Original Research

Evaluation of Patients with Suspicion of COVID-19 in Pediatric Emergency Department

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Abstract

Objectives: Coronavirus disease 2019 (COVID-19) have different clinical presentations in children. Most symptomatic children with suspicion of COVID-19 have fever and respiratory symptoms. In this retrospective study, we aimed to describe demographic features, clinical characteristics, and outcomes of confirmed and probable COVID-19 patients admitted to our pediatric emergency department (ED).

Methods: We identified 135 children (aged 1 month-18 years) with suspicion of the COVID-19 who were admitted to our ED between March 11 and May 12, 2020. The urgency of patients was evaluated according to their Pediatric Assessment Triangle (PAT) and Emergency Severity Index (ESI) scores. Patients were divided into two groups as confirmed cases (Group 1) and probable cases (Group 2). Clinical, laboratory, radiologic features, and the disease severity of patients were analyzed.

Results: According to PAT evaluation, 82 patients (65.6%) were non-urgent. The most frequent ESI triage category level was 3 (n=102, 76.1%). Forty-one (30.4%) patients were identified as laboratory-confirmed cases. Fifty-five (40.7%) patients were between 28 days and 4 years of age. Fever with cough was the most frequent symptoms at the onset of illness in COVID-19 positive patients (n=16, 39%). Sixty-four (47.4%) patients had mild disease and 40 (29.6%) patients had comorbidities. In Group 1, neutropenia was significantly higher than Group 2 (p=0.024). Mean procalcitonin and erythrocyte sedimentation rate levels of Group 2 were significantly higher than Group 1 (p=0.012 and p=0.028, respectively). Twenty-eight of 51 patients had chest computed tomography findings which were compatible with COVID-19. Fifty-one (37.8%) patients were discharged from ED, 81 (60%) were admitted to the ward, and 3 (2.2%) were admitted to the pediatric intensive care unit.

Conclusion: During our study, we confirmed the diagnosis of 45 of 135 probable cases with the SARS-CoV-2 polymerase chain reaction test. Among confirmed COVID-19 cases, most of our patients had mild or moderate disease. The clinic of only confirmed three patients was classified as severe disease, and we had no critically ill patient.

Keywords: Children, COVID-19, pandemics, pneumonia, severe acute respiratory syndrome, Turkey.

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Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[1] It started in Wuhan, China in December 2019 and was declared as a pandemic by the World Health Organization (WHO) on March 11, 2020.[2] As of January 26, 2021, there have been more than 98.7 million confirmed cases worldwide and more than 2.1 million deaths.[3]

Since adult patients are more symptomatic than pediatric patients, clinical presentation and epidemiological features of COVID-19 among adults are more clearly defined.[4] Primarily, the main symptoms of COVID-19 were defined as fever, cough, shortness of breath, fatigue, nasal congestion, arthralgia, myalgia, and headache. Fever and cough are the most commonly reported symptoms.[5,6] Although there were no specific findings in some patients, patchy consolidation and ground-glass opacities were found in their chest computed tomography (CT).[7] In the early stages of the pandemic, only 1-2% of patients infected with SARS-CoV-2 consist of pediatric cases, and about 90% of cases were reported as asymptomatic, mild, or moderate.[8,9]

With the increase in the experience of many centers in pediatric cases, publications highlighting the epidemiological and clinical features of children revised our knowledge day by day. COVID-19 started to be encountered with gastrointestinal symptoms such as nausea, vomiting, diarrhea, and abdominal pain, in addition to respiratory symptoms. [10] Especially in adult patients, SARS-CoV-2 also causes cardiac involvement. When pediatric patients were evaluated, it has been reported that cardiac findings are generally observed in patients with an underlying cardiac pathology or a history of previous cardiac operations and are usually manifested by myocardial involvement.[11] In late April 2020, the WHO,[12] the United States Centers for Disease Control and Prevention (CDC), and United Kingdom authorities[13] defined the multisystem inflammatory syndrome in children (MIS-C) with prolonged fever, laboratory evidence of hyperinflammation, multi-organ dysfunction, and presumed or confirmed infection by SARS-CoV-2. COVID-19 has been observed to cause more serious infections in children than at the beginning of the pandemic. On January 6, 2021, CDC notified that 10.6% of all COVID-19 cases were children.[14] The American Academy of Pediatrics (AAP) reported that approximately 2.3 million children were diagnosed with COVID-19 as of January 7, 2021.[15]

Based on these studies, we aimed to describe demographics, clinical characteristics, severity of the disease, and outcomes of confirmed and probable COVID-19 patients admitted to our pediatric emergency department (ED) in this single-center study.

