Dicle Tıp Dergisi / Dicle Med J (2023) 50 (3) : 354-364

www.diclemedj.org

Original Article / Özgün Araştırma

Examination of Radiological Findings and Clinical Parameters in Paediatric Patients with Covid-19

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Received: 15.05.2023; Revised: 06.09.2023; Accepted: 08.09.2023

Abstract

Objective: It was aimed to evaluate the relationship between imaging techniques and clinical and laboratory parameters in paediatric COVID-19 patients.

Methods: Our study included 187 patients under the age of 18 whose diagnosis of COVID-19 was confirmed by PCR test. Demographic, clinical, laboratory and radiological imaging findings of the patients were reviewed retrospectively from their file records.

Results: 57.2% of the patients were male and the mean age was 110.1±67.4 months. A pulmonary finding associated with COVID-19 was detected in 21 (12%) of 175 patients who underwent Posterior-anterior (PA) chest X-ray. The most common findings were consolidation (n=16; 9.1%), bilateral ground-glass appearance (n=11; 6.3%), and atelectasis (n=5; 2.9%), respectively. Computed lung tomography was performed in 67 of the patients. The presence of a pulmonary finding associated with COVID-19 was detected in 28 (41.8%) of these patients. The three most common findings were consolidation (n=16; 23.9%), bilateral ground glass appearance (n=16; 23.9%), and atelectasis (n=15; 22.4%), respectively. It was determined that for patients with imaging findings on PA X-ray needed more paediatric intensive care, the length of their hospital stay was longer, comorbid diseases were present, their cough and tachypnea complaints were more pronounced ($p<0.05$). As the disease severity increased, especially in patients <1 year of age, the frequency of significant findings increased in both imaging methods ($p<0.05$).

Conclusion: We think that imaging methods can be performed when necessary in children with suspected COVID-19 and can provide preliminary information about the course and severity of the disease.

Keywords: Computed Tomography, COVID-19, Paediatrics, Radiological findings, X ray

DOI: 10.5798/dicletip.1360679

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Covid-19 Tanılı Pediatrik Hastalarda Radyolojik Bulguların ve Klinik Parametrelerin İncelenmesi

Öz

Amaç: Pediatrik COVID-19 hastalarında görüntüleme teknikleri ile klinik ve laboratuvar parametreleri arasındaki ilişkinin değerlendirilmesi amaçlandı.

Yöntemler: Çalışmamıza PCR testi ile COVID-19 tanısı doğrulanan 18 yaş altı 187 hasta dahil edildi. Hastaların demografik, klinik, laboratuvar ve radyolojik görüntüleme bulguları dosya kayıtlarından retrospektif olarak incelendi.

Bulgular: Hastaların %57,2'si erkekti ve yaş ortalaması 110,1±67,4 aydı. Arka-ön (PA) akciğer grafisi çekilen 175 hastanın 21'inde (%12) COVID-19'a bağlı akciğer bulgusu saptandı. En sık görülen bulgular sırasıyla konsolidasyon (n=16; %9,1), bilateral buzlu cam görünümü (n=11; %6,3) ve atelektazi (n=5; %2,9) idi. Hastaların 67'sine bilgisayarlı akciğer tomografisi çekildi. Bu hastaların 28'inde (%41,8) COVID-19'a bağlı akciğer bulgusu varlığı saptandı. En sık görülen üç bulgu sırasıyla konsolidasyon (n=16; %23,9), bilateral buzlu cam görünümü (n=16; %23,9) ve atelektazi (n=15; %22,4) idi. PA röntgende görüntüleme bulgusu olan hastaların daha çok çocuk yoğun bakıma ihtiyaç duyduğu, hastanede kalış sürelerinin daha uzun olduğu, yandaş hastalıklarının olduğu, öksürük ve takipne yakınmalarının daha belirgin olduğu saptandı ($p<0,05$). Özellikle <1 yaş hastalarda hastalık şiddeti arttıkça her iki görüntüleme yönteminde de anlamlı bulgu sıklığı artıyordu ($p<0,05$).

Sonuç: COVID-19 şüphesi olan çocuklarda gerektiğinde görüntüleme yöntemlerinin yapılabileceğini ve hastalığın seyri ve şiddeti hakkında ön bilgi sağlayabileceğini düşünüyoruz.

