



Encephalitis Associated with COVID-19 in a 7-Year-Old Boy: A Case Report



Farzad Ferdosian¹ , Zahra Mohsenolhoseini^{2*} , Razieh Fallah¹

1. Department of Pediatrics, Children Growth Disorder Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

2. Department of Pediatrics, Faculty of Medicine, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

Use your device to scan and read the article online



Citation Ferdosian F, Mohsenolhoseini Z, Fallah R. Encephalitis Associated with COVID-19 in a 7-Year-Old Boy: A Case Report. Case Reports in Clinical Practice. 2021; 6(6):246-250.

Running Title Encephalitis Associated with COVID-19



Article info:

Received: 16 Nov 2021

Revised: 24 Nov 2021

Accepted: 25 Dec 2021

Keywords:

Coronavirus disease 2019; COVID-19; Child; Encephalitis

ABSTRACT

Coronaviruses (CoVs) are single-stranded RNA viruses described for >50 years. Novel coronavirus (SARS-Coronavirus-2: SARS-CoV-2) emerged in Wuhan and has spread globally. Coronavirus Disease 2019 (COVID-19) symptoms are primarily pulmonary (fever, dry cough, fatigue, pneumonia); however, other organs can be affected, including the gastrointestinal tract, kidneys, liver, heart, and brain.

Pediatric COVID-19 is milder than the adult's type. Children with severe disease often have an underlying co-morbidity, such as chronic lung disease or immunosuppression.

SARS-CoV-1, MERS-CoV, HCoV-OC43, and HCoV-229E are associated with neurological complications. Neurological manifestations of COVID-19 are not well understood in adults or children, and these manifestations are not rare. The number of patients with neurological manifestations has been increasing recently, especially in the third peak of the disease.

Early diagnosis and timely management may lead to a better outcome. There are limited reports of neurological complications in the pediatric population. Further studies are required for early diagnosis and better results. We reported the third case of encephalitis in children without any respiratory or gastrointestinal manifestation.

A 7-year-old male was admitted with fever and loss of consciousness. He presented no respiratory or gastrointestinal symptoms. He reported no medical history and history of substance abuse. Laboratory findings confirm that neurological manifestations might be expected in covid-19 infections, despite the absence of respiratory symptoms. The patient was treated, and the level of consciousness was gradually improving. Supportive treatment and outpatient follow-up were recommended.

* Corresponding Author:

Zahra Mohsenolhoseini, MD.

Address: Shahid Sadoughi Hospital, Ave-Sina Blvd, Shahid Ghandi Blvd, Yazd, Iran.

E-mail: znh213213@gmail.com



Introduction

Coronaviruses (CoVs) are single-stranded RNA viruses described for more than 50 years [1]. Novel coronavirus (SARS-Coronavirus-2: SARS-CoV-2) which emerged in Wuhan City, China, has spread worldwide. Some strains of coronavirus are associated with human disease and cause respiratory infections [1]. While Coronavirus Disease 2019 (COVID-19) symptoms are primarily pulmonary (fever, dry cough, fatigue, pneumonia), other organs can be affected, including the gastrointestinal tract, kidneys, liver, heart, and brain [2-5]. Neurological involvement affects up to ~36% of patients [6-10].

Pediatric COVID-19 infection is milder than its adult type [11]. Children with severe disease often present an underlying co-morbidity, such as chronic lung disease or immunosuppression [12-15]. COVID-19 has had a massive impact on the health care system, humanity, and world economy.

Some systematic reviews describe clinical manifestations of COVID-19 in children and neurological complications of COVID-19 in adults. While the number of patients and mortality increases, the disease does not affect children nearly as frequently as adults.

SARS-CoV-1, MERS-CoV, HCoV-OC43, and HCoV-229E are associated with neurological complications [1]. The neurological complications of COVID-19 are ischemic and hemorrhagic stroke, Guillain-Barré syndrome and its variants, encephalitis, and seizure. Neurological manifestations of COVID-19 are not well understood in adults or children, and these manifestations are not rare.

The number of COVID-19 patients with neurological manifestations has been increasing recently, especially in the third peak of the disease. Autopsy studies are beginning to be published. Postmortem disease findings are mostly secondary changes to the CNS, such as hypoxemia and ischemia [5], and no other significant CNS abnormalities. No pediatric autopsy cases have reported neuropathological involvement.