Methods

Study Design

We conducted a retrospective cohort study at University of Health Sciences, Sisli Hamidiye Etfal Training and Research Hospital, a large tertiary care hospital in Istanbul, Turkey. It has 126 pediatric beds with approximately 120.000 pediatric ED admission per year. We identified 135 children (aged 1 month-18 years) with suspicion of COVID-19 who were admitted to our pediatric ED between March 11 and May 12, 2020.

We use Pediatric Assessment Triangle (PAT) and Emergency Severity Index (ESI) to get information about a general impression of the child, the severity of the presentation, the determination of the type, and urgency of intervention for the evaluation of a patient during admission to our pediatric ED. PAT was developed by the AAP in 2005.[16] It is done through the assessment of a child's appearance, work of breathing and circulation in a short time using visual and auditory tips. Based on PAT results, it is decided where patients will be evaluated (outpatient clinic in pediatric ED or resuscitation room). ESI is a five-level triage system.[17] Most acute patients are level 1 (resuscitation) or level 2 (emergency), while other patients are classified between level 3 (urgent), level 4 (less urgent), and level 5 (non-urgent) depending on how many hospital resources will be used.

Data Collection and Analysis

Patients were divided into two groups as SARS-CoV-2 polymerase chain reaction (PCR) test confirmed cases (Group 1) and probable cases (Group 2), according to the case classification criteria of CDC.[18] Clinical, laboratory, and radiologic data of patients were collected from official medical records with a standardized data collection form. Disease severity of patients by age groups was evaluated (Table 1).[19]

Cases were screened for SARS-CoV-2 infection based on national recommendations during our study period. Our trained doctors collected nasopharyngeal swab specimens in line with these national recommendations (Table 2).[20] Samples tested for SARS-CoV-2 reverse transcriptase (RT)-PCR with the SARS-CoV-2 detection kit (SARS-CoV-2 N RT-qPCR Kit, Bio-Speedy®) according to the protocols provided by the manufacturer.[21]

In this study, SARS-CoV-2 PCR positivity and admission rates to pediatric ED by age groups, demographic characteristics, the relationship between PAT and ESI levels of patients, comorbidities, epidemiologic risk factors, respiratory viral test panel results, laboratory parameters, the severity of the disease, and outcomes (discharge from pediatric ED, and admitted to a ward or pediatric intensive care unit-[PI-

Table 1. Disease severity[7]

Asymptomatic: All the following must be present
  1. No signs or symptoms
  2. Negative chest X-ray
  3. Positivity of 2019-SARS-CoV-2 nucleic acid test result
Mild: Any of the following
  1. Symptoms of upper respiratory tract infection (fever, fatigue, myalgia, cough, sore throat, runny nose, and sneezing)
  2. Congestion of the pharynx and no auscultatory abnormalities at physical examination
Moderate: Any the following (and absence of criteria for more severe cases)
  1. Cough with sick appearing or pneumonia at chest X-ray
  2. No clinical signs and symptoms; but lung lesions on chest computed tomography, which are subclinical
Severe: Any of the following (and absence of criteria as for critical case)
  1. Oxygen saturation < 92%
  2. Difficult breathing or other signs of severe respiratory distress (apnea, gasping, and head nodding)
  3. Need for any respiratory support
Critical: Any of the following
  1. Patient in ICU
  2. Intubated or multiorgan failure
  3. Shock, encephalopathy, myocardial injury or heart failure, coagulation dysfunction, and acute kidney injury.

SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2; ICU: intensive care unit.

Table 2. National recommendations for COVID-19 test criteria

I. Epidemiological features
  a. Evaluation of the household;
    • Hospitalization with the diagnosis of respiratory tract infection in the same household, within last 14 days
    • COVID-19 diagnosis in the same household
    • People with fever and cough in the same household, or febrile or in the presence of respiratory distress without fever
  b. Presence of contact history with someone diagnosed with COVID-19
II. Sign and symptoms
  a. Presence of a fever history or measured temperature of 38.0°C or above
  b. Presence of lung auscultation findings
  c. Presence of tachypnea
  d. Presence of new onset cough
  e. Having an oxygen saturation of 92% or lower in room air
In the following cases, SARS-CoV-2 RT-PCR test is requested;
  1. The presence of at least one of I and II
  2. The presence of at least two of II (for each item, it cannot be precisely shown to be related for another reason)
  3. Presence of two or more people with COVID-19 diagnosis in the same household
  4. Infants under 9-month-old who have a mother diagnosed with COVID-19.

COVID-19: Coronavirus disease 2019; RT-PCR: Reverse-transcription polymerase chain reaction; SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2.

CU]) were evaluated. Probable COVID-19 cases with negative SARS-CoV-2 PCR test results were examined according to their final diagnosis.

Statistical Analysis and Ethics

SPSS 21.0 for Windows was used for the analysis of statistics. Mean, standard deviation, and frequency of the values were used in descriptive statistics of the data. The distribution of the variables was controlled by the Kolmogorov-Smirnov test. Independent samples t-test and Mann-Whitney U-test were used to analyze the quantitative data. The ratios in the groups were compared with Chi-square analysis. When the Chi-square conditions were not provided, Fisher's exact test was used. $P<0.05$ was considered significant.

