not. Older children with viral infections were found to have more tachypnea than younger children (less than 1 year of age). In the virus- positive group, infants with viral co-infections had a significantly higher proportion of tachypnea than that with single viral infections.

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Gabriela K et al[10] in 2015 in the retrospective hospital-based study showed Tachypnea (87.2%) and tachycardia (75.2%) were the most common signs found for vital abnormality. Most of the children (893%) had chest retraction, but cyanosis was found only in a small number (14.1%) of the children with cyanotic CHD. Abnormal heart sounds frequently heard on auscultation was systolic murmur (63.7%), and the most common additional breathing sound was crackles (91.9%). Other findings on physical examination were found in a small number of children such as continuous murmur (16.7%), wheezing (10.7%) and stridor (0.7%).

Our study had overlapping of signs among the patients. Majority of the patients 137 (91.3%) patients had crepts while 132 (88%) patients had chest retraction. The most common clinical findings were tachypnea 130 (86.7%) and tachycardia 128 (85.3%). Fever was found in 126(84%) and failure to thrive were 90 (60%). Cyanosis was found in 21 (14%) patients, clubbing in 5 (3.3%) while 94 (62.7%) patients had systolic murmur on auscultation. Some patients presented with congestive cardiac failure with hepatomegaly in 15 (10%) patients and oedema in 10(6%) patients. Five patients (3.3%) were found to have syndromic features/associated congenital anomaly.

This is consistent with the studies of Gabriela K et al[10] in 2015 and Solórzano-Santos F et al[12] in 2017.

The respiratory system is the most important system affected as a complication of children having CHD. Hemodynamically significant heart disease cause pulmonary congestion giving rise to respiratory symptoms and signs. The anatomically defective heart of these children cannot sustain the increased demands of the growing body causing a serious consequences on the respiratory system making it susceptible to infections. Acute lower respiratory tract infection causes inflammation of the lower airway causing edema,mucus and cellular debris collection. This results in respiratory obstruction which give rise to the various clinical signs like tachypnoea, respiratory distress in the form of supra clavicular,subcostal and intercostal retractions, crepts ,tachycardia,air hunger and often cyanosis. The lower respiratory tract infection in a heart disease child severely affects the growth of child causing failure to thrive.

Many of the congenital heart lesions have left to right shunting of the blood in the cardiac chambers which can be auscultated as murmurs. With lower respiratory tract infection with congenital heart disease, there comes a time when the heart cannot sustain the increased demand during the disease can result in congestive cardiac failure which present as hepatomegaly, oedema, severe respiratory distress.

Extra risk factors for children to develop lower respiratory tract infection were found to congenital anomaly and features like Downs syndrome, cleft palate, cleft lip and syndromic facies.

ALRTI in children with CHD is more frequently seen in children under 1 year of age. This fact is due to the low capacity of children immune system and the small size of respiratory tract. The lesion commonly found was left to right lesion, which caused low vascular resistance that would increase the vulnerability of infection in a child with CHD. Nutritional disturbances will affect immune system, therefore it will increase the risk of infection and slows down the healing process. Studies have suggested that severity of cardiac lesions influence the nutritional status in children with CHD.

Gabriela K et al in 2015 [10] in the retrospective hospital-based study showed most of the children (72.5%) had malnutrition of whom 47.7% with mild malnutrition and 27.5% with severe malnutrition. Malnutrition was associated with additional diagnosis of Failure to Thrive.

Rabiya N et al [13] in 2020 study showed more than 2/3rd patients belonged to low socio-economic status. The Infant and Young Child Feeding (IYCF) Practices and food intake were suboptimum in 80%. There was only one child in CCHD with normal weight and no stunting, wasting or chronic energy deficiency. In ACHD, 71% were underweight as per weight for age, 49%, had stunting as per height for age, 82% had wasting as per weight for height and 83% had chronic energy deficiency as per BMI.

