

# Pediatric COVID Encephalopathy: A Case Report

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### INTRODUCTION

- COVID-19 has many presentations including pneumonia, conjunctivitis, neurologic manifestations, and thromboembolic events.
- Neurological complications due to the virus that have been reported are cerebrovascular disease, Guillain-Barre syndrome, myositis, neuropathies, meningoencephalitis, rhombencephalitis, and acute disseminated encephalomyelitis.
- One presentation is COVID encephalopathy, which is more prevalent in hospitalized patients with risk factors for severe illness such as male sex, neurologic disorders, diabetes, dyslipidemia, cancer, cerebrovascular disease, chronic kidney disease, heart failure, hypertension, and smoking.
- The management for COVID encephalopathy is not outlined very well but some case studies have shown success with glucocorticoids and intravenous immunoglobulin (IVIg).
- Cases of pediatric COVID encephalopathy are not commonly described, nor is the management.
- Here we describe a case of pediatric COVID encephalopathy treated with IVIg and methylprednisolone.

#### CASE PRESENTATION

- 13-year-old white female with a PMH of epilepsy presented to the emergency department with jerking, sporadic movements
- She was transferred from another hospital where they resulted a comprehensive metabolic panel (CMP), a complete blood count (CBC), glucose serum level, phosphorus serum level, magnesium serum level, acetaminophen serum level, lactate serum level, and a head computed tomography (CT) without intravenous contrast.
- Her parents reported she had not felt well that morning and had one episode of vomiting prior to arrival at the emergency department
- Her parents stated that the jerking, sporadic movements were unlike her typical seizures and that they had been ongoing for several hours
- She tested positive for COVID-19 two weeks prior to the presentation
- The review of systems was limited due to the encephalopathic nature of the patient
- Initially, she was treated with IM Ativan 1 mg and IV Vimpat 100 mg q6h and Haldol 2 mg was given as needed but these only minimally decreased the thrashing. Therefore, the Haldol was increased to 5 mg with success in decreasing the thrashing.
- Overnight she remained encephalopathic with minimal head thrashing behavior, confusion, and incomprehensible speech.
- The following day, a brain MRI with and without contrast, a lumbar puncture, TSH, vitamin B12, folate levels, antinuclear antibody titer, vitamin D1-25 dihydroxy, urinalysis, and urine drug screen were obtained. A panel for autoimmune encephalitis from the CSF and serum was also collected but did not result for several weeks.
- Differentials at this point included autoimmune encephalitis and COVID encephalopathy.
- Treatment of 22 g IVIg and 800 mg methylprednisolone was initiated for 5 days
- She started to recover within a few hours and within 2 days she was completely back to baseline.
- She continues to have no residual symptoms
- The autoimmune panel for serum and CSF was negative for NMDAR1, AMPAR1, AMPAR2, GABABR LGI1, CASPR2 antibodies, ruling out autoimmune encephalitis.