Ethics approval was obtained from the Regional Ethical Review Board in the University of Health Sciences, Sisli Hamidiye Etfal Training and Research Hospital on 5/12/2020, registration number 1526.

Results

During the study period, 135 patients were admitted to our pediatric ED with suspicion of COVID-19. According to PAT evaluation in the triage room, 82 patients (65.6%) were classified as non-urgent. Most frequent ESI triage category was level 3 (n=102, 76.1%), followed by level 2 (n=20, 14.9%). When patients were evaluated according to their ESI scores, there was no significant difference between level 1 and level 2 versus level 3, 4, and 5 (p=0.47).

Forty-one (30.4%) patients were identified as laboratory-confirmed cases and 94 (69.6%) were probable cases. When patients were grouped as 28 days-4 years, 5-9 years, 10-14 years, and 15-18 years; most of them were between 28 days and 4 years of age (n=55, 40.7%). There was no significant difference among patients evaluated by age groups and COVID-19 positivity status (p>0.05). The number of girls was significantly higher than the number of boys in Group 1 (n=31, 75.6% vs. n=10, 24.4%, p=0.001). Detailed epidemiological and clinical features of the children are shown in Table 3. Final diagnoses of probable COVID-19 cases with negative SARS-CoV-2 PCR test results were: Viral pneumonia (n=11), bacterial pneumonia (n=11), acute lower respiratory tract infection (n=27), acute asthma attack (n=3), acute bronchiolitis (n=8), pneumothorax (n=1), acute upper respiratory tract infection (n=17), acute gastroenteritis (n=3), and acute rheumatic fever carditis (n=1). The clinical symptoms of the remaining 12 patients were consistent with COVID-19, but these patients were considered only probable cases because they were not laboratory confirmed.

The mean interval between the onset of the patients' symptoms and the time they were admitted to the hospital was 3.1±2.4 days. This period was 2.7±0.3 days in Group 1 and 3.2±0.2 days in Group 2, but there was no significant difference between them (p=0.31). Signs and symptoms were categorized mainly as respiratory symptoms and other symptoms. Fever with cough was the most frequent symptoms at the onset of illness in COVID-19 positive patients (n=16, 39%). When complaints were compared between groups, only headache was significantly higher in Group 1 (14.6% vs. 4.3%, p=0.044). Among other symptoms, myalgia/arthralgia was the most frequent (n=20, 14.8%) complaint. Among signs and symptoms, hyposmia was rarely encountered (n=1).

Respiratory viral panel test was performed on 34 (25.1%) patients. Seven patients were tested positive for other viruses including influenza in Group 1 (n=2) and respiratory syncytial virus in Group 2 (n=5). Laboratory tests are summarized in Table 4. White blood cell count was 8.80±5.48 10^9/L in Group 1 and 10.74±5.88 10^9/L in Group 2. Leukope-

nia was found to be more common in Group 1 but it is not significant (p=0.091). Neutropenia was significantly higher in Group 1 than Group 2 (p=0.024). Mean procalcitonin (PCT) levels and erythrocyte sedimentation rate (ESR) of Group 2 were significantly higher than Group 1 (p=0.012 and p=0.028, respectively). No significant difference was observed in other laboratory parameters.

Among 126 (93.3%) children with chest X-ray, 73 (54.1%) were normal, 51 (37.8%) had consolidation, and one of them was compatible with pneumothorax (0.7%). Fifty-one patients (37.7%) had chest CT. Twenty-eight of them (20.7%) were compatible with COVID-19. These images were ground-glass opacities (n=20, 14.9%), local patchy shadowing (n=5, 3.7%), and bilateral patchy shadowing (n=3, 2.2%).

When disease severity was evaluated, most patients were diagnosed with mild disease (n=64, 47.4%). The distribution of disease severity by age groups and diagnosis of COVID-19 is shown in Figure 1. There was no significance between severity and age groups (p=0.607). Thirteen patients who had negative SARS-CoV-2 PCR were classified as severe disease. Five of them had chest CT that were compatible with COVID-19, also SARS-CoV-2 IgM and IgG were positive in one patient. In 7/13 of severe patients, COVID-19 was excluded and these patients were treated as lower respiratory tract infections.

SARS-CoV-2 PCR results of three critically ill patients were negative. Two of them were diagnosed with COVID-19 pneumonia according to their chest CTs, one of them was diagnosed with respiratory syncytial virus pneumonia, in which oxygen support was required with a high-flow nasal cannula.