An early diagnosis of COVID-19 and timely management may lead to a better outcome. Prehospital teams who take care of children with symptoms that COVID-19 may cause, and do not require hospital treatment, should leave the child at home with instructions for the parents. Further studies are required for early diagnosis

and better outcomes. We reported a case of encephalitis associated with COVID-19 infection in a 7-year-old male.

Case Presentation

A 7-year-old boy from a particular area with uncontrolled COVID-19 in Iran (Yazd Province, Iran) was admitted to the emergency ward in Shahid Sadoghi Hospital. He presented fever and loss of consciousness and inability to speak. The fever started 3 days ago. Then, the level of consciousness decreased. He had no respiratory or gastrointestinal symptoms. He had a history of seizures from 5 months ago only. Seizures were controlled with medication. He presented no medical history and history of substance abuse.

The patient was febrile. His heart rate was 100/min, blood pressure was 125/80 mmHg, respiratory rate was 20/min, and oxygen saturation on room air was 96%. The patient's level of consciousness fluctuated. Cranial nerves examination was unremarkable. The motor examination, including tone, decreased force, and deep tendon reflexes, were regular. Coordination was difficult to assess at this point. There was no evidence of meningeal signs and focal neurological signs. Chest examination was normal. Abdominal examination revealed a soft abdomen without any evidence of tenderness or organomegaly.

Investigations

Imaging

Brain Magnetic Resonance Imaging (MRI) with and without contrast was performed after 12 hours of hospitalization revealed diffuse brain edema. No evidence of space-occupying lesion in supra and infratentorial structures were detected. The white and gray matter in both hemispheres have average signal intensity. Ventricular size and shape appear normal.

The pituitary gland, optic chiasma, and orbit were intact; the 7/8 nerves complex, post fossa, and clivus appear normal (Figure 1). Chest X-Ray (CXR) was performed on the first day with no pathological evidence. After 2 days, CXR was repeated and showed mild reticulo alveolar opacity in both lungs (Figure 2). Chest CT scan illustrating consolidation and atelectasis in lower lobes and posterior segment of the right upper lobe was reported due to aspiration pneumonia or infections. There existed no appreciable pneumothorax or pleural effusion. No evidence of ground-glass opacities was observed (Figure 3).

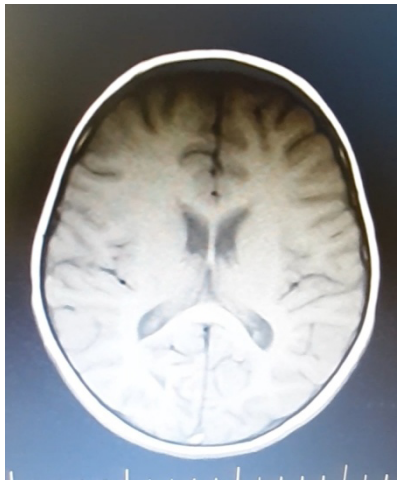


Figure 1. Brain MRI, showing diffuse brain edema



ECG data were normal

Lab data

First laboratory findings suggested leukocytosis, White Blood Cell (WBC): 14000/mm³, neutrophil: 71%, lymphocyte: 21% and Creatine Phosphokinase (CPK): 42, Lactate Dehydrogenase (LDH): 554, C-Reactive Protein (CRP): weakly +, Erythrocyte Sedimentation Rate (ESR): 6. COVID-19 PCR was negative.

A lumbar puncture was conducted. Cerebrospinal fluid analysis was normal (WBC: 3, Red Blood Cell (RBC): 0, Glucose: 57, LDH: 21, Protein: 30) the COVID-19 PCR was positive in Cerebrospinal fluid.

The patient was admitted to a sole care unit. Primary care was initiated, including nasogastric tube and Foley catheter insertion, oxygen supplementation by mask, and intravenous fluids for hydration.

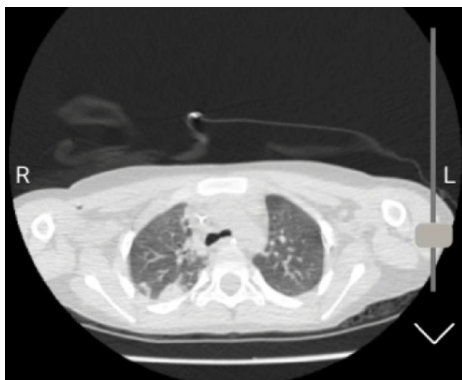


Figure 3. Consolidation and atelectasis in lower lobes and posterior segment of the right upper lobe

