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*RESEARCH ARTICLE*

# SEVERE PEDIATRIC ARDS SECONDARY TO INFLUENZA B WITH BACTERIAL COINFECTION SUCCESSFULLY MANAGED WITH VENO-VENOUS ECMO: A CASE REPORT

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## Manuscript Info

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## Abstract

Severe viral–bacterial coinfection is increasingly recognized in Indian paediatric populations, with studies demonstrating a high overlap of viral (≈60%) and bacterial (≈45%) pathogens in hospitalized children with acute respiratory infections. Such coinfections can lead to rapid clinical deterioration, severe pneumonia, and progression to acute respiratory distress syndrome (ARDS), often necessitating intensive care support. Early recognition and aggressive management are therefor e critical to improving outcomes in these critically ill patients.once hypoxemia crosses thresholds such as an oxygenation index (OI) > 16–25 or $PaO_2/FiO_2$ ratio < 100 despite optimal ventilation, mortality risk increases significantly, occasionally necessitating Extracorporeal Membrane Oxygenation (ECMO) as a salvage therapy. We report the case of a 4-year-old boy who presented with fever, cough, and progressive respiratory distress and was diagnosed with bilateral pneum onia with pleural effusion. Respiratory multiplex PCR identified Influe nza B with bacterial coinfection including Streptococcus pneumoniae, Haemophilus influenzae, and methicillin-resistant Staphylococcus aureus. Despite escalation to invasive mechanical ventilation and maximal ventilatory support, the child developed refractory hypoxemia, left sided pneumothorax, and septic shock required dual vasopressor and antimicrobial agent. Veno-venous extracorporeal life support (VV-ECLS) was initiated as Murray score was more than 3. During the course of ECMO support, complications included persistent bilateral pneumothoraces resolved with ICD with suspected bronchopleural fistula, neuromuscular weakness, and epileptiform activity on electroen cephalography which treated with antiepileptic drug.Gradual improvem ent in pulmonary compliance allowed successful ECMO decannulation, subsequent ventilator weaning, and eventual extubation. This case highlights the role of ECMO as a life-saving intervention in severe paediatric ARDS secondary to viral–bacterial coinfection and illustrates the complexity of complications encountered during prolonged critical care.



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## Introduction:-

Acute respiratory distress syndrome (ARDS) in children remains a significant cause of morbidity and mortality in paediatric intensive care units. Severe viral infections, particularly influenza, may predispose patients to secondary bacterial pneumonia leading to rapid respiratory deterioration. In cases of refractory hypoxemia despite optimal mechanical ventilation, extracorporeal membrane oxygenation (ECMO) may serve as a rescue therapy to allow lung-protective ventilation and recovery of pulmonary function. We report a paediatric case of severe ARDS secondary to Influenza B with multiple bacterial coinfections successfully managed with veno-venous ECMO support.

**Case Presentation:-**

A 4-year-old boy presented with a history of fever for 6 days, cough for 4 days, and respiratory distress for 1 day. He was initially evaluated by a local physician and treated with oral antibiotics. Chest radiography revealed bilateral pneumonia with pleural effusion. Inspite of NIV support, respiratory distress had not reduced, so he was referred to Apollo Multispeciality Hospital for further evaluation and management on 1st October 2025. Initially, the patient was managed with non-invasive respiratory support; however, progressive respiratory distress was present and child was having persistently desaturation, Spo2- 70 % on HFNC (Flow -35 lit, Fio2-100%) for whichnecessitated escalation to invasive mechanical ventilation (Mode- PRVC, FIO2-100%, PEEP-9, RR-45 br/min) on 2nd October 2025. Respiratory multiplex PCR testing detected Influenza B, along with bacterial pathogens including Streptococcus pneumoniae, Haemophilus influenzae, and methicillin-resistant Staphylococcus aureus. Antimicrobial therapy was escalated to intravenous meropenem, doxycycline, and teicoplanin, along with oral oseltamivir.

Despite maximal ventilatory support (PEEP 14 cm $H_2O$ and $FiO_2$ 100%), the child remained persistently hypoxic and mixed acidosis was also presentand developed left sided pneumothorax resulting into midline shift, requiring insertion of a left intercostal drain. His clinical condition deteriorated with worsening septic shock requiring dual vasopressor support (Inj. Noradrenaline0.4mcg/kg/min, inj. Vasopressin 0.02u/kg/hr,). Anisocoria was observed, and MRI of the brain demonstrated features suggestive of raised intracranial pressureand electroencephalography revealed an abnormal encephalopathic pattern, which was treated with inj. LevipilandInj. Valparin. Given the presence of severe ARDS with refractory hypoxemia and shock, the patient was referred for extracorporeal membrane oxygenation support as Murray score was more than 3. Sequential arterial blood gas analysis showed persistent derangements with worsening hypercapnia. After discussion with the family, veno-venous extracorporeal life support (VV-ECLS) via femoro-jugular cannulation was initiated as a salvage therapy on 05 October 2025.

