

Challenges in a child with asthma and COVID-19

M. Kamali Aghdam¹, M. Sadeghzadeh², S. Sadeghzadeh³ and K. Namakin³

1) Department of Pediatrics, 2) Zanjan Metabolic Disease Research Center, Department of Pediatrics, Zanjan University of Medical Sciences, Zanjan and 3) Shahid Beheshti University of Medical Sciences, Tehran, Iran

Abstract

Today clinicians may diagnose hundreds of people with coronavirus disease 2019 (COVID-19). We report the case of a child with asthma who sought care for COVID-19 symptoms whose condition did not improve despite appropriate treatment for asthma, pneumonia and COVID-19. Further examination revealed a surprising underlying disease. It is important to consider that in pandemics such as COVID-19, because all attention is paid to the disease, underlying hidden causes may be neglected.

© 2020 Published by Elsevier Ltd.

Keywords: Asthma, child, COVID-19, foreign body, SARS-CoV-2

Original Submission: 21 May 2020; **Revised Submission:** 17 June 2020; **Accepted:** 3 August 2020

Article published online: 7 August 2020

Corresponding author: M. Sadeghzadeh, Department of Pediatrics, Ayatollah Moussavi Hospital, Zanjan, Iran.
E-mail: sadeghzadeh@zums.ac.ir

Introduction

The detection of an unfamiliar pneumonia in December 2019 led to the discovery of the new severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes coronavirus disease 2019 (COVID-19) [1]. Until 22 April 2020, more than 2 million coronavirus cases were laboratory confirmed, and 169 006 deaths had been reported globally [2]. Among the 149 760 reported cases in data from the United States Centers for Disease Control and Prevention by 2 April 2020, 1.7% occurred in children below the age of 18, and about 57% to 60% of those were boys. The symptoms common among them were fever, cough and shortness of breath [3]. Among 728 children with confirmed COVID-19 disease in a series in Hubei, China, 55% were mild or asymptomatic, 40% moderate (radiographic imaging of pneumonia with normal blood oxygen level) and 5% severe (hypoxaemia, dyspnoea, central cyanosis), and <1% were critical cases with respiratory failure [4]. Low incidence and severity of COVID-19 in children may be due to

their low expression of angiotensin-converting enzyme 2 (ACE2), which is highly expressed in adults' lungs, and their immature immune system, which inhibits intense inflammatory response or cytokine storm [5]. Most children with COVID-19 manifest milder symptoms than adults, but serious cases ending in hospitalization have been reported [3].

Here we report a case of a child with asthma with an initial diagnosis of COVID-19 pneumonia whose clinical course revealed an underlying condition.

Case presentation

On 28 March 2020, a 7-year-old boy was referred to the paediatric emergency room of Ayatollah Moussavi Hospital, Zanjan, Iran. He presented with dry cough, fever, headache, malaise and dyspnoea for 3 days, with no gastrointestinal symptoms such as diarrhoea or vomiting. His father had a history of cough, but the PCR test for SARS-CoV-2 was negative, and the computed tomographic (CT) images did not reveal any lung abnormalities. No remarkable symptoms were mentioned in his mother's history. The patient was the first child of the family and was born premature at 33 weeks' gestation. For the boy's medical history, his parents mentioned a 2-year history of asthma and allergy, with intermittent treatment with salbutamol and fluticasone sprays. Last year he

was admitted for an asthma attack. There was no history of choking.

Physical examination revealed that he had fever (temperature of 38.4°C), with tachypnoea (Respiratory Rate = 45/min) and oxygen saturation of 90% (without oxygen). The patient was conscious but in respiratory distress with moderate intercostal, suprasternal and subcostal retractions. Reduced breath sounds in left lung and diffuse wheezing in right lung were detected. He was admitted to the paediatric intensive care unit and isolated. Laboratory results revealed a white blood cell count of 12 500/ μ L with 10% lymph, C-reactive protein 58 mg/L, erythrocyte sedimentation rate 48 mm/h and lactate dehydrogenase 418 U/L. Arterial blood gas showed mild respiratory acidosis. In chest X-ray, left lower lobe pneumonia was detected (Fig. 1). Because of the COVID-19 epidemic, reverse-transcription PCR assay was performed.

Treatment with vancomycin, meropenem, salbutamol and fluticasone sprays along with intravenous hydrocortisone and pantoprazole was initiated right after admission. Oxygen saturation raised to 94% with an oxygen mask. No obvious improvement was seen clinically after 2 days. At the same time, a PCR test for COVID-19 was positive, and chloroquine and oseltamivir were added according to the Iranian Ministry of Health guidelines for the novel coronavirus at that time. As a result of his positive test results and the deterioration of his condition, chest CT scan was performed for further evaluation of his pulmonary status. CT scan revealed a consolidation in the inferior segment of the lingula with centrilobular ground-glass nodules in the left lower lobe (Figs. 2 and 3).

Regarding the CT, bronchoscopy was accomplished afterwards, showing a 0.5 cm mass in the left main bronchus, 2 cm away from the carina. The mass was resected and analyzed. The



FIG. 1. Patient's chest X-ray showing left lower lobe pneumonia.