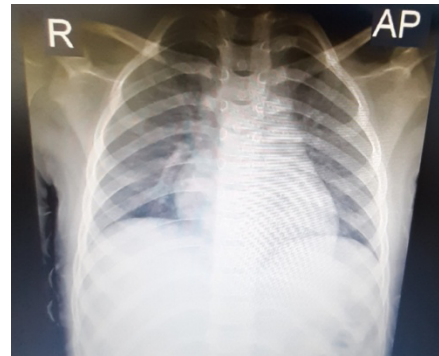


Figure 2. Normal heart, lung, mediastinum, and soft tissue



The following treatment plan was immediately started: cefotaxime 1200mg 3 times per day, pantoprazole 20mg two times per day, 250mg of intravenous acyclovir sodium three times per day for addressing the possibility of Herpes Simplex Virus (HSV) I and II encephalitis was started empirically before the Cerebrospinal Fluid (CSF) results were obtained, we decide to discontinue the acyclovir after the absence of evidence of HSV in the CSF, the level of consciousness was improving gradually. The patient had several seizures controlled with Levetiracetam 500mg three times per day and phenytoin 60mg BD during hospitalization.

Two days after admission, the COVID-19 RNA PCR test in CSF was positive. HSV PCR And Enterovirus PCR were negative (Table 1). Laboratory findings confirm that neurological manifestations might be expected in covid-19 infections, despite the absence of respiratory symptoms. Then the patient was treated with Dexamethason, IVIG 15 gr for 5 days, vit C Daily, B-complex daily, and Remdesiver 60 mg daily.

The level of consciousness was improving gradually but not completely. The patient was discharged from the hospital after three weeks. He has been prescribed vitamin C and zinc supplements. Supportive treatment and outpatient follow-up were recommended.

Discussion

The neurological complications of COVID-19 infection Some systematic reviews describe the clinical manifestations of COVID-19 in children and the neurological complications of COVID-19 in adults. There are limited reports of neurological manifestations in the pediatric population.

In August 2020, one case of Encephalitis associated with COVID-19 in a 13-year-old girl in Spain and One case of encephalitis associated with COVID-19 Infection

Table 1. Laboratory findings

Tests		Values
Complete blood count	WBC (/mm ³)	14000
	Neutrophil (%)	71
	Lymphocyte (%)	21
	Hb (gr/dl)	14.7
	PL (-)	396
Kidney tests	Urea (mg/dl)	42
	Cr (mg/dl)	0.5
Electrolytes	Na (meq/L)	134
	K (meq/L)	4.9
	Mg (mg/dl)	2.2
	Ca (mg/dl)	9.1
Liver function tests	AST (U/L)	AST:19
	ALT (U/L)	ALT:10
CSF analysis	WBC(cell/microL)	3
	RBC (cell/microL)	0
	Glucose(mg/dl)	57
	LDH (-)	21
	Protein (mg/dl)	30
CSF virology	CSF COVID-19 PCR	Positive
	Herpes simplex virus	Negative
	Enterovirus RNA PCR	Negative
U/A	Normal	
Respiratory infection RT- PCR	Negative	
Others	CPK (U/L)	42
	LDH (U/L)	554
	CRP	Poorly positive
	ESR (mm/h)	6
	PT (sec)	12
	PTT (sec)	28
	INR (sec)	1



in an 11-year-old child in New York had been reported. In this case, we reported the third case of encephalitis in children.

A case of Guillain-Barré syndrome (GBS) (acute inflammatory demyelinating polyneuropathy variant) was reported in an 11-year-old boy by Frank and associates. One child with acute disseminated encephalomyelitis and non-COVID coronavirus was reported. Several neurological complications were described in patients with respiratory distress. However, we reported a case of encephalitis in a 7-year-old boy without any respiratory or gastrointestinal manifestation.

The neurological complications of covid 19 are ischemic and hemorrhagic stroke, Guillain-Barre syndrome and its variants, encephalitis, and seizure. In this case, a case of encephalitis due to covid-19 in a 7-year-old boy was reported.

In December 2019, there was the first description of SARS-CoV-2 in Wuhan City, China. Since the beginning of the pandemic, data from a series of patients from Wuhan have pointed out the prevalence of neurological complications in 36.4% of hospitalized adult patients. Therefore, the impact of coronavirus on the nervous system is significant.

Ethical Considerations

Compliance with ethical guidelines

Informed consent was obtained from the parents of the children before enrollment, and the Ethics Committee of Shahid Sadoughi University of Medical Sciences, Yazd approved the study.