During ECMO support, child developedbilateral pneumothoraces, the right-sided pneumothorax resolved with ventilator pressure titration; however, the left-sided pneumothorax persisted despite a patent intercostal drain, raising suspicion of a bronchopleural fistula Over time, Acute Kidney injury which subsided by fluid management and Acute liver injury treated with N acetyl cysteine and raised intracranial pressure stabilized and the child's level of consciousness improved.As pulmonary compliance improved during ECMO support, graded lung recruitment strategies and sequential ECMO weaning were initiated. Following a successful weaning trial, the child was able to maintain adequate gas exchange through the native lungs. After obtaining informed consent, he was successfully decannulated from ECMO on 21st October 2025. Child was treated with antibacterial and anti-fungal.Post-decannulation, the patient developed severe neuromuscular weakness requiring intensive physiotherapy.

Subsequent chest radiography suggested evolving empyema, and a 16 Fr intercostal drain was inserted into the pleural space. Pleural fluid analysis was sterile. Trials of ventilator weaning were successful, and the patient was extubated on 09thNovember 2025 and transitioned to high-flow nasal oxygen therapy. During recovery, the child experienced intermittent feed intolerance requiring parenteral nutrition. Gradual improvement in lung expansion resulted in resolution of the hydropneumothorax, and the left intercostal drain was removed on 13thNovember 2025. An orthopaedic consultation was obtained for persistent external rotation of the lower limbs, and appropriate management was initiated.Strict infection control practices ensure the safety of the ECMO circuit, reduce morbidity and mortality, and support better recovery outcomes. Stringent infection prevention precautions are essential for the safe care of a 4-year-old patient on Extracorporeal Membrane Oxygenation (ECMO). ECMO requires prolonged use of invasive lines and circuits that provide a direct pathway into the bloodstream, significantly increasing the risk of serious infections. Any breach in aseptic technique can lead to complications and infections in ECMO patients can worsen outcomes.Infection prevention measures were strictly maintained throughout the patient's hospital stay. Hand hygiene was performed using the recommended six-step technique at all five key moments. Aseptic precautions were followed while handling tubes and lines, including scrubbing the hub with an alcohol swab and

ensuring that only closed ports were used. All ports were consistently covered with a sterile drape. Medical equipment was cleaned every shift, and all linen used for the patient was sterilized prior to use. Standard infection control bundles were adhered to at all times. Additionally, post-discharge education was provided to the patient and caregivers regarding infection control practices to be continued at home, as applicable.

**Lab Reports**

**Table 1:**

| Investigation | Day 1 | Day 5 | Day 10 (10.02.25) | Day 20(18.10.25) | Day 30 (28.10.25) | Day 40 (14.11.25) | Day 47 (Discharge)17. 11.25 |
|---|---|---|---|---|---|---|---|
| Hb | 10.2g/dl | 10.3g/dl | 7.2g/dl | 8.4g/dl | 8.6g/dl | 9g/dl | 9.8g/dl |
| WBC | 4800cu/mm | 11500cu/mm | 5600cu/mm | 6700cu/mm | 5100cu/mm | 13500cu/mm | 13000cu/mm |
| Platelet | 1.13Lacs/ cumm | 0.86Lacs/cu mm | 1.35 Lacs/cu mm | 1.32Lacs/cu mm | 1.32Lacs/cumm | 5.09Lacs/cumm | 3.57lacs/cu mm |
| CRP | 18.5mg/ dl | 3.1mg/dl | 0.638mg/dl | 5.2mg/dl | - | 1.3mg/dl | - |
| PCT | 10.2 | - | - | 0.15 | - | - | 0.04 |

**ABG Analysis**

**Table 2:**

| **Parameters** | **Before intubation** | **Before ECMO Initiation( on ventilator, Mode-PC, PEEP-7, RR-60, FIO2-82%, PC above PEEP-27** | **After ECMO initiation on Ventilator, Mode-PC, PEEP-6, RR-16, FIO2-40%, ECMO setting: RPM-3000, Flow-1.26, sweep-1.5L, FDO2-100%** | **Before Discharge (RA)** |
|---|---|---|---|---|
| pH | 7.14 | 7.241 | 7.247 | 7.48 |
| PO2 | 105 | 52.2 | 79.0 | 95.8 |
| PCO2 | 57 | 76.6 | 58 | 36.4 |
| $HCO3^-$ | 16 | 32.2 | 24.7 | 27.0 |
| Lactate | 1.04 | 1.19 | 1.80 | 0.87 |

