

CASE REPORT

COVID-19 infection in an infant with cystic fibrosis: A case report and possible therapeutic effect of hypertonic saline

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Abstract

Pulmonary infections represent the major causes of morbidity and mortality in cystic fibrosis (CF). Here, we report a 3-month-old infant with pancreatic insufficient CF was hospitalized with positive RT-PCR test for COVID-19. He was treated successfully. Hypertonic saline can be hypothesized as a treatment regimen against COVID-19 infection after further investigations.

KEYWORDS

children, COVID-19, cystic fibrosis

1 | INTRODUCTION

The novel corona virus commonly known as COVID-19 has caused global pandemic. As of April 9th, more than 1.65 million individuals are affected with a death rate of 6%.¹⁻³ However, not many cases of serious COVID-19 cases have been reported in children. Angiotensin converting enzyme II (ACE2) is the likely receptor for COVID-19. There are different investigations that shows ACE2 is a cellular receptor of SARS-CoV-2 entry. After its cell entry, it leads to decline in ACE2 protein and thereafter results in pulmonary injury and vasoconstriction. It also enhances the thrombosis, cytokine production, and finally pulmonary tissue inflammation.⁴ It is known that isolated alveolar type II (ATII) cells may be variant in the expression of ACE2 protein and tendency to severe disorder. This infected ATII cells can stimulate the innate immune answer and likes to virus propagation near to alveoli. This dysregulated inflammatory response results in cytokine storm and severe SARS-CoV-2 related

ARDS.⁵ There is speculation that children may have decreased binding ability to ACE2 as maturity and function is lower. This may explain the lower severity in children. CF is an autosomal-recessive genetic disease.

Early data recommended that major of CF patients are doing an exceptional job avoiding SARS-CoV-19 infection, but they must remain dedicated to this task.⁶ There have limited case reports of patients with CF and COVID-19 and their management.⁷ Here, we present a case of an infant with CF who recovered from COVID-19 infection after treatment with hydroxychloroquine and inhaled hypertonic saline.

2 | CASE PRESENTATION

A 3-month-old male, the second child of a family with consanguineous marriage, with pancreatic insufficient CF who was born at full-term gestation with birth weight of 3.25 kg status post two operations for intestinal

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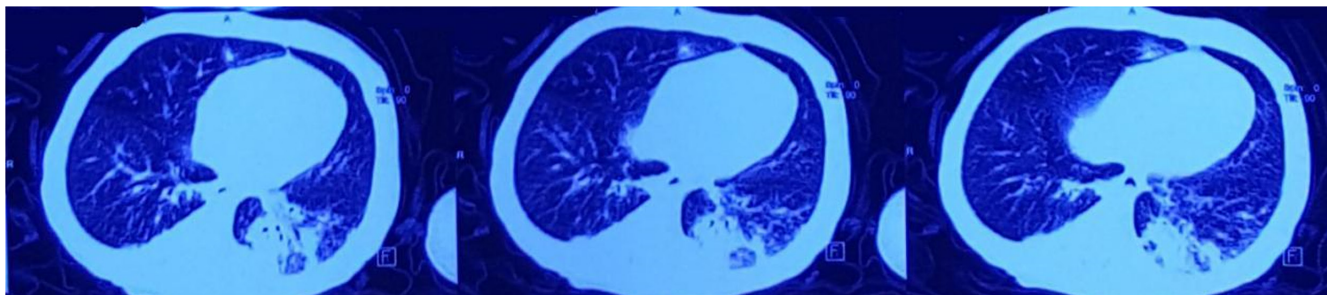


FIGURE 1 Lung CT scan demonstrating patchy infiltrates and increased interstitial markings bilaterally

obstruction at 3 and 46 days of life. Sweat test were 98 and 90 mmol/L. He was admitted because of fever, tachypnea, and hypoxia, with oxygen saturation of 78% in room that increased to 97% on 4 L/min of oxygen via oxyhood. He weighed 3.5 kg. Lungs were remarkable for bilateral crackles and presence of bilateral lower limb edema. On admission, WBC was $(16.9 \times 10^9)/L$ (21% neutrophil, 62% lymphocyte, and 10% monocyte), Hb was 9.4 g/L, and platelet was $(412 \times 10^9)/L$. Electrolytes and liver function tests were normal. Chest radiograph and chest CT (Figure 1) showed patchy infiltrates and increased interstitial markings bilaterally. EKG was normal with QT interval of 0.37. G6PD level was normal. He was treated with Meropenem and Vancomycin until the deep throat culture results showed *Klebsiella pneumonia* that was sensitive to Meropenem. Vancomycin was discontinued. Hydroxychloroquine was started at 3 mg/kg/dose, twice a day for 10 days. On the third day of admission, he was started on aerosolized Salbutamol and hypertonic saline (5%) three times a day with improvement in oxygen requirement and his respiratory symptoms. After five days of inhalation therapy, his clinical status improved with resolution of respiratory distress and oxygen requirement. His bilateral lower limb edema was attributed to hypoalbuminemia and treated with nutritional supplementation and appropriate pancreatic enzyme dosing.

3 | DISCUSSION

COVID-19 has not significantly affected individuals with CF. Whether there is one or combination of protective factors in CF such as medical therapies related to CF, genetic, immunological, or mucosal barrier from thick secretions remains to be identified. Children with CF have underlying lung disease that is associated with pulmonary exacerbation by viral infections.

Previous studies have shown that salt can affect viruses. In a study by Zhang et. al.,⁸ high salt was identified as a crucial regulator of signaling. In another study by Siber and Podgornik,⁹ the influence of salt was shown on encapsidation of single-stranded viral RNA molecules.

This influence was also shown on double-stranded RNA at 250 mM sodium chloride. Five percent hypertonic saline is equivalent to 0.85 mM NaCl. In our case, we demonstrated that using hypertonic saline for five days beside other supportive care led to significant improvement of patient clinically. This was a first CF infant case was treated by using this method. As inhaled hypertonic saline enhances mucociliary clearance, improves lung function, and reduces pulmonary exacerbations in people with cystic fibrosis,¹⁰ and according to the supporting evidences on its anti COVID-19 effects, it improves our case's outcome.

In a recent study of COVID-19 patients in China¹¹ who received hydroxychloroquine, an antimalarial agent with anti-inflammatory and immunomodulatory activities, showed the drug did not clear the patients of the virus. The overall 28-day conversion rate was not different between the standard of care group and standard of care plus hydroxychloroquine group.

4 | CONCLUSIONS

There was no previous reports on the effect of hypertonic saline in management of CF cases with COVID-19 in infancy. In this report, we try to hypothesize that hypertonic saline may be considered as a therapeutic option for COVID-19 after further investigations and randomized studies. Here, we reported that using hypertonic saline could lead to prevent from deterioration of CF patient.

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CONFLICT OF INTEREST

There is no conflict of interest. We declare that none of the authors listed on the manuscript are employed by a government agency that has a primary function other than research and/or education. None of the authors are submitting this manuscript as an official representative or on behalf of the government.

AUTHOR CONTRIBUTIONS

Dr. Seyed Javad Seyedi, Dr. Abdolkarim Hamed, Dr. Amin Saeidinia, and Dr. Hamidreza Kianifar managed patients and written the first draft of the manuscript. Dr. Amin Saeidinia and Dr. Hossein Sadeghi collected patient's data and written the final version. All authors read and approved the final version.

CONSENT

The authors have confirmed that patient's consent have been signed and collected in accordance with the journal's patient consent policy.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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