Anahtar kelimeler: Bilgisayarlı Tomografi, COVID-19, Pediatri, Radyolojik bulgular, Röntgen.

INTRODUCTION

Coronaviruses are important human and animal pathogens. At the end of 2019, a new coronavirus was identified as the cause of a number of pneumonia cases in Wuhan, a city in China's Hubei Province. It has been determined that this virus spread rapidly, resulting in an epidemic throughout China, and then the number of cases in other countries of the world gradually increased. In February 2020, the World Health Organization (WHO) named this disease COVID-19, which means 2019 coronavirus disease[1].

Children of all ages can be infected with COVID-19[2]. Children seem to be less affected than adults and are tested less frequently than adults because of their asymptomatic findings[3]. In surveillance from various countries, children typically account for 15 percent of laboratory-confirmed cases[4].

The symptoms of COVID-19 are similar in children and adults, but the incidence of symptoms varies[5]. COVID-19 appears to be milder in children than in adults, but severe cases have been reported in children[6]. Increasing cases of multiple system inflammatory syndrome (MIS-C) are seen due to COVID-19. Although clinical findings are varied in children with COVID-19, fever or chills and cough are the most commonly reported symptoms[7].

One of the systems first targeted by the coronavirus infection is the respiratory system. Imaging findings are variable and may precede symptoms[8]. Therefore, lung imaging methods are frequently used for initial evaluation and follow-up in suspected or confirmed cases of COVID-19 in adults. Although RT-PCR is diagnostic for COVID-19, computed tomography of the lung is widely used for the prediction and prognosis of the disease. Before the clinical signs and symptoms of the disease appear prominently, some of the findings can be seen on computed tomography. Since the disease in children is usually asymptomatic or mildly progressed, lung imaging findings are

often indistinct compared to adults and therefore cannot be detected on direct chest X-ray. In a meta-analysis of 1026 children with PCR-confirmed COVID-19 who underwent computed tomography (CT) imaging, normal findings were found in 36% and bilateral lesions in 28%.9 The most common findings were ground glass opacities (37%) and consolidation or pleural effusions (22%), respectively. Findings specific to other viral respiratory tract infections (eg, hyperinflation, peribronchial signs) have not been reported[9]. Comprehensive knowledge of imaging modality selection and radiological findings at various stages of the disease will assist pediatricians in early diagnosis, disease severity, prognosis, and appropriate clinical management.

In this retrospective study, it was aimed to evaluate the necessity of chest X-rays and computed thorax tomography imaging, clinical and laboratory findings in paediatric patients affected by the COVID-19 pandemic.

METHODS

This retrospective study included 218 patients aged 0-18 years, who were diagnosed with COVID-19 by PCR test and were hospitalized in the Paediatric COVID-19 clinic of Dicle University Faculty of Medicine between April 10, 2020 and November 30, 2021. The study was conducted based on the rules of Declaration of Helsinki and approved by the Institutional Ethics Committee of Dicle University, Faculty of Medicine (15.12.2021- 517).

31 patients with missing data were not included in the study and thus the sample size was determined as 187 patients. Demographics (gender and age), clinical (disease severity, admission complaint, hospitalisation site, length of hospital stay, additional disease information), laboratory and radiological imaging findings (data obtained from direct chest X-ray and computed chest tomography) of the patients hospitalised during the disease were analysed retrospectively from the file records. Direct chest X-ray imaging was performed using the Bucky Diagnost model (Philips® medical systems, Hamburg, Germany). Computed tomography of the lungs was performed with Activion 16 (Toshiba® Medical Systems Corp., Tokyo, Japan) in thin-section, low-dose and high-resolution. The findings detected in the obtained radiological imaging were evaluated together with the Radiology Department, and the findings were confirmed.

For the diagnosis of COVID-19, combined oropharyngeal/nasopharyngeal swab samples were obtained from patients. In the laboratory, DIAGNOVITAL® DIAGNO5plex NS SARS-CoV-2 Real Time PCR (Istanbul/Turkey) Detection Kit was used and studied in Light Cyler 96 (ROCHE® SWITZERLAND) device according to the manufacturer's recommendations. The tests were evaluated as positive and negative according to the manufacturer's recommendations.

