International Journal of Tokat Medical Sciences

Olgu Sunumu / Case Report

Int J Tokat Med Sci
2025;17(3):142-147

Other Old Causes of Pneumonia in the COVID-19 Era: A Case Series of 11 Children

COVID-19 Döneminde Diğer Bilinen Pnömoni Nedenleri: 11 Çocuktan Oluşan Vaka Serisi

Nurhayat Yakut[1,*], Kahraman Yakut[2], Murat Aydin[3], Nuran Karabulut[4]

[1]Basaksehir Cam and Sakura City Hospital, Department of Pediatrics, Division of Pediatric Infectıous Dıseases, Istanbul, Turkey.
[2]Basaksehir Cam and Sakura City Hospital, Department of Pediatrics, Division of Pediatric Cardiology, Istanbul, Turkey.
[3]Acibadem Atasehir Hospital, Department of Pediatrics, Istanbul, Turkey.
[4]Basaksehir Cam and Sakura City Hospital, Department of Medical Microbiology, Istanbul, Turkey.

Abstract

Objective: Since its emergence in December 2019, Coronavirus disease 2019 (COVID-19) has posed a significant global public health challenge. However, pneumonia remains one of the major causes of childhood death, especially in developing countries.

Case Report: Here, we report 11 children with pneumonia caused by different non-COVID-19 agents. All patients showed negative results on SARS-CoV-2 polymerase chain reaction assays.
The most causative pathogen of pneumonia was Streptococcus pneumoniae. One patient was diagnosed with concomitant pulmonary tuberculosis.

Conclusion: Clinicians should consider other old non-COVID-19 causes of pneumonia in children to accurately manage these common infections.

Keywords: Pneumonia, Streptococcus pneumoniae, COVID-19.

Öz

Amaç: Aralık 2019'da ilk kez tespit edilmesinin ardından 2019 koronavirüs hastalığı (COVID-19), dünya genelinde önemli bir halk sağlığı sorunu hâline gelmiştir. Bununla birlikte pnömoni, özellikle gelişmekte olan ülkelerde, çocuk ölümlerinin başlıca nedenlerinden biri olmaya devam etmektedir.

Olgu Sunumu: Bu çalışmada, COVID-19 dışındaki farklı etkenlerin neden olduğu pnömoni görülen 11 çocuk olgu sunulmaktadır. Tüm hastalarda SARS-CoV-2 polimeraz zincir reaksiyonu negatif sonuçlanmıştır. Bu olgu serisinde pnömoninin en sık nedeni Streptococcus pneumoniae olarak belirlenmiştir. Bir hastada eş zamanlı olarak pulmoner tüberküloz teşhisi konulmuştur.

Sonuç: Klinisyenler, çocuklarda yaygın görülen bu enfeksiyonların uygun yönetimi için COVID-19 dışındaki diğer bilinen pnömoni nedenlerini de göz önünde bulundurmalıdır.

Anahtar Kelimeler: Pnömoni, Streptococcus pneumoniae, COVID-19.

Geliş Tarihi: 22.01.2025 • **Kabul Tarihi:** 13.03.2025 • **Sorumlu Yazar:** nurhayatyakut@gmail.com

Introduction

Pneumonia remains a leading contributor to illness and death Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), has been documented as a major viral agent leading to pneumonia over the past five years. We aimed to remind previously known pathogens causing pneumonia and presented the laboratory and clinical characteristics of 11 children with pneumonia who were admitted suspicion of COVID-19 (1).

The study population consisted of 11 children who presented with suspected COVID-19 but were ultimately diagnosed with pneumonia due to non-COVID pathogens at a tertiary hospital in Turkey between October 2020 and May 2021.

Case Reports

Case 1: A 6-year-old boy with no prior medical problems arrived with a three-day history of fever and cough. Auscultation of the lungs revealed bilateral rhonchi. Chest computed tomography (CT). scan results presented in Figure 1A. These findings were thougt to be consistent with COVID-19. Nasopharyngeal multiplex polymerase chain reaction (PCR) was negative for SARS-CoV-2 but positive for Human bocavirus.

Figure 1.A

Case 2: A 16-year-old boy with no prior medical issues presented after experiencing two weeks of fever, productive cough, sore throat, and chest pain. On examination, breath sounds were diminished over the left lung field. His chest CT findings are shown in Figure 1B. Because his presentation initially raised concern for COVID-19, he was admitted for further evaluation. Nasopharyngeal multiplex PCR testing was negative for SARS-CoV-2 but detected Streptococcus pneumoniae.The patient experienced an episode of hemoptysis on the 4th day of hospitalization. Quantiferon-TB Gold In-Tube assay was positive. The patient was diagnosed with pulmonary tuberculosis. Isoniazid, rifampicin, pyrazinamide and ethambutol was started. After 25 days of hospitalization, the patient was discharged with antituberculosis treatment.