Among 135 patients, 40 patients had underlying comorbidity (29.6%). Asthma/chronic lung disease was the most common diseases (n=24, 17.8%). The disease severity of comorbid patients was evaluated. One patient was asymptomatic, 14 had mild, 16 had moderate, seven had severe disease, and two were critically ill patients. All of the severely ill patients had asthma or chronic lung disease. Two children with critical illness were being followed up with a diagnosis of cerebral palsy. Nine of comorbid patients had positive SARS-CoV-2 PCR but there was no significant relationship between comorbidity and SARS-CoV-2 PCR positivity (p=0.90). Only one patient with a positive SARS-CoV-2 PCR test had severe disease. Although SARS-CoV-2 PCR results were negative in eight patients with comorbidity, their chest CTs were compatible with COVID-19. When disease severity was evaluated among these patients, only one patient had severe disease and one patient was critically ill.

Table 3. Epidemiological and clinical features of children in general and according to their SARS-CoV-2 PCR test results

	Total n (%)	Confirmed COVID-19 patients (group 1) n (%)	Probable COVID-19 patients (group 2) n (%)	p
Total patients	135	41 (30.4)	94 (69.6)	
Boys	62 (45.9)	10 (24.4)	52 (55.3)	0.001
Girls	73 (54.1)	31 (75.6)	42 (44.7)	
Age, years: mean±SD	7.6±5.8	8.8±6.4	7.0±5.5	0.144
Age group				
28 day-4 years	55 (40.7)	14 (34.1)	41 (43.6)	0.34
5-9 years	35 (25.9)	8 (19.5)	27 (28.7)	0.29
10-14 years	19 (14.1)	6 (14.6)	13 (13.8)	0.9
15-18 years	26 (19.3)	13 (31.7)	13 (13.8)	0.07
Signs and symptoms				
Fever (≥38.0°C)	85 (63)	26 (63.4)	59 (62.8)	0.47
Respiratory symptoms				
Cough	94 (69.6)	25 (61)	69 (73.4)	0.84
Shortness of breath	22 (16.3)	5 (12.2)	17 (18.1)	0.79
Rhinorrhea	19 (14.1)	7 (17.1)	12 (12.8)	0.40
Sore throat	10 (7.4)	3 (7.3)	7 (7.4)	0.99
Other symptoms				
Myalgia/arthralgia	20 (14.8)	9 (22)	11 (11.7)	0.10
Headache	10 (7.4)	6 (14.6)	4 (4.3)	0.044
Diarrhoea	8 (5.9)	2 (4.9)	6 (6.4)	0.54
Nausea/vomiting	9 (6.7)	2 (4.9)	7 (7.4)	0.067
Abdominal pain	6 (4.4)	1 (2.4)	5 (5.3)	0.1
Feeding intolerance/irritability	3 (2.2)	0	3 (3.2)	0.33
Hyposmia	1 (0.7)	0	1 (1.1)	0.69
Tachycardia	10 (8.2)	2 (5.1)	8 (9.6)	0.32
Tachypnea	24 (19.8)	6 (15.4)	18 (22)	0.27
Hypoxia	1 (0.8)	0	1 (1.2)	0.68
Comorbidities				
Any comorbidity	40 (29.6)	9 (22)	31 (33)	0.9
Asthma/chronic lung disease	24 (17.8)	5 (55.6)	19 (61.3)	0.9
Epilepsy/cerebral palsy/developmental delay	5 (3.7)	1 (11.1)	4 (12.9)	0.33
Malignancy	4 (3)	0	4 (12.9)	0.56
Others	7 (4.9)	3 (33.3)	4 (12.9)	0.18
Allergies	2 (1.5)	1 (2.4)	1 (1.1)	0.51
Epidemiologic risk factors				
Fever and/or respiratory symptoms in the same household	77 (57)	37 (90.2)	40 (42.6)	>0.0001
Contact with a positive case	71 (52.6)	35 (85.4)	36 (38.3)	>0.0001
COVID-19 diagnosis in the same household	67 (49.6)	34 (82.9)	33 (35.1)	>0.0001
Hospitalization in the same household	29 (21.6)	17 (41.5)	12 (12.9)	0.0005
Disease severity				
Asymptomatic	5 (3.7)	2 (4.9)	3 (3.2)	0.63
Mild	64 (47.4)	24 (58.5)	40 (42.6)	0.0014
Moderate	47 (34.8)	12 (29.3)	35 (37.2)	0.43
Severe	16 (11.9)	3 (7.3)	13 (13.8)	0.38
Critical	3 (2.2)	0	3 (3.2)	0.55

COVID-19: Coronavirus disease 2019; SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2; PCR: Polymerase chain reaction.