# PERTINENT RESULTS

WBC count Neutrophil % Abs. Neutrophil count  CMP Potassium Als. Phos 127 g/dL Lactate Phosphorus Serum Glucose CSF Glucose Glucose Clarity Color Color Colorless Clarity Escherichia coli K1 Haemophilus influenzae Listeria monocytogenes Streptococcus agalactiae Streptococcus pneumoniae Cytomegalovirus Negative Human Herpesvirus 6 Human parechovirus Negative Negative Negative Varicella Zoster Virus Cryptococcus neoformans/gattii Negative VNL Vitamin B12 Thyroxine VNL Vitamin D1-25 dihydroxy UDS Negative	Lab	Result
Neutrophil % Abs. Neutrophil count  CMP  Potassium 2.9 mmol/L Alk. Phos 127 g/dL Lactate 7 mmol/L Phosphorus 3.2 mg/dL Serum Glucose 230 mg/dL CSF Glucose 58 mg/dL WBC Count 1/mm² RBC Count Color Coloriess Clarity Clear Escherichia coli K1 Haemophilus influenzae Listeria monocytogenes Streptococcus agalactiae Negative Streptococcus pneumoniae Negative Enterovirus Negative Human parechovirus Negative Human parechovirus Negative Varicella Zoster Virus Negative TSH WNL Thyroxine WNL Vitamin B12 1381 pg/mL Folate WNL ANA Negative Vitamin D1-25 dihydroxy UDS Negative Few Amorphous Few Megative Few Megative Few Megative Few Megative Few Megative Vegative Veg	CBC w/ diff	
Abs. Neutrophil count  CMP  Potassium  2.9 mmol/L  Alk. Phos  127 g/dL  Lactate  7 mmol/L  Phosphorus  3.2 mg/dL  Serum Glucose  230 mg/dL  CSF  Glucose  58 mg/dL  WBC Count  1/mm²  RBC Count  Color  Coloress  Clarity  Clear  Escherichia coli K1  Negative  Haemophilus influenzae  Listeria monocytogenes  Streptococcus agalactiae  Negative  Streptococcus pneumoniae  Cytomegalovirus  Negative  Herpes simplex viruses 1 and 2  Human Herpesvirus  Varicella Zoster Virus  Negative  WNL  Thyroxine  WNL  Vitamin B12  ANA  Negative  VItamin D1-25 dihydroxy  UA  Protein  2+  Ketones  1+  Blood  3+  RBC  7  Mucus  Few  Amorphous  Negative  Logative  L	WBC count	14,100 cells/μL
CMP Potassium 2.9 mmol/L Alk. Phos 127 g/dL Lactate 7 mmol/L Phosphorus 3.2 mg/dL Serum Glucose 230 mg/dL CSF Glucose 58 mg/dL WBC Count 1/mm² RBC Count 0/mm² Color Colorless Clarity Clear Escherichia coli K1 Negative Haemophilus influenzae Negative Listeria monocytogenes Negative Streptococcus agalactiae Negative Cytomegalovirus Negative Enterovirus Negative Herpes simplex viruses 1 and 2 Negative Human Herpesvirus 6 Negative Human parechovirus Negative Varicella Zoster Virus Negative TSH WNL Thyroxine WNL Vitamin B12 1381 pg/mL Folate WNL ANA Negative Vitamin D1-25 dihydroxy 105 pg/mL UA Protein 2+ Ketones 1+ Blood 3+ RBC 7 Mucus Few Amorphous Negative Negative Negative Negative Negative Vegative WNL ML Protein 2+ Ketones 1+ Blood 3+ RBC 7 Mucus Few Megative	Neutrophil %	70.7%
Potassium  Alk. Phos  127 g/dL  Lactate  7 mmol/L  Phosphorus  3.2 mg/dL  Serum Glucose  230 mg/dL  CSF  Glucose  58 mg/dL  WBC Count  1/mm²  RBC Count  Color  Color  Colorius  Clarity  Escherichia coli K1  Haemophilus influenzae  Listeria monocytogenes  Negative  Streptococcus agalactiae  Negative  Streptococcus pneumoniae  Cytomegalovirus  Enterovirus  Herpes simplex viruses 1 and 2  Human Herpesvirus 6  Human parechovirus  Negative  Varicella Zoster Virus  Cryptococcus neoformans/gattii  Thyroxine  Vitamin B12  1381 pg/mL  Folate  WNL  Vitamin B12  1381 pg/mL  Folate  WNL  ANA  Negative  VIL  Vitamin D1-25 dihydroxy  UA  Protein  2+  Ketones  1+  Blood  3+  RBC  7  Mucus  Few  Amorphous  Negative  Interval Interval  Interv	Abs. Neutrophil count	9900 cells/μL