In comparison to the studies of Gabriela K et al [10]2015 and Rabiya N et al[13] 2020, our study showed similar results with 39 (26%) patients having normal

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weight while 111 (74%) patients being underweight as per weight for age (WfA). Eighty five (56.7%) patients had stunting as per height for age (HfA) while 126 (84%) patients had wasting as per weight for height (WfH). Etiology of malnutrition in CHD is multifactorial mainly due to elevated energy expenditure, chronic hypoxemia, malabsorption or feeding difficulties and hypermetabolism. In those with CCHD, the extent of malnutrition was more than ACHD, attributable to the complex nature of heart disease and associated hypoxia.

Gabriela K et al[10] in 2015 and Rabiya N et al[13] in 2020 studied the hematological parameters in children with CHD suffering from ALTRI.

Gabriela K et al[10] in 2015 in the retrospective hospital-based study observed only few children were with leucocytosis (24.2%), so most of the children had a normal number of white blood cells. But in their study only a small number of children had anemia (8.1%).

Rabiya N et al[13] 2020 study found anemia was diagnosed in 1/3rd and iron deficiency were common. Even though polycythemia was noted in those with CCHD, increased RDW and reduced red cell indices unmasked iron deficiency. Peripheral smear examination showing microcytic hypochromic anemia with increased RDW confirmed iron deficiency anemia..

The hematological parameters in our study showed anemia in 58 patients(38.6%) , leucocytosis in 26 patients(17.3%) and thrombocytosis in 20(13.3%) patients.

Those with anemia i.e Hb < 11gm/dl were further investigated and majority of the patients were diagnosed with iron deficiency anemia.

The finding of high prevalence of nutritional anemia especially iron deficiency anemia shows the effect of poor diet and warrants corrective interventions by iron supplementation in optimum doses both for prevention and treatment. Optimizing the dose of iron is also important as majority may be on suboptimum doses of iron.

Microbiological cause of ALRTI requires bacterial and viral isolation by culture and PCR testing of the sputum,gastric lavage or bronchoalveolar lavage. Due to inadequate monetary funds these tests could not performed in this study.

The peripheral white blood cells(WBC) count can be useful in differentiating viral from bacterial pneumonia. In viral pneumonia, the WBC counts can be normal but bacterial pneumonia is often associated with the elevated WBC count i.e more than the upper limit of age specific ranges. Taking this into consideration, the majority of the ALTRI in this present study were attributed to viral etiology.

Radiological techniques are used for diagnostic purposes in respiratory infection, among which chest xray is routinely used. A posteroanterior chest radiograph was taken of all patients in our study. The most common chest xray finding in 120(80%) patients was bilateral inhomogeneous patchy areas of consolidation involving several lobes which was suggestive of bronchopneumonia.

Twenty five (16.6%) had bilateral symmetric hyperinflation(air trapping) finding suggestive of bronchiolitis whereas 5 (3.3%) had homogenous consolidation predominantly involving one lobe with air bronchograms suggestive of lobar consolidation. Eighty nine patients out of the total 150 patients with CHD had significant cardiomegaly on chest xray. These findings were consistent with the study of Medrano C et al[14] 2007 and Gabriela K et al[10] 2015.

Medrano C et al[14] 2007 study observed Bronchiolitis (51.4%), upper respiratory tract infections (25.7%), and pneumonia (20%) were the main diagnoses.

Gabriela K et al[10] 2015 in the retrospective hospital-based study showed chest x-ray, infiltrate (80.5%) and increase of Broncho vascular pattern (75.8%) were the common findings in children with ALRTI. Enlargement of the heart (cardiomegaly) was found in most of the patients (92%) related to CHD. The study showed most common type of ALTRI was bronchopneumonia (86.6%).

Five (3.3%) patients in our study had pneumonia with complications like necrotizing pneumonia, pleural effusion and empyema. Complications of pneumonia are usually the result of direct spread of bacterial infection within the thoracic cavity or bacteremia and hematological spread.