Table 4. Laboratory tests

Laboratory tests	N (confirmed/ suspected)	Mean±SD in confirmed COVID-19 patients	Mean±SD in suspected COVID-19 patients	p
White blood cell count (10^9/L)	39/91	8.80±5.48	10.74±5.88	0.081
Lymphocyte count (10^9/L)	39/90	2.97±2.12	3.25±2.12	0.5
Eosinophil count (10^9/L)	39/88	0.13±0.22	0.21±0.41	0.24
Neutrophil (10^9/L)	39/91	5±4.22	6.5±4.7	0.077
C-reactive protein (mg/L)	39/90	13.65±29.90	26.38±52.17	0.084
Procalcitonin (ug/L)	33/65	0.16±0.13	0.43±0.82	0.012
Erythrocyte sedimentation rate (mm/h)	11/34	14.45±9.91	28±29.94	0.028
Creatine kinase (U/L)	27/53	158.52±164.20	131.04±106.06	0.36
Ferritin (ug/L)	31/64	42.34±64.71	34.49±36.07	0.45
Hs Troponin I (ng/L)	7/91	5.15±6.63	73.01±369.57	0.056

Hs Troponin: High sensitive troponin.
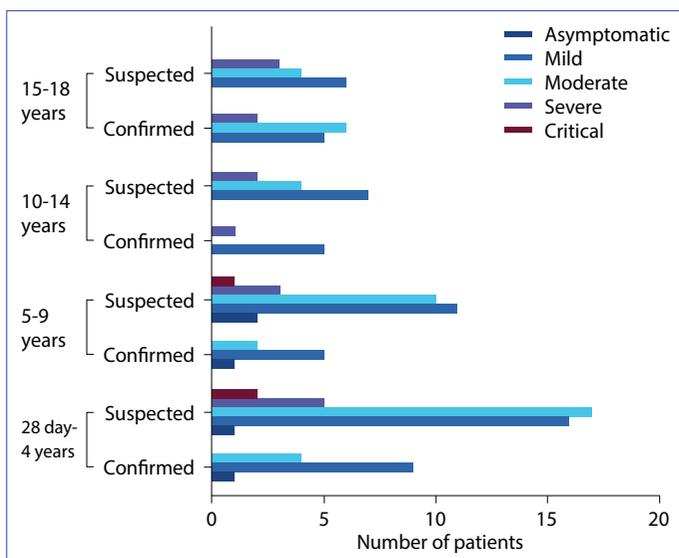
Figure 1. Distribution of disease severity by age groups and diagnosis of COVID-19.

During the study, 51 (37.8%) patients were discharged from pediatric ED after the first visit, and they were isolated at home. Eighty-one patients were admitted to the ward (60%) and three patients were admitted to PICU (2.2%). No death was reported in our study.

Discussion

This study contributes to the literature about the clinical symptoms that can be encountered in pediatric ED during the COVID-19 pandemic and about the relevant parameters for the laboratory tests and radiological imaging. It also offers a perspective on socio-demographic characteristics, disease severity, and outcomes of Turkey's pediatric COVID-19 patient group in pediatric EDs.

Age distribution of pediatric COVID-19 patients that were admitted to EDs varies among countries. A study from Iceland showed that the proportion of symptomatic patients over 10 years of age was higher than those under 10 years (13.7% vs. 6.7%).[22] Similarly, Australian data show that 1% of COVID-19 cases are under 10-years-old and 3% are between age 10 and 19.[23] The most important epidemiological risk factor in every age group is familial cluster transmission. Besides, adolescents aged 15-18 have a higher risk of being infected than younger children because they have more daily social activities.[24,25] Although COVID-19 cases are more common among older children, the reason why we have more patients between 28 days and 4-years-old may be related to crowded family life and close relationship with relatives in Turkey. Conventionally, caregivers of young children are mostly grandparents in Turkey and this type of lifestyle increases the risk of infection for children in the younger age group.

Triage and clinical scoring systems applied in EDs give an idea of how fast we should intervene to the patients. When symptoms of patients, general conditions, and their urgency status are evaluated, it is shown that there is no need for emergent intervention in most of these patients according to their PAT and ESI scores. Furthermore, it is seen that hospitalization rates do not depend on their PAT and ESI scores. However, as in our study, these tools and scales do not guide the outcomes of patients. Thus, new scoring systems are needed to predict the outcome of patients in EDs.[26,27]

The positivity rate of SARS-CoV-2 PCR test results can vary among studies. Ibrahim et al. found 0.9% test positivity, whereas Dong et al. found this rate as 34.1%.[4,23] The positivity rates of our study were similar to the results of Dong et al. (30.4%). During this pandemic, we identified suspected cases following our national guidelines. We think that our SARS-CoV-2 PCR positivity rate is higher because, we performed tests only on probable cases.

