

Respiratory Viral Co-infection with Novel Coronavirus in Children: A Case Series

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Case Report

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Abstract

Background:

The novel coronavirus, COVID-19 was identified in January 2020 initially in Wuhan, China but quickly spread worldwide and was declared a global pandemic by the World Health Organization on March 11, 2020. There are more than 185 countries impacted and the numbers of cases and deaths continues to rise. The rate of coinfections with COVID-19 in children and the clinical implications are unknown.

Case Presentation:

We describe the clinical presentation and course of three patients with COVID-19 and coinfections with other common respiratory viruses. Two cases were diagnosed with COVID-19 as well as rhinovirus/enterovirus and the third case was COVID-19 and pertussis. Each case had a unique presentations and hospital courses including an emergency room discharge, urgent surgical evaluation and an intensive care unit admission.

Conclusions:

This is the first US-based case report to discuss coinfections with COVID-19 and other respiratory viruses. Decisions regarding diagnosis and management of children in the setting of the current pandemic should account for the possibility of coinfections. We also highlight publish health challenged resulting from children with the novel coronavirus.

Background

The novel coronavirus, SARS-CoV-2, was first identified in Hubei Province, China in January 2020 (1). The virus is the etiologic agent for novel coronavirus disease 2019 (COVID-19) whose prevalence has grown exponentially. Total cases worldwide exceed 1.6 million in 185 countries at the time of this draft (2). In many areas, testing for SARS-CoV-2 has been limited by the availability of diagnostic testing supplies. Therefore, the guidance from many jurisdictions has been to perform COVID-19 testing only after other infectious etiologies have been fully evaluated. Widely available commercial comprehensive diagnostic testing utilizes RT-PCR to identify the presence of up to 20 common respiratory viruses. In many clinical settings, if this test is positive then further testing for SARS-CoV-2 has been discouraged. However, previous reports show that during a normal winter respiratory season, up to two-thirds of pediatric patients can be concurrently infected with multiple common viruses (3). We report three cases of young children with varying clinical presentations of COVID-19 and coinfections with rhinovirus/enterovirus or Bordetella pertussis in March and April 2020. Included are the data on the patient's clinical presentation and clinical course.

Case Presentations

Patient 1, a 5-year old female previously healthy child presented to the Pediatric Emergency Department (PED) on March 16, 2020 with a complaint of 2-3 weeks of productive cough and one day of tactile fevers. The patient's mother noted multiple episodes of non-bloody and non-bilious emesis and watery, non-bloody diarrhea associated with cramping diffuse abdominal pain over the past day. On further history, the patient's mother denied any respiratory distress, chest pain, cyanosis, or syncope. She had been tolerating a regular diet but the

mother reports decreased activity level. The patient lives with her parents and 6-year-old and 7-year-old siblings. The mother reported a mild cough for several days but denied any symptoms in the rest of the family. There was no history of recent travel or contact with any individuals with known COVID-19 infection. The patient was up to date on all immunizations with the exception of the seasonal influenza vaccine.

The physical examination revealed a temperature of 37.2° Celsius, heart rate of 139 beats per minute, respiratory rate of 26 breaths per minute, oxygen saturation of 98% while the patient was breathing ambient air, and blood pressure of 114/64 mmHg. There was mild nasal congestion and rhinorrhea. Lung auscultation revealed no rhonchi, wheezing or rales. The child had a soft abdomen without tenderness on palpation, and no hepatosplenomegaly or masses were appreciated. Her extremities were warm, well perfused, with normal capillary refill time, and with full range of motion. Skin examination did not reveal any rashes or lesions. Her neurological examination was normal for her developmental age.

A chest radiograph was performed which demonstrated a normal midline trachea, no osseous or soft tissue abnormalities, a normal cardiac silhouette, and normal lung fields without infiltrates or effusions. Nasopharyngeal specimens were sent for the detection of viral respiratory pathogens and SARS-CoV-2 by RT-PCR. The patient tested positive for rhinovirus/enterovirus on respiratory viral pathogen panel. The patient was discharged to home and given recommendations for supportive care, indications for return to the ED, and self-isolation pending the results of viral testing. The following day, the patient presented to another PED for similar symptoms. She was discharged home after receiving a sodium biphosphate and sodium phosphate rectal enema for constipation with improvement of symptoms.