**Radiological Investigations:**

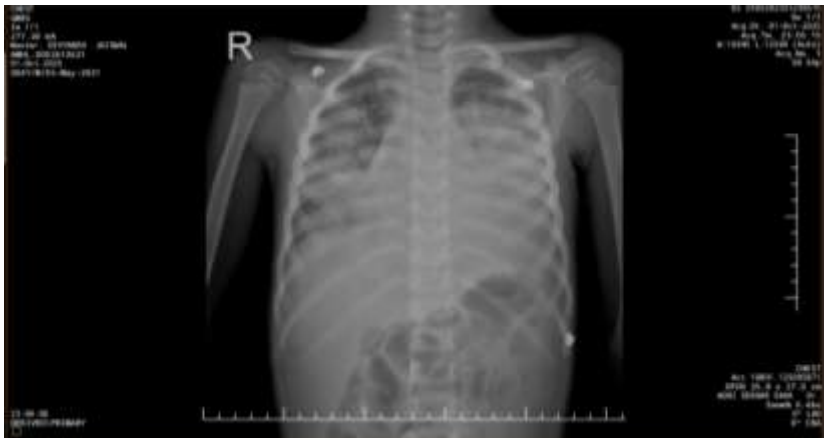


**Figure 1:Chest radiograph at admission showing bilateral pneumonia with pleural effusion**

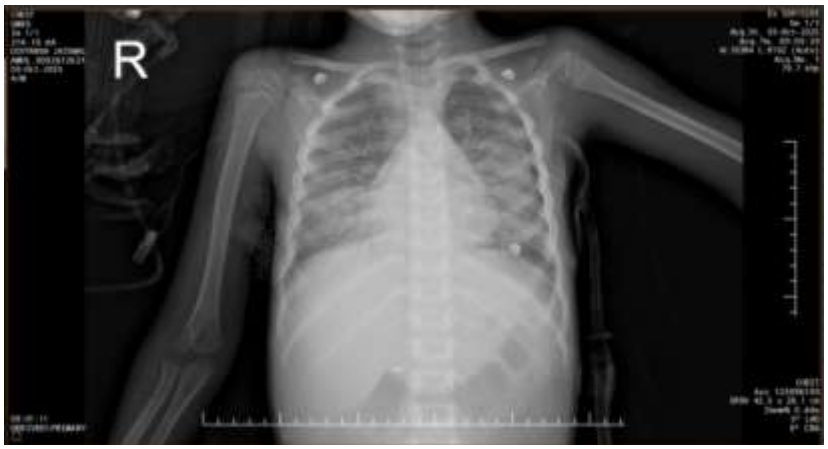


**Figure 2: Chest radiograph during ICU course demonstrating bilateral pneumothoraces with left intercostal drain in situ**

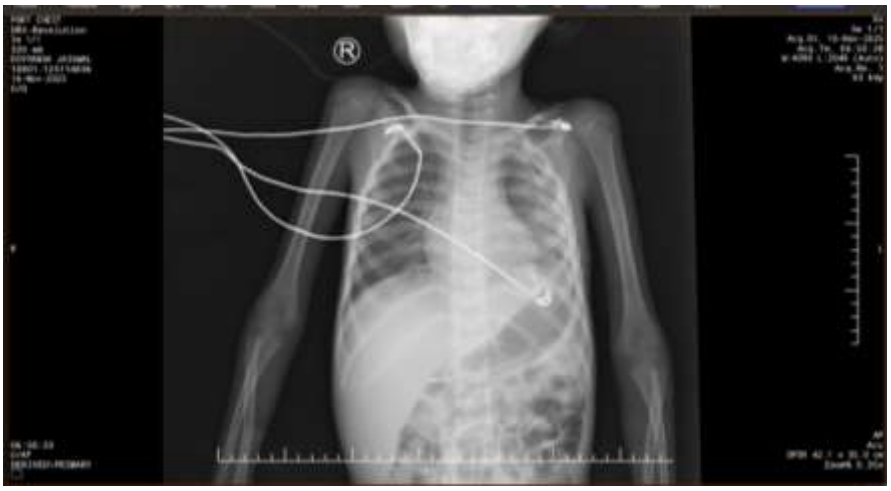


**Figure 3: Post-decannulation chest radiograph demonstrating gradual re-expansion of the left lung and resolution of hydropneumothorax**

