

STUDY OF VIRAL LOWER RESPIRATORY TRACT INFECTIONS AMONG CHILDREN WITH CONGENITAL HEART DISEASE ADMITTED TO ALEXANDRIA UNIVERSITY CHILDREN’S HOSPITAL

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Introduction

The incidence of congenital heart disease (CHD) among Egyptian children has been estimated to be 5-6/1000 live birth. Globally, CHD constitutes the major cause of mortality among children, especially in developing countries. It also accounts for more than 20% of infant’s death prenatally. According to the World Health Organization's report in 2022, pneumonia is the leading infectious cause of death among children. Approximately 73% of community acquired pneumonia (CAP) in children are caused by viruses, Respiratory syncytial virus (RSV) is the predominant viral pathogen of childhood pneumonia, accounting for 28%, with the highest incidence in children <2 years of age. Other viruses include human metapneumovirus (hMPV), parainfluenza viruses (types 1, 2, and 3), influenza viruses (A and B), adenoviruses, bocavirus, rhinoviruses, and enteroviruses. Children with CHD are at an increased risk of morbidity from viral lower respiratory tract infection (LRTI) due to increased ventilation-perfusion mismatch and, ultimately, hypoxia. Especially those with acyanotic lesions due to the left-to-right shunting of blood, which occurs through a septal defect or the arterial duct, causing pulmonary over circulation and pulmonary edema. The pulmonary edema leads to congestive heart failure and becomes a nidus of infection for the LRTI.

Aim of the work

The prevalence of viral LRTIs among children with CHD. Common viral pathogens causing LRTIs among children with CHD. The clinical outcome among the studied patients.

Patients

50 patients with CHD complaint of pneumonia were qualified to be enrolled in the current study. This study was conducted from May 2022 to May 2023 on children with pneumonia among children with CHD at Alexandria University Children’s Hospital.

Methods

Data collection: (History taking, Full clinical examination, Chest x ray, Echo, Lab investigation(CBC, CRP, arterial blood gases)). Sample collection: All samples for microbiological diagnosis were collected before the start of antibiotic treatment and within 24 hrs of presentation.

Nasopharyngeal aspirate (Processing of sputum samples, Nucleic acid extraction, Real time polymerase chain reaction (PCR) amplification and detection(Respiratory Pathogens 33 assay for amplification of 19 viruses, including: influenza A virus, influenza B virus, influenza C virus, influenza A(H1N1) virus (swine-lineage), human parainfluenza viruses 1, 2, 3 and 4, human coronaviruses NL63, 229E, OC43 and HKU1, human metapneumoviruses A/B, human rhinovirus, human Respiratory Syncytial Viruses A/B, human Adenovirus, Enterovirus, human Parechovirus, human Bocavirus. The results were considered positive if cycle thresholds (Ct) is ≤ 40 .).

Results

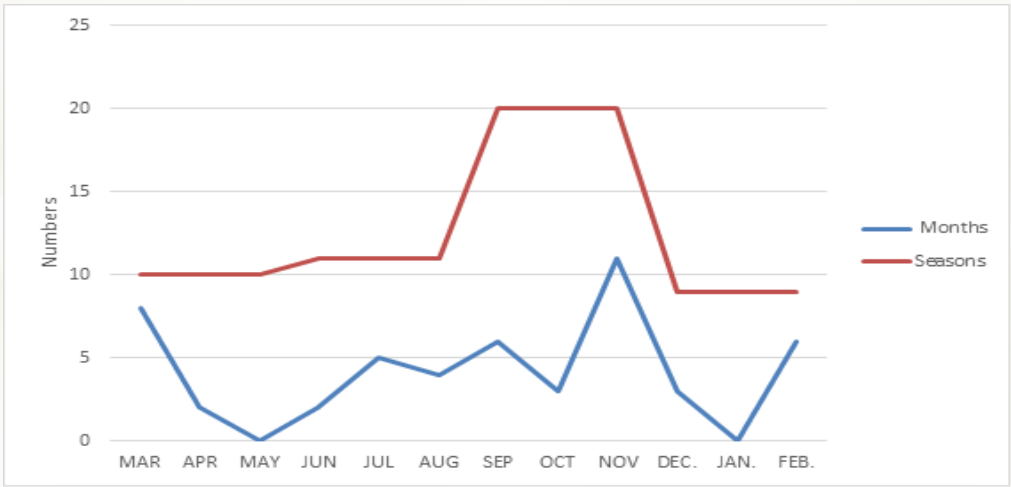


Figure (1): Distribution of the studied cases according to months and season (n = 50).