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Revised WHO Integrated Management of Childhood Illness (IMCI)[15](revised) classifies children with pneumonia based on their clinical status. The study population in this study were also classified according to the IMNCI classification. Out of the 120 patients who suffered from pneumonia, 78 (65%) presented with severe pneumonia according to the IMNCI clinical classification, 29(24.16%) presented with pneumonia and 13 (10.8%) as no pneumonia. With the goal of getting appropriate treatment to more children, the WHO guidance for classifying and treating childhood pneumonia at the first-level health facility and outpatient department has been revised. This simplifies the management of pneumonia at outpatient level, reduces substantially the number of referrals for hospitalization and achieves better treatment outcomes.

Congenital heart diseases can be cyanotic or acyanotic. The structure of the heart is a complex one and hence the congenital anomalies of the heart can be multiple. To evaluate the study population, patients with acyanotic heart diseases were divided into those having isolated VSD, isolated ASD and isolated PDA. Patients with coarctation of aorta, aortic stenosis ,interrupted aorta, pulmonary artery hypertension and mixed lesions were labelled as complex heart diseases.

Cyanotic heart diseases included TOF- Tetralogy of Fallot ,DORV- Double Outlet Right ventricle, TGA- Transposition of Great Arteries, and TAPVR- Total anomalous pulmonary venous return.

(PDA - Patent Ductus Arteriosus; VSD - Ventricular Septal Defect; ASD - Atrial Septal Defect; CoA - Coarctation of Aorta TOF- Tetralogy of Fallot DORV- Double Outlet Right ventricle, TGA- Transposition of Great Arteries, TAPVR- Total anomalous pulmonary venous return)

Majority of the patients 47(31.3%) in our study population were observed to have VSD (31.3%), 40(26.6%) with isolated ASD, 25 (16.6%) with complex heart disease, 21 (14%) with cyanotic heart disease and 17 (11.3%) with isolated PDA.

Some of the patients ,32(21.3%) of the total study population , showed valvular involvement as well. The most common type of valve anomaly in the patients was Mitral regurgitation 21 (65.6%%) followed by Tricuspid regurgitation in 6 (18.75%), Pulmonary regurgitation in 4 (12.5%) and Aortic regurgitation in 1 (3.1%) patient.

Similar observations were noted in the studies of Smitha R et al [16]2006, Kapoor R et al [17] 2008 , Gabriela K et al[10] 2015 and Rabiya N et al [13] 2020.

Smitha R et al[16] 2006 study on Prevalence of congenital heart diseases showed VSD (40.7%), ASD (19.06%), PDA (9.53%) and TOF (13.8%) respectively.

Kapoor R et al[17] 2008 study on prevalence of congenital heart diseases showed VSD (21%), ASD (19%), PDA (14.6%) and TOF (4.6%) respectively.

Gabriela K et al 2015[10] retrospective hospital-based study observed CHD was commonly found in children hospitalized with ALRTI, the most common defect in their study were PDA (47.6%) and VSD (47%). Both diseases defected with the presence of shunt from left to right. However isolated VSD was the most common defect in our study and isolated PDA was found to be least in number. Rabiya N et al[13] 2020 study showed majority had ACHD (81%) and VSD was the most common (35%). Among those with CCHD (18.7%), TOF the most common (13.7%).

Heart diseases with left to right shunt lesions lead to increased pulmonary blood flow and congestion which causes decrease in the function residual capacity of then lung causing a ventilation perfusion ratio mismatch. These physiologic risk factors in children with CHD that can contribute to worse clinical outcomes from viral respiratory infections

Outcome of the patients included in the study was noted.

In the present study, 86(57.3%)patients were discharged , 54(36%) patients were referred for surgical intervention to a cardiac centre whereas 10 patients died out of which 8 patients(5.33%) could not receive any surgical intervention and 2 patients (1.33%) had received cardiac surgical care.

Similar observations were noted in the studies of Medrano C et al[14] 2007, Gabriela K et al[10] 2015 and Chen J et al[11] 2018.