Alk. Phos 127 g/dL Lactate 7 mmol/L Phosphorus 3.2 mg/dL Serum Glucose 230 mg/dL CSF Glucose 58 mg/dL WBC Count 1/mm² RBC Count 0/mm² Color Colorless Clarity Clear Escherichia coli K1 Negative Haemophilus influenzae Negative Listeria monocytogenes Negative Streptococcus agalactiae Negative Streptococcus pneumoniae Negative Cytomegalovirus Negative Enterovirus Negative Herpes simplex viruses 1 and 2 Negative Human Herpesvirus 6 Negative Varicella Zoster Virus Negative Cryptococcus neoformans/gattii Negative TSH WNL Thyroxine WNL Vitamin B12 1381 pg/mL Folate WNL ANA Negative Vitamin D1-25 dihydroxy 105 pg/mL UA Protein 2+ Ketones 1+ Blood 3+ RBC 7 Mucus Few Megative Negative UDS Negative Negative UDS Negative Negative Negative	CMP	
Lactate 7 mmol/L Phosphorus 3.2 mg/dL Serum Glucose 230 mg/dL CSF Glucose 58 mg/dL WBC Count 1/mm² RBC Count 0/mm² Color Colorless Clarity Clear Escherichia coli K1 Negative Haemophilus influenzae Negative Listeria monocytogenes Negative Streptococcus agalactiae Negative Cytomegalovirus Negative Enterovirus Negative Enterovirus Negative Human Herpesviruses 1 and 2 Negative Human Herpesvirus 6 Negative Varicella Zoster Virus Negative Cryptococcus neoformans/gattii Negative TSH WNL Thyroxine WNL Vitamin B12 1381 pg/mL Folate WNL ANA Negative Vitamin D1-25 dihydroxy 105 pg/mL UA Protein 2+ Ketones 1+ Blood 3+ RBC 7 Mucus Few Megative Negative Megative Megative Megative Megative Protein 2+ Mucus Few Mucus Few Megative Megative Megative Megative Megative Megative Megative	Potassium	2.9 mmol/L
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WBC Count  RBC Count  O/mm²  Color  Colorless  Clarity  Escherichia coli K1  Negative  Haemophilus influenzae  Listeria monocytogenes  Streptococcus agalactiae  Negative  Streptococcus pneumoniae  Cytomegalovirus  Negative  Enterovirus  Negative  Herpes simplex viruses 1 and 2  Human Herpesvirus 6  Human parechovirus  Negative  Cryptococcus neoformans/gattii  TSH  WNL  Thyroxine  Vitamin B12  Folate  ANA  Negative  Vitamin D1-25 dihydroxy  UA  Protein  Ketones  Blood  3+  RBC  7  Mucus  Amorphous  Negative  Colorless  Clear  Negative  Negative  Negative  Negative  Negative  WNL  Vitamin D1-25  Human Parechovirus  Negative  Voltamin D1-25  Negative  Negative  Voltamin D1-25  Negative	CSF	
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Vitamin D1-25 dihydroxy UA  Protein 2+  Ketones 1+  Blood 3+  RBC 7  Mucus Few  Amorphous Few  UDS Negative	Folate	WNL
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Protein 2+ Ketones 1+ Blood 3+ RBC 7 Mucus Few Amorphous Few UDS Negative	Vitamin D1-25 dihydroxy	105 pg/mL
Ketones 1+ Blood 3+ RBC 7 Mucus Few Amorphous Few UDS Negative	UA	
Blood 3+ RBC 7 Mucus Few Amorphous Few UDS Negative	Protein	2+
RBC Mucus Few Amorphous Few Negative	Ketones	1+
Mucus Few Amorphous Few UDS Negative	Blood	3+
Amorphous Few UDS Negative	RBC	7
UDS Negative	Mucus	Few
	Amorphous	Few
lmaging Results	UDS	Negative
<u> </u>	Imaging R	esults

CT head w/ and w/out contrast Unremarkable and within normal limits

MRI brain w/ and w/out contrast No acute abnormalities

## DISCUSSION

We report a case of COVID encephalopathy within the pediatric population, which has very few cases and no protocol on treatment options. The pathogenesis for COVID brain inflammation and injury should be studied more intensively so we can better understand methods of management. A commonality with the patient we treated and other described patients with COVID encephalopathy were the history of neurological illness. Our patient presented with a history of medication-controlled epilepsy. There were no other risk factors present for severe illness in this patient. She had been asymptomatic prior to encephalopathy, which is inconsistent with the cases of encephalopathy described thus far. It is unclear if this patient would have spontaneously recovered from the encephalopathy without medications or if she would have proceeded to get worse. The risk of morbidity and mortality outweighed the risk of the use of glucocorticoids and IVIg. We are thankful for a prompt recovery of our patient.

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