Figure 1.B

Case 3: A 9-year-old boy was brought to the emergency department with chest pain and shortness of breath. Lung auscultation revealed clear bilateral fine crackles. Nasopharyngeal multiplex PCR testing detected S. pneumoniae and Staphylococcus aureus.

Case 4: A 32-day-old boy was admitted to the emergency room with complaints of fever, cough and poor feeding, On physical examination, rhonchi on lower zone of both lungs was noted. Nasopharyngeal multiplex PCR was negative for SARS-CoV-2 but positive for S. pneumoniae and Haemophilus influenzae.

Case 5: A previously healthy 1.5-year-old boy presented with complaints of fever, cough, vomiting and respiratory distress. On physical examination, obvious bilateral fine crackles and bilateral rhonchi of the lungs was noted. Chest CT scan results presented in Figure 1C. His clinical condition worsened and admitted to the pediatric intensive care unit (PICU) on the 3th day of hospitalization. He needed non-invazive mechanical ventilation for four days. Nasopharyngeal multiplex PCR was positive for H. influenzae.

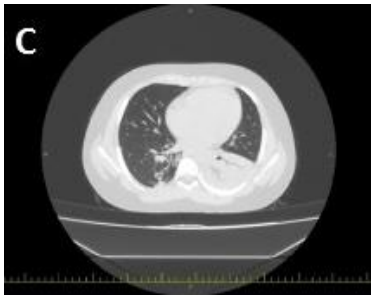

Figure 1.C

Case 6: A 17-year-old boy with the diagnosis of acute lymphoblastic leukemia presented with complaints of fever, cough and fatigue for a couple of days. He was in the maintenance phase of chemotherapy receiving oral methotrexate and mercaptopurine. Chest CT scan results presented in Figure 1D. Nasopharyngeal multiplex PCR was negative for SARS-CoV-2 but positive for Pneumocystis jirovecii and rhinovirus.

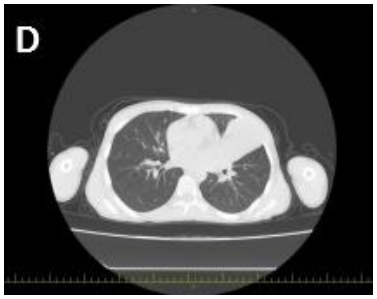

Figure 1.D

Case 7: A 11-year-old boy with asthma was admitted to the emergency room with complaints of fever, cough and vomiting for two days. A physical examination revealed decreased breath sound on lower zone of both lungs and hepatosplenomegaly. Chest CT scan results presented in Figure 1E. On the 2th day of hospitalization, the patient was admitted to the PICU because of respiratory distress. He needed non-invazive mechanical ventilation for five days. Nasopharyngeal multiplex PCR was positive for Moraxella catarrhalis.

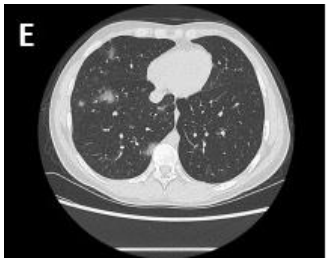

Figure 1.D

Cases 8 and 9: A 2-year-old boy and 6-year-old girl presented with complaints of respiratory distress to the emergency department. Chest CT scan imaging was consistent with COVID-19 in both patients [Figure 1F and 1G]. Nasopharyngeal multiplex PCR was negative for SARS-CoV-2 but positive for S. pneumoniae in both patients.

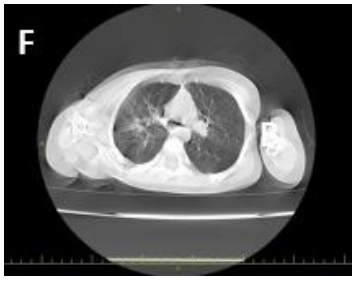

Figure 1.F

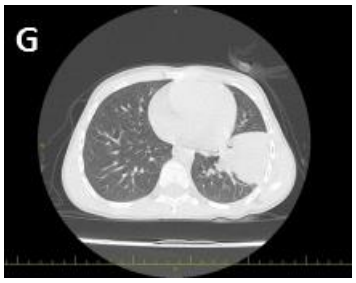

Figure 1.G

Case 10: A 7-year-old girl was admitted with a history of fever, coughing, and vomiting. Lung examination demonstrated coarse crackles and rhonchi bilaterally. Nasopharyngeal multiplex PCR was positive for S. pneumoniae and respiratory syncytial virus.