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Medrano C et al[14] 2007 study observed median length of hospitalization was 7 days. In 18 patients (17.1%), the clinical course of respiratory infection was complicated and 2 died.

Gabriela K et al[10] 2015 retrospective hospital-based study showed as much as 83.9% of the children was discharged with good condition however, only few children died (6.75%).

Chen J et al[11] 2018 cross-sectional study reported 9 children died including 8 boys and 1 girl.

To summarize the study concluded that Acute Lower Respiratory Tract Infection (ALRTI) is the most common risk factor of morbidity in children with CHD. The most common ALTRI in these children with CHD is bronchopneumonia and the most common cardiac defect is isolated VSD. Children with CHD are prone to repeated episodes of respiratory infections due to the anatomical cardiac lesions along with poor growth, low immunity, failure to thrive and anemia which can worsen an already compromised respiratory status. Infants with large cardiac defects present with heart failures despite optimal medical management. These patients are at a risk for pulmonary vascular disease if the defect is not repaired at the earliest.

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Figures

Figure No 1: Distribution of patients according to Symptoms

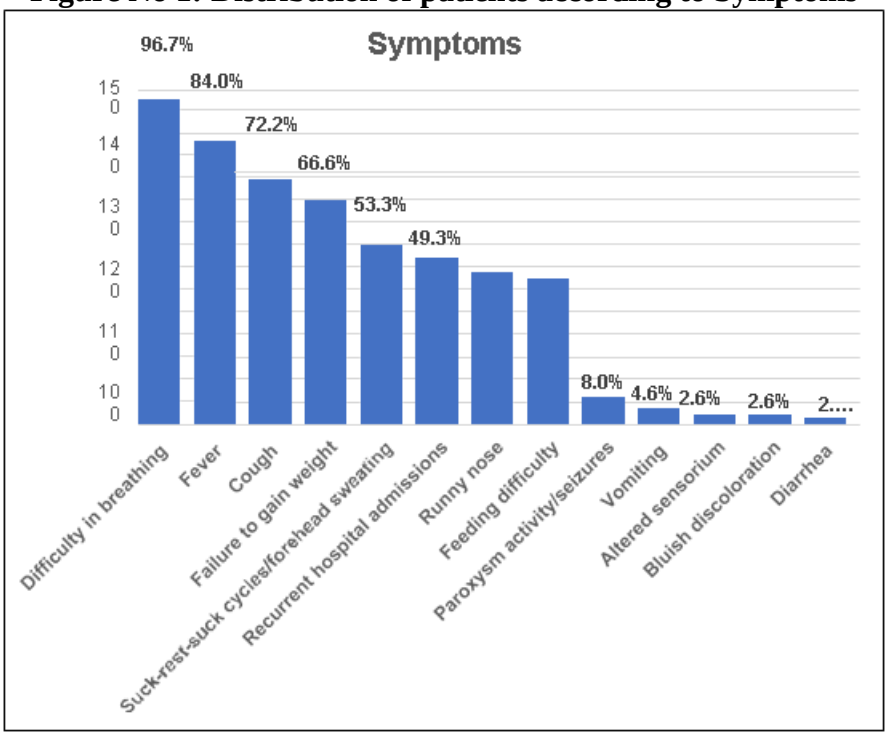

Figure No 2: Distribution of patients on hematological parameters.