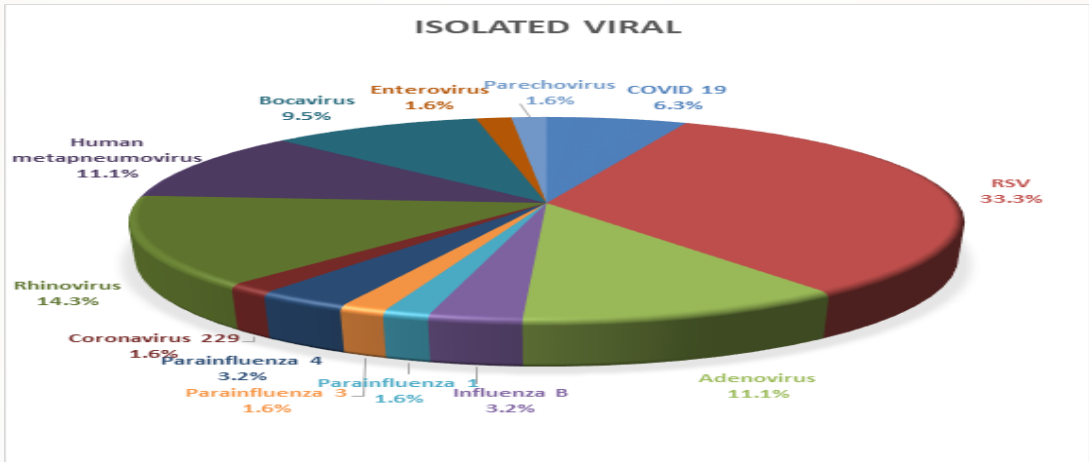


Figure (2): Common viral organisms isolated.

Table (1) demonstrates the types of CHD diseases among the studied children. There was predominance of acyanotic congenital heart disease patients diagnosed with viral pneumonia which accounted for 84% (n=42).

Type of CHD	A cyanotic (42) (84.0%)		Cyanotic (n=8) (16.0%)		Total (n=50)	
	No.	%	No.	%	No.	%
Isolated VSD	19	45.2	0	0.0	19	38.0
Isolated ASD	8	19.0	0	0.0	8	16.0
Isolated PDA	2	4.8	0	0.0	2	4.0
Isolated AVSD	8	19.0	0	0.0	8	16.0
TOF	0	0.0	6	66.7	6	12.0
TGA	0	0.0	1	11.1	1	2.0
AS	1	2.4	0	0.0	1	2.0
VSD, ASD & PS	1	2.4	0	0.0	1	2.0
ASD & VSD	2	4.8	0	0.0	2	4.0
ASD & PDA	1	2.4	0	0.0	1	2.0
DIRV & L-TGA	0	0.0	1	11.1	1	2.0

VSD: Ventricular septal defect, ASD: Atrial septal defect, PDA: Patent ductus arteriosus, AVSD: Atrioventricular septal defect, TOF: Tetralogy of Fallot, TGA: Transposition of great arteries, AS: Aortic stenosis, PS: Pulmonary stenosis, DIRV: Double inlet right ventricle, L-TGA: Levo transposition of great arteries.

Conclusion

In this study, pneumonia was a frequent complication among children with congenital heart disease (CHD), occurring in 76.3% of cases. Of these pneumonia cases, 48.5% were attributed to viral infections. The majority of affected children were under two years old, male, and had acyanotic CHD, particularly ventricular septal defects (VSDs) and atrial septal defects (ASDs). Respiratory syncytial virus (RSV) was the most common virus isolated, followed by rhinovirus and adenovirus. Viral pneumonia cases were more prevalent during the autumn and winter months. Overall, the study highlights the significant burden of pneumonia in children with CHD, emphasizing the need for early diagnosis, effective management, and preventive measures to improve outcomes.