Many studies show that the most common symptoms are cough and fever.[28,29] When we evaluated the clinical features of our patients, we had similar results. Symptoms involving other systems such as myalgia/arthralgia and headache in addition to respiratory symptoms have shown us that we are dealing with an infectious agent that effects various organs. Anosmia or ageusia are important symptoms of COVID-19.[30] However, clinical symptoms like anosmia in children may differ from adults. Hyposmia or anosmia can be seen in 61.2% of adults and 37% in children.[31,32] In our study group, only one patient had hyposmia.

Laboratory findings in SARS-CoV-2-positive pediatric patients can also vary from adults. Although lymphopenia is common in adults with COVID-19, this rate was not significant in our patients as in other studies in which pediatric patients were examined.[29,33] On the other hand, as in our study, neutropenia is significantly encountered in positive cases. Therefore, when evaluating laboratory parameters, we should pay attention to neutropenia rather than lymphopenia in children.[29]

Elevations in acute phase reactants differ in bacterial and viral infections. PCT and ESR levels are expected to be within normal limits in viral infections, but the elevation of PCT can be observed in severe COVID-19 infection or the presence of bacterial coinfections.[34] When we compare PCT and ESR levels of our patients, they are significantly higher in SARS-CoV-2 PCR negative patient group. These elevations show bacterial coinfection in our patients or infection, in which we cannot determine its etiology.

Chest CT can be diagnostic even when the SARS-CoV-2 PCR result is not positive yet. Sometimes, besides chest CT, SARS-CoV-2 antibody tests can help in diagnosis. The disease can be detected with chest CT during early days before typical clinical symptoms become evident.[35] Chest CT findings of children and adults are similar. Unilateral or bilateral subpleural ground-glass opacities and consolidations with surrounding halo signs are the most common CT manifestations.[36] However, these findings are not specific to COVID-19 and many different infectious agents can cause similar images.[37] In our study, ground-glass opacities were the most frequent chest CT abnormality. Under the recommendations of the American College of Radiology, we did not use chest CT as a first-step imaging method and we only performed it on symptomatic patients which were planned to be hospitalized.[38]

When pediatric patients are evaluated according to the severity of the disease, the majority of them have mild disease and a better prognosis. This is related to their faster metabolism and their higher regeneration capacity than adults.[39,40] Even if the preliminary diagnosis is COVID-19,

other diseases should be kept in mind, when patients are admitted to EDs with respiratory symptoms during this pandemic period. COVID-19 was excluded in 11 of our severe or critically ill patients and they were treated according to their diagnosis.

Some authors state that children with comorbidities would have a more severe COVID-19 clinic during this pandemic but only one of our patients with comorbidity and positive SARS-CoV-2 PCR test had severe disease.[25,36] Even if the PCR result is negative, we cannot exclude the disease. We perform chest CT and SARS-CoV-2 antibody tests that help in diagnosis.[36] When we evaluated patients for whom we performed chest CT and antibody tests, we found that only one of the patients with comorbidity was critical and two had severe disease.

The limitation of our study was that it was conducted in a single center and therefore the number of confirmed cases was limited. Since our study is compatible with other studies, we believe that the results are contributing to the literature, even though our study is retrospective and the number of confirmed cases is low.

Conclusion

Emergency physicians should always remember that COVID-19 may also have different clinical presentations in children. In accordance with the literature, the most common symptoms of our patients were fever and cough. Probable cases, whose clinical and epidemiological characteristics are compatible with COVID-19, must be confirmed with the SARS-CoV-2 PCR test. During our study, we confirmed the diagnosis of 45 of 135 probable cases with the SARS-CoV-2 PCR test. In the last stages of the pandemic, pediatric cases may present not only as mild infections but also with more mortal clinical presentations such as MIS-C. Among confirmed COVID-19 cases, most of our patients had mild or moderate disease. The clinic of only three confirmed patients was classified as severe disease, and we had no critically ill patient. We did not encounter mortality in any of our confirmed or probable patient group. We believe that developing more sensitive diagnostic tests will enable us to determine the infected children more rapidly in the early stages of the disease and this will be very important in preventing viral transmission. As long as the COVID-19 pandemic continues, further prospective studies are needed to elucidate the clinic presentations of COVID-19 in pediatric patient group.

Disclosures

Ethics Committee Approval: The research protocol was approved by the Regional Ethical Review Board in The University of Health Sciences, Sisli Hamidiye Etfal Training and Research Hospital Ethics Committee (Date: 05.12.2020, Decision Number: 1526).

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

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References

1. Chen ZM, Fu JF, Shu Q, Chen YH, Hua CZ, Li FB, et al. Diagnosis and treatment recommendations for pediatric respiratory infection caused by the 2019 novel coronavirus. World J Pediatr 2020;16:240–6. [CrossRef]

2. Du Z, Wang L, Cauchemez S, Xu X, Wang X, Cowling BJ, et al. Risk for transportation of coronavirus disease from Wuhan to other cities in China. Emerg Infect Dis 2020;26:1049–52. [CrossRef]

3. World Helath Organization. Numbers at a glance. Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019. Accessed Jan 26, 2021.