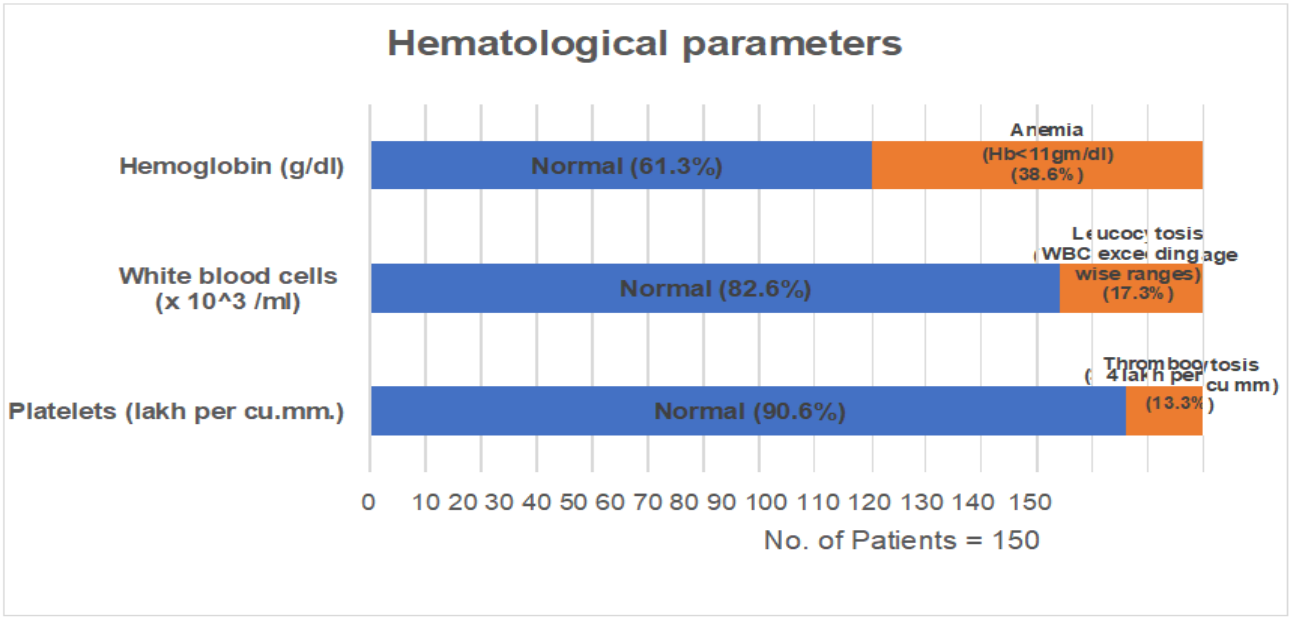

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Figure No 3: Distribution of patients according to the type of acute lower respiratory tract infection (ALRTI)