Case 11: A 1.5-year-old boy presented with complaints of fever, cough, runny nose for four days. On admission, he appeared unwell, with a body temperature of 39°C. Chest CT scan results presented in Figure 1H. Nasopharyngeal multiplex PCR was positive for Human bocavirus.

Patients characteristics and chest CT scan imaging reports are demonstrated in Table 1.

Table 1. Characteristics and chest CT scan imaging

Case no	Age	Gender	Hospital Stay (day)	Admission to PICU	Signs and symptoms	Treatment	Chest CT scan imaging report	Respiratory panel (PCR)
1	6 year	Male	9	No	Fever, cough	Ceftriaxone, azithromycin	Subsegmental atelectasis in right lung middle lobe and left lingular segment. Subpleural patchy ground-glass area in the right lower lobe	Human bocavirus
2	16 year	Male	25	No	Fever, cough, chest pain, sore throat	Ceftriaxone,teicoplanin Isoniazid, rifampicin, pyrazinamide, ethambutol	Consolidation in the lingular segment of the left lung and calcification in the bronchial wall of this area.	*Streptococcus pneumoniae*
3	9 year	Male	13	No	Chest pain, shortening of breath	Ceftriaxone, clarithromycin, teicoplanin	None	*Streptococcus pneumoniae, Staphylococcus aureus*
4	32 day	Male	13	No	Fever, cough, poor feeding	Ampicillin, cefotaxime, azithromycin	None	*Streptococcus pneumoniae, Haemophilus influenzae*
5	1.5 year	Male	10	Yes	Fever, vomiting, cough, respiratory distress	Cefotaxime	Increased density and slight thickening of pleura in the hilum of the left lung. Pneumonic consolidations in both parahilar areas.	*Haemophilus influenzae*
6	17 year	Male	13	No	Fever, cough, fatigue	Teicoplanin, piperacillin-tazobactam	Bilateral diffuse alveolar ground glass pattern.	*Pneumocystis jirovecii, Rhinovirus*
7	11 year	Male	10	Yes	Fever, vomiting, cough	Ceftriaxone	Consolidation in the left and right lung lower lobe. Subsegmental atelectasis and ground-glass areas in the posterior lower lobe of the right lung.	*Moraxella catarrhalis*
8	2 year	Male	11	No	Respiratory distress	Ceftriaxone, teicoplanin	Widespread peripherally located patchy ground-glass consolidations in both lungs.	*Streptococcus pneumoniae*
9	6 year	Female	11	No	Respiratory distress, abdominal pain	Ceftriaxone, teicoplanin	Mass-formed consolidation including air bronchogram, peripherally located patchy ground-glass pattern and extending from the paracentral area to the pleural space in the left lung	*Streptococcus pneumoniae*
10	7 year	Female	11	No	Fever, cough, vomiting	Ceftriaxone, teicoplanin	None	*Streptococcus pneumoniae, Respiratory syncytial virus*
11	1.5 year	Male	12	No	Fever, cough, runny nose	Ceftriaxone, teicoplanin	Subpleural atelectasis in the lower lobe of the right lung, linear fibrotic band formations in the upper lobe of both lungs and the lower lobe of the left lung	Human bocavirus

PICU: Pediatric Intensive Care Unit , CT: Computed Tomography, PCR: Polymerase Chain Reaction, results of the patients.

Laboratory findings are demonstrated in Table 2.

Table 2. Laboratory findings of the patients

Parameters	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10	Case 11
White blood cell ($x10^9$ cells/L)	7150	9800	9590	11480	12030	2850	3580	18400	9750	14360	6020
Platelet ($x10^9$ cells/L)	311000	326000	219000	671000	404000	145000	204000	370000	329000	241000	440000
Neutrophil ($x10^9$ cells/L)	5400	7000	6000	2700	6100	2080	2260	15590	7930	11540	2360
Lymphocyte ($x10^9$ cells/L)	980	1870	2560	5200	4210	160	1030	2070	1230	1980	3090
Blood urea nitrogen (mg/dl)	14.3	17	17.7	17.2	11.8	21.5	33.8	22.9	15	28.9	12.9
Creatinine (µmol/L)	0.35	0.47	0.53	0.18	0.32	0.58	0.6	0.35	0.4	0.44	0.26
Lactate dehydrogenase (U/L)	239	97	-	63	389	259	330	333	242	266	331
Sodium (mmol/L)	136	137	138	137	136	139	136	137	135	139	148
Potassium (mmol/L)	4.1	4.1	4.3	5.07	3.8	3.4	4.08	4.6	4.4	4.6	5.1
Ferritin (ng/ml)	46	117	-	-	87	1746	180	45	-	189	-
Erythrocyte sedimentation rate (mm/h)	24	31	-	-	35	17	37	12	22	-	-
C-reactive protein (mg/L)	<5	37	142	50	32.3	45.5	37.5	22.6	169	238	<5
Procalcitonin (ng/ml)	0.07	0.156	0.157	-	0.88	0.26	0.159	0.67	-	7.65	0.09
Interleukin- 6(pg/ml)	17.7	-	-	-	3.24	24.8	21.6	<0.15	-	-	-
D-dimer (µgFEU/ml)	<0.2	-	0.97	-	0.976	2.07	1.88	0.28	-	0.49	-
pCO_2 (Partial Pressure of carbon dioxide)	38.9	-	40	50.4	34.8	47.3	40.3	36.2	40.8	35	37.5
pO_2 (Partial Pressure of oxygen)	37.1	-	37.6	34.7	36.3	24.7	29.1	41.7	35.2	63.5	45.6
HCO_3 (Bicarbonate)	24.1	-	25	27.8	20.8	28.3	25.4	20.1	27	22.7	23.6
spO_2 (Oxygen Saturation)	95	-	95	97	98	99	98	96	100	95	98