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;145:e20200702. [CrossRef]

5. Liguoro I, Pilotto C, Bonanni M, Ferrari ME, Pusiol A, Nocerino A, et al. SARS-COV-2 infection in children and newborns: a systematic review. Eur J Pediatr 2020;179:1029–46. [CrossRef]

6. Hoang A, Chorath K, Moreira A, Evans M, Burmeister-Morton F, Burmeister F, et al. COVID-19 in 7780 pediatric patients: A systematic review. EClinicalMedicine 2020;24:100433. [CrossRef]

7. Chang TH, Wu JL, Chang LY. Clinical characteristics and diagnostic challenges of pediatric COVID-19: A systematic review and meta-analysis. J Formos Med Assoc 2020;119:982–9. [CrossRef]

8. CDC COVID-19 Response Team. Coronavirus disease 2019 in Children - United States, February 12-April 2, 2020. MMWR Morb Mortal Wkly Rep 2020;69:422–6. [CrossRef]

9. Swann OV, Holden KA, Turtle L, Pollock L, Fairfield CJ, Drake TM, et al; ISARIC4C Investigators. Clinical characteristics of children and young people admitted to hospital with covid-19 in United Kingdom: prospective multicentre observational cohort study. BMJ 2020;370:m3249.

10. Vespa E, Pugliese N, Colapietro F, Aghemo A. STAY (GI) HEALTHY: COVID-19 and Gastrointestinal manifestations. Tech Innov Gastrointest Endosc 2021 Jan 21 [Epub ahead of print], doi: 10.1016/j.tige.2021.01.006. [CrossRef]

11. Sanna G, Serrau G, Bassareo PP, Neroni P, Fanos V, Marcialis MA. Children's heart and COVID-19: Up-to-date evidence in the form of a systematic review. Eur J Pediatr 2020;179:1079–87. [CrossRef]

12. World Health Organization. Multisystem infammatory syndrome in children and adolescents with COVID-19: Scientific Brief. 2020. Available at: https://www.who.int/publications-detail/multisystem-infammatory-syndrome-in-children-and-adolescents-with-covid-19. Accessed Feb 6, 2021.

13. Centers for Disease Control and Prevention Health Alert Network (HAN). Multisystem Inflammatory Syndrome in Children (MIS-C) Associated with Coronavirus Disease 2019 (COVID-19). Available at: https://emergency.cdc.gov/han/2020/han00432.asp. Accessed Feb 6, 2021.

14. COVID Data Tracker. Available at: https://covid.cdc.gov/covid-data-tracker/index.html#datatracker-home. Accessed Feb 6, 2021.

15. Children and COVID-19: State-Level Data Report. Available at: https://services.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/children-and-covid-19-state-level-data-report. Accessed Feb 6, 2021.

16. Dieckmann RA, Brownstein D, Gausche-Hill M. The pediatric assessment triangle: a novel approach for the rapid evaluation of children. Pediatr Emerg Care 2010;26:312–5. [CrossRef]

17. Wuerz RC, Milne LW, Eitel DR, Travers D, Gilboy N. Reliability and validity of a new five-level triage instrument. Acad Emerg Med 2000;7:236–42. [CrossRef]

18. Coronavirus Disease 2019 (COVID-19) 2020 Interim Case Definition. Available at: https://wwwn.cdc.gov/nndss/conditions/coronavirus-disease-2019-covid-19/case-definition/2020/08/05/. Accessed Feb 6, 2021.

19. Fang F, Chen Y, Zhao D, Liu T, Huang Y, Qiu L, et al; Chinese Pediatric Society and the Editorial Committee of the Chinese Journal of Pediatrics. Recommendations for the diagnosis, prevention, and control of coronavirus disease-19 in children-the Chinese perspectives. Front Pediatr 2020;8:553394. [CrossRef]

20. COVID-19 Turkish Ministry of Health: Covid-19 Guide for Medical Personnel-Turkish. Available at: https://data2.unhcr.org/en/documents/details/74802 Accessed Jan 16, 2021.

21. CDC 2019-Novel Coronavirus (2019-nCoV) Real-Time RT-PCR Diagnostic Panel. Centers for Disease Control and Prevention Division of Viral Diseases. Catalog 2019-nCoVEUA-01. Available at: https://www.fda.gov/media/134922/download. Accessed Apr 8, 2021.