On March 18, 2020, diagnostic testing results returned positive for SARS-CoV-2; the mother reported that the child's symptoms were improving and that she was doing well at home. The mother was provided instructions for self-quarantine and home care precautions if other family members became symptomatic. Two days later, the patient's two siblings presented to our PED with mild upper respiratory symptoms and were discharged home after evaluation. The 6-year old sibling tested positive for SARS-CoV-2 and negative for other common respiratory viruses.

Patient 2, a 2-year-old male previously healthy child presented to the PED on March 31, 2020 with a complaint of 2 days of non-bloody, non-bilious emesis and one day of watery stools associated with decreased food intake, lethargy, and abdominal distension. His father noted that he had mild cough one week ago but had resolved and subjective fever two days prior to presentation. Father denied any travel or known sick contacts and the patient was up to date on all immunizations.

The physical examination revealed a temperature of 36.8° Celsius, heart rate of 118 beats per minute, respiratory rate of 26 breaths per minute, oxygen saturation of 98% while the patient was breathing ambient air, and blood pressure of 104/69 mmHg. Patient was tired appearing with dry mucus membranes. Lung auscultation revealed no rhonchi, wheezing or rales. The child had a soft abdomen, hyperactive bowel sounds with mild distension without tenderness to palpation, and no hepatosplenomegaly or masses were appreciated. Testes were descended bilaterally and penis was circumcised with inferiorly displaced urethral meatus without chordee. His extremities were warm, well perfused, with normal capillary refill time. Skin examination did not reveal any rashes or lesions.

Abdominal radiographs were initially performed to evaluate for intussusception which demonstrated dilated loops of small bowel and some gas-filled colon noted consistent with partial obstruction or severe ileus. Abdominal ultrasound showed moderate bilateral hydronephrosis, urinary bladder distention, small bowel dilatation, and small right pleural effusion. Laboratory evaluation was significant for bicarbonate 17.0 mmol/L, urea nitrogen 8 mg/dL, and creatinine 0.23 mg/dL and white blood cell count of 6.7 K/uL with 36.6% neutrophils and 41.6% lymphocytes. Urinalysis revealed protein to 30mg/dL, greater than 80 mg/dL of protein, negative nitrites and negative leukocyte esterase. Nasopharyngeal specimens were sent for the detection of viral respiratory pathogens and SARS-CoV-2 by RT-PCR.

Patient 2 was admitted to the Pediatric Observation Unit for hydration and management of ileus. Due to concern for small bowel obstruction, computerized tomography of abdomen and pelvis with oral and intravenous contrast was performed and demonstrated moderate left hydronephrosis, normal anatomy without signs of volvulus, no transition point, and colonic distention. Subsequent abdominal radiographs showed passage of contrast through the cecum and into the rectum. During the hospitalization the viral respiratory pathogens panel resulted positive for rhinovirus/enterovirus and the SARS-Cov-2 testing returned positive; the urine culture returned negative. Intravenous hydration was continued until the patient tolerated a regular diet. Urology follow up was arranged for a voiding cystourethrography and patient was discharged to home.

Patient 3, a 2-month-old male born at full-term gestation without perinatal complications presented to the Pediatric Emergency Department on April 1, 2020 with a complaint of 2 weeks of cough associated with apneic episodes. During a routine two-month well visit, the mother reported that with coughing, he had short periods where he stops breathing and his tongue and mouth turn blue. The patient's mother endorsed occasional post-tussive emesis but denied fevers, rash, nasal congestion, runny nose, or diarrhea. The patient's two older sisters also had cough two weeks prior. The patient received the first hepatitis B vaccination at birth. The primary care doctor referred them to the PED for further evaluation.

In the PED, the physical examination revealed a temperature of 36.6° Celsius, heart rate of 184 beats per minute, respiratory rate of 56 breaths per minute, oxygen saturation of 93% while the patient was breathing ambient air, and blood pressure of 123/70 mmHg. He had staccato cough associated with apneic episodes lasting 10 to 20 seconds with subcostal retractions. Lung auscultation revealed no rhonchi, wheezing or rales. The infant had a soft abdomen without tenderness on palpation, and no hepatosplenomegaly or masses were appreciated. His extremities were warm, well perfused, with normal capillary refill time. Skin examination did not reveal any rashes or lesions. His neurological examination was normal for his age.

Laboratory evaluation was significant for a white blood cell count 6.3 K/uL with 21.3% neutrophils and 60.7% lymphocytes and normal basic metabolic panel. A chest radiograph was performed which demonstrated mild pulmonary plethora with no focal pulmonary consolidations, normal cardiac silhouette, a normal midline trachea, no osseous or soft tissue abnormalities, and gaseous distension of the stomach. Blood cultures were collected, and nasopharyngeal specimens were sent for the detection of viral respiratory pathogens and SARS-CoV-2 by RT-PCR. He was placed on 2L nasal cannula, given intravenous fluids. and admitted to the pediatric intensive care unit for monitoring given episodes of apnea.