Funding

This research did not receive any grant from funding agencies in the public, commercial, or non-profit sectors.

Conflict of interest

The authors declared no conflict of interest.

Acknowledgements

The authors thank the Deputy for Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

References

- [1] Moriguchi T, Harii N, Goto J, Harada D, Sugawara H, Takamino J, et al. A first case of meningitis/encephalitis associated with SARS-Coronavirus-2. *International Journal of Infectious Diseases*. 2020; 94:55-8. [DOI:10.1016/j.ijid.2020.03.062] [PMID] [PMCID]
- [2] Asadi-Pooya AA, Simani L. Central nervous system manifestations of COVID-19: A systematic review. *Journal of the Neurological Sciences*. 2020; 413:116832. [DOI:10.1016/j.jns.2020.116832] [PMID] [PMCID]
- [3] Needham EJ, Chou SH-Y, Coles AJ, Menon DK. Neurological implications of COVID-19 infections. *Neurocritical Care*. 2020; 32:(3):667-71. [DOI:10.1007/s12028-020-00978-4] [PMID] [PMCID]
- [4] Paybast S, Emami A, Koosha M, Baghalha F. Novel coronavirus disease (COVID-19) and central nervous system complications: What neurologist need to know. *Acta Neurologica Taiwanica*. 2020; 29(1):24-31. [PMID]
- [5] Helms J, Kremer S, Merdji H, Clere-Jehl R, Schenck M, Kummerlen C, et al. Neurologic features in severe SARS-CoV-2 infection. *The New England Journal of Medicine*. 2020; 382(23):2268-70. [DOI:10.1056/NEJMc2008597] [PMID] [PMCID]
- [6] Mao L, Jin H, Wang M, Hu Y, Chen S, He Q, et al. Neurologic manifestations of hospitalized patients with coronavirus disease 2019 in Wuhan, China. *JAMA Neurology*. 2020; 77(6):683-90. [DOI:10.1001/jamaneurol.2020.1127] [PMID] [PMCID]
- [7] Baig AM, Khaleeq A, Ali U, Syeda H. Evidence of the COVID-19 virus targeting the CNS: Tissue distribution, host-virus interaction, and proposed neurotropic mechanisms. *ACS Chemical Neuroscience*. 2020; 11:995-8. [DOI:10.1021/acscchemneuro.0c00122] [PMID] [PMCID]
- [8] Wu Y, Xu X, Chen Z, Duan J, Hashimoto K, Yang L, et al. Nervous system involvement after infection with COVID-19 and other coronaviruses. *Brain, Behavior, and Immunity*. 2020; 87:18-22. [DOI:10.1016/j.bbi.2020.03.031] [PMID] [PMCID]
- [9] Paterson RW, Brown RL, Benjamin L, Nortley R, Wiethoff S, Bharucha T, et al. The emerging spectrum of COVID-19 neurology: Clinical, radiological and laboratory findings. *Brain*. 2020; 143(10):3104-20. [DOI:10.1093/brain/awaa240] [PMID] [PMCID]
- [10] Koralnik IJ, Tyler KL. COVID-19: A global threat to the nervous system. *Annals of Neurology*. 2020; 88(1):1-11. [DOI:10.1002/ana.25807] [PMID] [PMCID]
- [11] Balasubramanian S, Rao NM, Goenka A, Roderick M, Ramanan AV. Coronavirus disease 2019 (COVID-19) in children- what we know so far and what we do not. *Indian Pediatrics*. 2020; 57(5):435-42. [DOI:10.1007/s13312-020-1819-5] [PMID] [PMCID]
- [12] Zimmermann P, Curtis N. Coronavirus infections in children including COVID-19. *The Pediatric Infectious Disease Journal*. 2020; 39(5):355-68. [DOI:10.1097/INF.0000000000002660] [PMID] [PMCID]
- [13] Dong Y, Mo X, Hu Y, Qi X, Jiang F, Jiang Z, et al. Epidemiology of COVID-19 among children in China. *Pediatrics* 2020; 145(6):e20200702. [DOI:10.1542/peds.2020-0702] [PMID]
- [14] Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: Summary of a report of 72,314 cases from the Chinese center for disease control and prevention. *JAMA*. 2020; 323(13):1239-42. [DOI:10.1001/jama.2020.2648] [PMID]
- [15] Tezer H, Demirdag TB. Novel coronavirus disease (COVID-19) in children. *Turkish Journal of Medical Sciences*. 2020; 50:592-603. [DOI:10.3906/sag-2004-174] [PMID] [PMCID]