22. Gudbjartsson DF, Helgason A, Jonsson H, Magnusson OT, Melsted P, Norddahl GL, et al. Spread of SARS-CoV-2 in the Icelandic Population. N Engl J Med 2020;382:2302–15. [CrossRef]

23. Ibrahim LF, Tosif S, McNab S, Hall S, Lee HJ, Lewena S, et al. SARS-CoV-2 testing and outcomes in the first 30 days after the first case of COVID-19 at an Australian children's hospital. Emerg Med Australas 2020;32:801–8. [CrossRef]

24. Zhen-Dong Y, Gao-Jun Z, Run-Ming J, Zhi-Sheng L, Zong-Qi D, Xiong X, et al. Clinical and transmission dynamics characteristics

of 406 children with coronavirus disease 2019 in China: A review. J Infect 2020;81:e11–5. [CrossRef]

25. Jeng MJ. Coronavirus disease 2019 in children: Current status. J Chin Med Assoc 2020;83:527–33. [CrossRef]

26. Hinson JS, Martinez DA, Schmitz PSK, Toerper M, Radu D, Scheulen J, et al. Accuracy of emergency department triage using the Emergency Severity Index and independent predictors of under-triage and over-triage in Brazil: a retrospective cohort analysis. Int J Emerg Med 2018;11:3. [CrossRef]

27. Fernandez A, Benito J, Mintegi S. Is this child sick? Usefulness of the Pediatric Assessment Triangle in emergency settings. J Pediatr (Rio J) 2017;93 Suppl 1:60–7. [CrossRef]

28. Qiu H, Wu J, Hong L, Luo Y, Song Q, Chen D. Clinical and epidemiological features of 36 children with coronavirus disease 2019 (COVID-19) in Zhejiang, China: an observational cohort study. Lancet Infect Dis 2020;20:689–96. [CrossRef]

29. Du W, Yu J, Wang H, Zhang X, Zhang S, Li Q, et al. Clinical characteristics of COVID-19 in children compared with adults in Shandong Province, China. Infection 2020;48:445–52. [CrossRef]

30. Lechien JR, Chiesa-Estomba CM, De Siati DR, Horoi M, Le Bon SD, Rodriguez A, et al. Olfactory and gustatory dysfunctions as a clinical presentation of mild-to-moderate forms of the coronavirus disease (COVID-19): a multicenter European study. Eur Arch Otorhinolaryngol 2020;277:2251–61. [CrossRef]

31. Speth MM, Singer-Cornelius T, Oberle M, Gengler I, Brockmeier SJ, Sedaghat AR. Olfactory dysfunction and sinonasal symptomatology in COVID-19: prevalence, severity, timing, and associated characteristics. Otolaryngol Head Neck Surg 2020;163:114–20.

32. Qiu C, Cui C, Hautefort C, Haehner A, Zhao J, Yao Q, et al. Olfactory and gustatory dysfunction as an early identifier of COVID-19 in adults and children: an international multicenter study. medRxiv May 16, 2020 [Epub ahead of print], doi: 10.1101/2020.05.13.20100198. [CrossRef]

33. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al; China Medical Treatment Expert Group for Covid-19. clinical characteristics of coronavirus disease 2019 in China. N Engl J Med 2020;382:1708–20. [CrossRef]

34. Lippi G, Plebani M. Procalcitonin in patients with severe coronavirus disease 2019 (COVID-19): A meta-analysis. Clin Chim Acta 2020;505:190–1. [CrossRef]

35. Pan Y, Guan H, Zhou S, Wang Y, Li Q, Zhu T, et al. Initial CT findings and temporal changes in patients with the novel coronavirus pneumonia (2019-nCoV): a study of 63 patients in Wuhan, China. Eur Radiol 2020;30:3306–9. [CrossRef]

36. Xia W, Shao J, Guo Y, Peng X, Li Z, Hu D. Clinical and CT features in pediatric patients with COVID-19 infection: Different points from adults. Pediatr Pulmonol 2020;55:1169–74. [CrossRef]

37. Hoang A, Chorath K, Moreira A, Evans M, Burmeister-Morton F, Burmeister F, et al. COVID-19 in 7780 pediatric patients: A systematic review. EClinicalMedicine 2020;24:100433. [CrossRef]

38. American College of Radiology. ACR Recommendations for the use of Chest Radiography and Computed Tomography (CT) for Suspected COVID-19 Infection. Available at: https://www.acr.org/Advocacyand-Economics/ACR-Position-Statements/Recommendations-for-Chest-Radiography-and-CT-forSuspected-COVID19-Infection. Accessed Jul 20, 2020.

39. Parri N, Lenge M, Buonsenso D; Coronavirus Infection in Pediatric Emergency Departments (CONFIDENCE) Research Group. Children with Covid-19 in pediatric emergency departments in Italy. N Engl J Med 2020;383:187–90. [CrossRef]

40. Bulbul A, Agirgol E, Uslu S, Elitok GK, Tellioglu A, Avsar H, et al. COVID-19 Management in Newborn Babies in the Light of Recent Data: Breastfeeding, Rooming-in and Clinical Symptoms. Sisli Etfal Hastan Tip Bul 2020;54:261–70. [CrossRef]