In the pediatric intensive care unit, testing subsequently returned positive for Bordetella pertussis and SARS-CoV-2. Azithromycin was initiated for treatment of pertussis. He was weaned to room air and did not have any

episodes of apnea, bradycardia, or oxygen desaturations. On hospital day 3, patient was discharged to home to complete the azithromycin course. Immediate family was prescribed azithromycin prophylaxis.

Diagnostic Testing and Results

In each case, a nasopharyngeal swab specimen was sent for detection of viral respiratory pathogens by RT-PCR which included influenza A and B, parainfluenza, respiratory syncytial virus, rhinovirus, adenovirus and several other common respiratory viruses. Testing was also performed to identify SARS-CoV-2, the agent responsible for COVID-19. A nasopharyngeal swab specimen was collected with synthetic fiber swab which was then inserted into a sterile tube contained 2 to 3 mL of viral transport medium. The testing was performed using the cobas® SARS-CoV-2 test. The test was developed, and performance characteristics determined by LabCorp Laboratories. This test has been authorized by FDA under an Emergency Use Authorization (EUA).

Discussions And Conclusion

Here we describe three cases of children with COVID-19 and a coinfection with an additional respiratory viral pathogen, rhinovirus/enterovirus and Bordetella pertussis. Guidance on limiting SARS-CoV-2 testing has largely been driven by a lack of testing capacity, a situation that is rapidly changing. As more testing becomes available, jurisdictions and professional society recommendations should consider the possibility of co-infection. The clinical presentations of each of these cases varied significantly, with dispositions varying from discharge home to observation for surgical intervention and intensive care admission. This potentially demonstrates the variation in presentation of COVID-19 in children, influenced by features of the coinfection.

It is unclear whether co-infection rates of SARS-COV-2 with other pathogens will be similar than in previous studies, and whether co-infection impacts the clinical course of patients with COVID-19. A study by Asner et al found that children with any respiratory viral coinfection did not have a significantly different clinical severity compared to children with a single virus infection (4). Two brief reports with small samples from China(5) and Spain(6) demonstrate that 4.8 to 40% of children with COVID-19 may also present with viral coinfections, they did not describe the clinical course of this subset of patients.

Results of tests for common viral respiratory illnesses should not influence decisions regarding diagnostic evaluation for SARS-CoV-2. Many municipalities have endorsed limited testing to only those with severe manifestations of COVID-19 (7) but in a pediatric population, the ability to determine a child's COVID-19 status may prevent unnecessary exposures to health care workers and family through early and appropriate isolation instructions and cohorting in admitted patients. Further, in balancing diagnostic testing capacity, utilization of health care resources, and reducing contagion, determination of criteria on which individuals to test should take into account the unique position children hold in our society. While children may have a mild course of illness, they are in near constant contact with susceptible adults. As municipalities enact shelter-in-place orders in an attempt to decrease community spread, the burden of childcare often shifts to even more susceptible grandparents and other family members. Broader testing and identification of children with mild COVID-19 manifestations may help reduce spread within family clusters.

To our knowledge, this is the first case report of a United States-based community spread of COVID-19 and viral respiratory co-infection in pediatric patients. Continuing efforts should be dedicated to characterizing the clinical

course of children with co-infections to identify specific resource needs this patient population may require. Further, studying the impact of children have on the spread of COVID-19 in our population may also elucidate testing criteria based on epidemiological data.

Abbreviations

SARS-CoV-2, severe acute respiratory syndrome coronavirus 2

COVID-19, 2019 novel coronavirus disease

PED, Pediatric Emergency Department

RT-PCR, Real-time polymerase chain reaction

RSV, Respiratory Syncytial Virus

Declarations

Ethics approval and consent to participate: Not applicable.

Consent for publication: Written informed consent was obtained from the patient's parents for publication of this Case report and any accompanying images. A copy of the written consent is available for review by the Editor of this journal.

Availability of data and materials: Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

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Authors' contributions:

EH conceptualized the case report, drafted the initial manuscript, reviewed and revised the manuscript. AL, JL, SY were involved in direct patient care, identified the case, conceptualized the case report, obtained consent from the patient's family, and reviewed and revised the manuscript. EE, YC and BB identified the cases, conceptualized the case report, reviewed and revised the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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