Discussion

Pneumonia still remains one of the main causes of childhood mortality worldwide especially in low-income developing countries. The epidemiology, etiology and management of childhood pneumonia can be affected with the outbreak of COVID-19 occuring major global health concern. It may be difficult to distinguish bacterial from viral pathogens of pneumonia because of clinical characteristics are similar. However, determining of etiologic agents is crucial to provide appropriate management. Molecular methods such as respiratory multiplex PCR testing have been used as a diagnostic tool by the identification of causative pathogens. Although the causative pathogens of pneumonia vary depending on the age of the patient, viral agents are responsible for most of the cases, predominantly in young children (2). In large cohort studies conducted on pediatric patient with pneumonia, the rate of viral pathogens was reported as 81% by Rhedin et al. (3) 61.4% by The Pneumonia Etiology Research for Child Health (PERCH) Study Group and 69.4% by Nascimento-Carvalho et al. (4).

In our study, we found that HBoV in two patients, RSV and RV (with co-infection) in one each patient

were responsible for pneumonia. In accordance with our study, previous studies have been reported that bacterial and viral co-infections were common (5).

With the introduction of vaccines and widespread use of molecular techniques in diagnosis of pneumonia, the commonest bacterial pathogens responsible for pneumonia have changed. The "EPIC" study reported that bacterial pathogens were identified in approximately 8% of childhood pneumonia with 4% of *S. pneumoniae* (6). In accordance with this study, we detected *S.pneumoniae* in six patients. *Pneumocystis jirovecii* pneumonia (PCP) is a life-threatening condition in both HIV and non-HIV infected immunocompromised children. In our series, one patient with ALL was diagnosed PCP and treated succesfully with timely diagnosis.

According to our case series, S. pneumoniae and H.influenza still remains main causative pathogens of pneumonia requiring hospitalization in children. To evaluate the changes of epidemiology and management of childhood pneumonia due to COVID-19 outbreak, there is a need for multicenter research involving larger patient cohorts. Thus, we think that better strategies may be developed for prevention and appropriate management of pneumonia in children.

Written Consent for Publication: Written consent to publish was obtained from the patients and parents.

Funding: No funding was utilized for this manuscript.

Ethics Committee Approval: The patient signed a written informed consent form.

Authors' Contributions: All authors contributed equally.

References

1. Qin Q, Shen KL. Community-acquired pneumonia and its complications. Indian J Pediatr 2015; 82: 45-51.
2. Nascimento-Carvalho CM. Community-acquired pneumonia among children: the latest evidence for an updated management. J Pediatr (Rio J) 2020**;**1:29-38.
3. Rhedin S, Lindstrand A, Hjelmgren A, Ryd-Rinder M, Öhrmalm L, Tolfvenstam T, et al. Respiratory viruses associated with community-acquired pneumonia in children: matched casecontrol study. Thorax. 2015; 70: 847-853.
4. Nascimento-Carvalho AC, Vilas-Boas AL, Fontoura MH, Vuorinen T, Nascimento-Carvalho CM, PNEUMOPAC-Efficacy Study Group. Respiratory viruses among children with non-severe communityacquired pneumonia: a prospective cohort study. J Clin Virol.2018; 105:77-83.
5. Feikin DR, Hammitt LL, Murdoch DR, O'Brien KL, Scott JAG. The enduring challenge of determining pneumonia etiology in children: considerations for future research priorities. Clin Infect Dis 2017; 64:188–196.
6. Ning G, Wang X, Wu D, Yin Z, Li Y, Wang H, et al. The etiology of community-acquired pneumonia among children under 5 years of age in mainland China, 2001-2015: A systematic review**.** Hum Vaccin Immunother. 2017;13(11):2742-2750.