FIG. 2. Consolidation in the inferior segment of the lingula.

pathology report affirmed it was a nonviable foreign body (consisting mainly of dietary fibers) and pieces of bronchial tissue with normal respiratory epithelium and submucosal glands with infiltration of mixed inflammatory cells and haemorrhagic areas.

On the eighth day, patient improved clinically, his body temperature became normal and signs of distress disappeared. He was therefore discharged with amoxicillin clavulanate syrup and chloroquine tablets.

Discussion

The clinical course of COVID-19 in children is usually milder than in adults [5,6]. The most common risk factors of severe COVID-19 are cardiopulmonary diseases, diabetes, immunodeficiency and allergic disorders [1,3,7]. A study stated that 23% of children with the severe form of the disease have an underlying condition [3]. Although current evidence does not support asthma as a risk factor for severe COVID-19, it has been suggested that referral to health facilities for asthma exacerbations may increase the risk of COVID-19 exposure [8,9]. According to the guidelines regarding the current COVID-19 pandemic, this virus should be considered an exacerbating factor which may prolong the recovery period in all children with asthma who are in respiratory distress [3].

In this case, appropriate treatment that was based on the initial diagnosis of asthma and COVID-19 pneumonia was performed, but the child's distress did not completely improve. In any child with asthma whose disease does not respond properly to treatment, an underlying condition must be suspected.



FIG. 3. Centrilobular ground-glass in left lobe lobe.

A foreign body is always in the differential diagnosis of asthma. It causes partial or complete airway obstruction, and it sometimes may lead to chronic symptoms and signs such as cough, wheezing, stridor and pneumonia. Often it is confused with asthma, and a delayed diagnosis may increase the morbidity rate, especially in children [10]. It is noteworthy that lack of choking history cannot rule out foreign body aspiration.

In our case, as a result of the prolonged partial response to bronchodilators and inhaled corticosteroids, this issue was neglected for years. Concurrent COVID-19 infection in this patient worsened the clinical situation; as a result, the patient's reassessment was inevitable. Further evaluations by chest CT revealed a lobar pneumonia, which is not uncommon in children with COVID-19 [7]. In short, the child's clinical deterioration led us to reexamine him, which accidentally confirmed the hidden foreign body aspiration. Foreign body aspiration is usually seen in the right bronchus; interestingly, in this case, it was seen in the left bronchus.

Conclusion

The misdiagnosis of foreign body aspiration as asthma has been reported in several cases, but the coincidence of asthma, COVID-19 and foreign body is rare. Although a history of choking can be helpful in the diagnosis of foreign body

aspiration, this diagnosis should be considered in any at-risk paediatric patients. It is important to consider that in pandemics such as COVID-19, underlying hidden causes other than COVID-19 must not be neglected.

Conflict of interest

None declared.

Acknowledgements

The authors are grateful for Leila Soleimani's assistance (head nurse of PICU) in collecting patient records. Also they would like to thank the parents of the patient for providing written informed parental consent.

References

- [1] NaserGhandi A, Allameh SF, Saffarpour R. All about COVID-19 in brief. *New Microbes New Infect* 2020.
- [2] World Health Organization (WHO). Coronavirus disease 2019 (COVID-19) situation report 93. Available at: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200422-sitrep-93-covid-19.pdf?sfvrsn=35cf80d7_4.
- [3] US Centers for Disease Control and Prevention. Coronavirus disease 2019 in children—United States, February 12–April 2 2020. *MMWR Morb Mortal Wkly Rep* 2020;69:422–6.
- [4] Dong Y, Mo X, Hu Y, Qi X, Jiang F, Jiang Z, et al. Epidemiology of COVID-19 among children in China. *Pediatrics* 2020.
- [5] Mehta P, McAuley DF, Brown M, Sanchez E, Tattersall RS, Manson JJ. COVID-19: consider cytokine storm syndromes and immunosuppression. *Lancet* 2020;395(10229):1033–4.
- [6] Brodin P. Why is COVID-19 so mild in children? *Acta Paediatr* 2020;25:1–2.
- [7] Dong X, Cao YY, Lu XX, Zhang JJ, Du H, Yan YQ, et al. Eleven faces of coronavirus disease 2019. *Allergy* 2020 Jul;75(7):1699–709. <https://doi.org/10.1111/all.14289>.
- [8] Morais-Almeida M, Aguiar R, Martin B, Ansotegui IJ, Ebisawa M, Arruda LK, et al. COVID-19, asthma, and biologic therapies: what we need to know. *World Allergy Organ J* 2020;13:100126.
- [9] Li X, Xu S, Yu M, Wang K, Tao Y, Zhou Y, et al. Risk factors for severity and mortality in adult COVID-19 inpatients in Wuhan. *J Allergy Clin Immunol* 2020.
- [10] Hakim DDL, Rachmawati Rahadian FJ, Somasetia DH, Peryoga SU, Meilyana F. A screw in the left bronchus aspirated foreign body diagnosed after 4 years: a case report. *Int J Pediatr* 2020;8:10899–903.