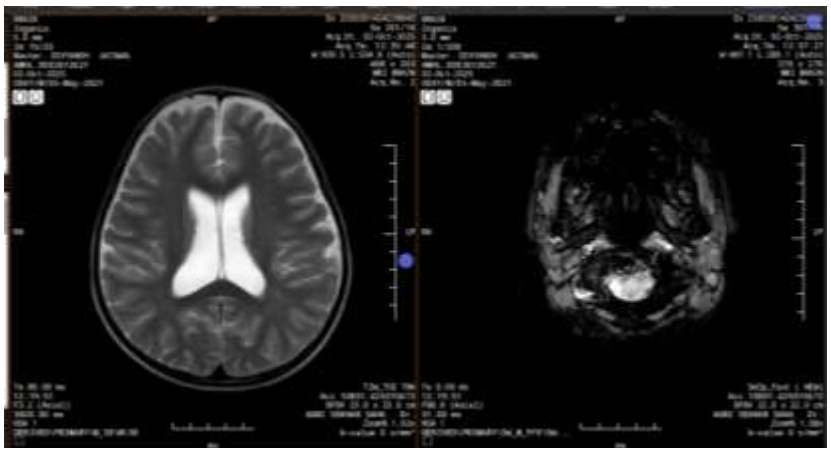

**Figure 4: MRI Brain showing raised intracranial pressure**

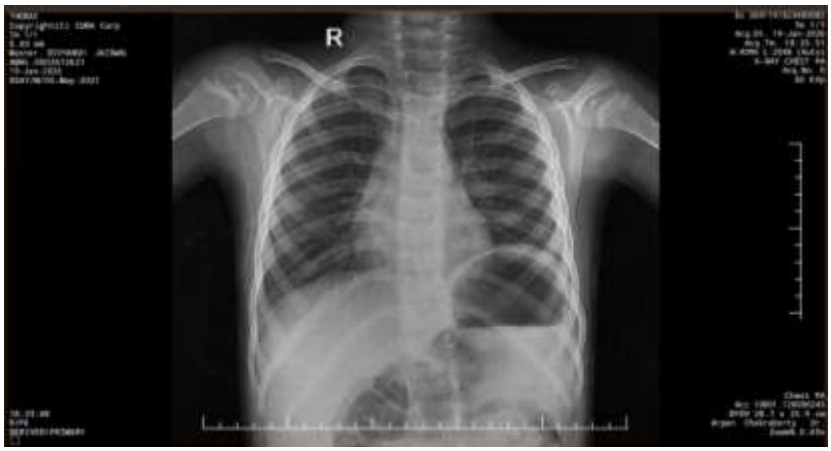


**Figure 5: Chest radiograph at follow up**

## Discussion:-

Severe influenza infection in children may lead to fulminant pneumonia and ARDS, particularly when associated with bacterial coinfection. In the present case, the detection of multiple pathogens including Streptococcus pneumoniae, Haemophilus influenzae, and MRSA likely contributed to the rapid progression of respiratory failure.
When conventional mechanical ventilation fails to maintain adequate oxygenation, ECMO provides an effective rescue modality. Veno-venous ECMO allows lung-protective ventilation strategies while ensuring adequate gas exchange. However, ECMO therapy is associated with potential complications, including pneumothorax, infections, neurological injury, and neuromuscular weakness. In this patient, complications included bilateral pneumothoraxes, suspected bronchopleural fistula, neurological dysfunction, and prolonged ventilator dependence. Despite these challenges, multidisciplinary intensive care management and gradual lung recovery allowed successful ECMO decannulation and eventual ventilator liberation. This case highlights the importance of early recognition of refractory ARDS and timely initiation of ECMO support in selected paediatric patients.

**Follow-up care**: Follow-up after ECMO focuses on neurodevelopment, hearing, lung function, cardiac status, growth and development, with early intervention services when needed. Provide ongoing support and education to promote long-term management and prevention of further complications.

## Conclusion:-

This case demonstrates the successful use of veno-venous ECMO as a salvage therapy in severe paediatric ARDS secondary to Influenza B with bacterial coinfection. Early initiation of ECMO, meticulous management of complications, and multidisciplinary care were critical to achieving a favourable outcome.

**Key Clinical Messages:-**

1. Severe influenza infection in children may rapidly progress to ARDS, particularly when associated with secondary bacterial coinfections such as Streptococcus pneumoniae**,** Haemophilus influenzae**,** or MRSA.
2. Early recognition of refractory hypoxemia despite optimal mechanical ventilation is crucial in identifying patients who may benefit from extracorporeal life support.
3. Veno-venous ECMO can serve as a life-saving rescue therapy in paediatric patients with severe ARDS, allowing lung-protective ventilation and time for pulmonary recovery.
4. Complications during ECMO support are common and may include pneumothorax, bronchopleural fistula, neurological dysfunction, and neuromuscular weakness, requiring multidisciplinary management.
5. Gradual ECMO weaning combined with rehabilitation strategies**,** including physiotherapy and nutritional support, plays a key role in improving outcomes after prolonged critical illness.

**Conflict of Interest:-**

The authors declare no conflict of interest.

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