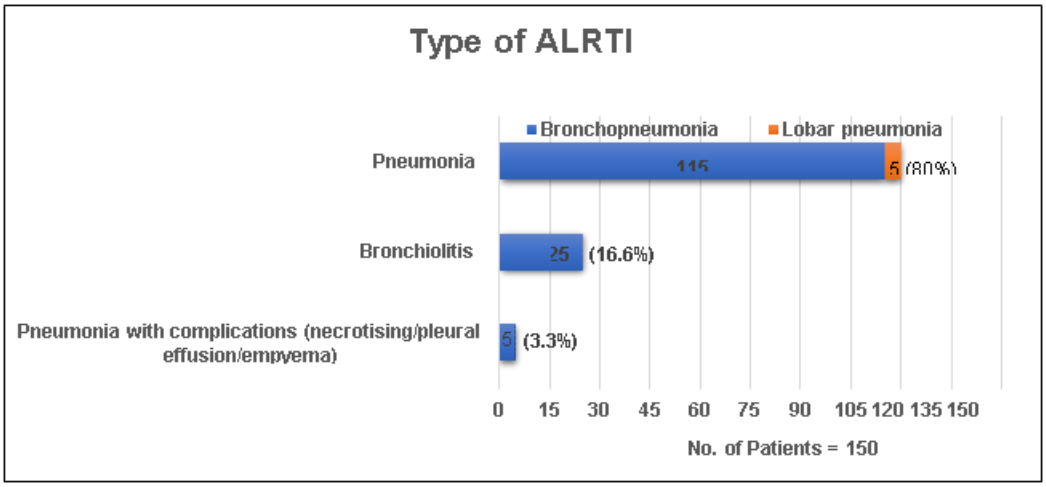
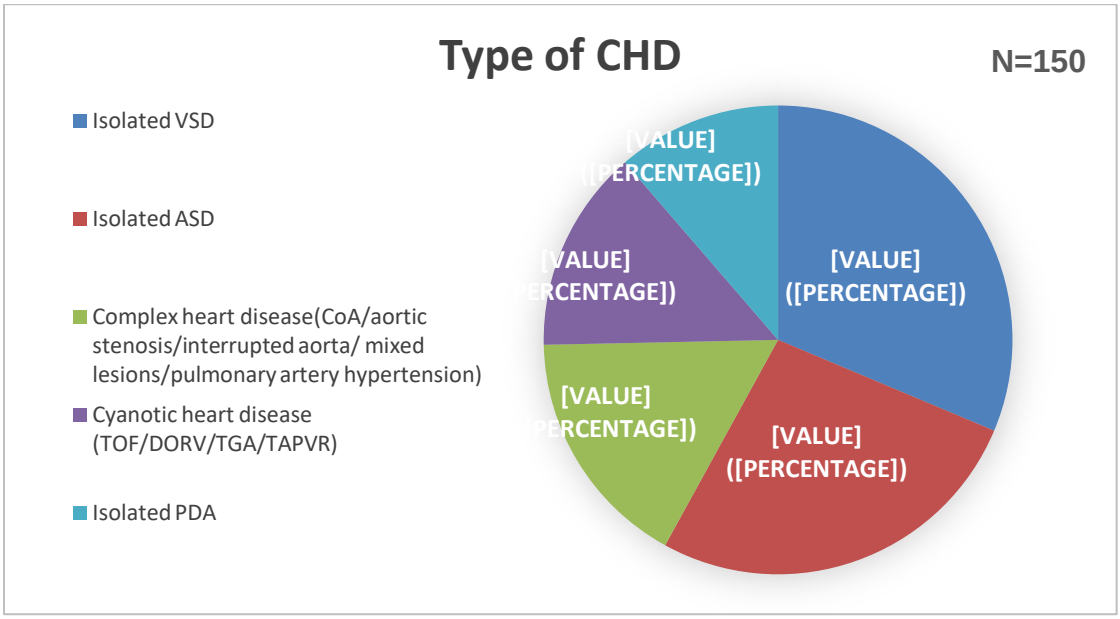


Figure No 4 : Distribution of patients according to type of CHD



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TABLES:

Table No 1: Clinical Findings among the study population

Clinical findings	N=150	%
Crepts	137	91.3%
Chest retractions	132	88%
Tachypnoea	130	86.7%
Tachycardia	128	85.3%
Fever	126	84%
Murmur	94	62.7%
Failure to thrive	90	60%
Cyanosis	21	14%
Hepatosplenomegaly	15	10%
Oedema	10	6%
Precordial bulge	10	6%
Clubbing	5	3.3%
Syndromic features/ associated congenital anomaly.	5	3.3%

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Table No 2: Radiological findings among the study population

Chest x ray findings	N= 150	%	Image
Peribronchial thickening and poorly defined air-space opacities; b/l inhomogeneous patchy areas of consolidation involving several lobes (bronchopneumonia)	120	80%	
Bilateral symmetric hyperinflation(air trapping), parahilarperibronchial infiltrates and diffuse interstitial markings (bronchiolitis)	25	16.6%	
Non-segmental, homogenous consolidation predominantly involving one lobe with air bronchograms(lobar pneumonia).	5	3.3%	
Cardiomegaly (cardiothoracic ratio >0.5)	89	59.3%	

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Table No 3 : Clinical pneumonia in the patients according to IMNCI

Pneumonia according to IMNCI	n1=120	%
Very severe/severe pneumonia	78	65%
Pneumonia	29	24.16%
No pneumonia	13	10.8%
Total	120	100%

Table No 4: Distribution of patient according to outcome

Patient outcome		N=150	%
Discharged		86	57.3%
Referred for Surgical intervention		54	36%
Died	Without surgical intervention	8	5.33%
	With surgical intervention	2	1.33%
Total		150	100%

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