The clinical conditions of the patients were classified as asymptomatic, mild, moderate and severe[10].

Inclusion criteria;

-Confirmation of the diagnosis of COVID-19 by PCR test

-Being in the 0-18 age range

-Being hospitalized and followed up and treated

Exclusion criteria;

-The diagnosis of COVID-19 could not be confirmed by PCR testing

-Being over the age of 18

-Incomplete anamnesis and laboratory data on the hospital information management system

Statistical Analysis

Statistical analysis of the data was performed using the SPSS 25.0 (SPSS Inc., Chicago, Illinois)

program. Normality test of numerical variables was determined by Kolmogorov-Smirnov test. Numerical variables were summarized as mean (±standard deviation) and minimum-maximum. Categorical variables were given as numbers and percentages. When comparing numerical variables between the two groups, the Mann Whitney U test was used since the variables did not show normal distribution. Chi-square and Fisher's exact tests were used when comparing categorical variables. The correlations between the measurement variables were compared with the Spearman correlation test for those who did not fit the normal distribution, and the correlation coefficients were calculated. Significance will be controlled. Statistical significance level was taken as 0.05 for each test.

RESULTS

57.2% of the patients evaluated within the scope of the study were male, and the mean age was 110.1±67.4 months (1-216 months). The most common complaints were fever (23%), cough (20.9%) and fatigue (17.6%). When the disease was classified according to severity, the largest group consisted of those who had mild (n=83; 44.4%) and asymptomatic (n:74, 39%) disease. The mean hospitalization period of all patients was 3.9±3.3 days (1-20 days). Two patients (1.1%) died at the end of the treatment period.

Posterior anterior (PA) chest radiography was performed on 175 patients. Twenty-one (12%) of the patients who had a PA chest X-ray had a finding associated with COVID-19. The most common findings were consolidation (n=16/175; 9.1%), bilateral ground glass appearance (n=11/175; 6.3%), and atelectasis (n=5/175; 2.9%), respectively. Other findings are summarized in table 1 (Figure 1).

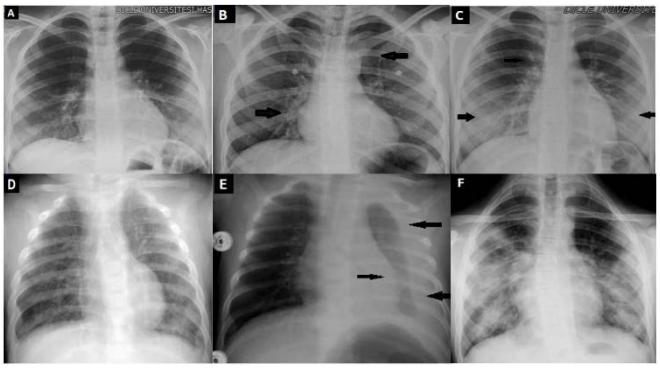

Figure 1. PA Chest X-ray imaging findings of hospitalized patients with a diagnosis of COVID-19. (A): A 13-year-old female patient who was asymptomatic. Normal PA chest X-ray graph. (B): A 14-year-old male patient with dyspnea. Pneumothorax on the left and increased vascularity on the right. (C): A 12-year-old female patient with complaints of fever, headache and sore throat. Bilateral ground glass density. (D): A 6-month-old male patient with a diagnosis of hemophagocytic lymphohistiocytosis, with cough, fever and shortness of breath, died on the 14th day of his hospitalization while being treated in the intensive care unit. Bilateral ground glass density and consolidation. (E): A 2-month-old female patient who was treated in the intensive care unit with complaints of fever and shortness of breath. Left pleural effusion. (F): A 17-year-old male patient diagnosed with Down Syndrome and Acute Lymphoblastic Leukemia, with complaints of fever, cough and shortness of breath, and died on the 4th day of his hospitalization while being treated in the intensive care unit. Bilateral ground glass density and consolidation.

Table I: PA Chest X-ray findings

Findings	**Total n: 175 n,%**
Nature	154 (88%)
Significant finding	21 (12%)
Distribution of significant findings detected on PA chest X-ray within itself*	**Total n: 21 n,%**
Consolidation	16 (76%)
Bilateral ground glass	11 (52%)
Atelectasis	5 (23.8%)
Unilateral ground glass	4 (19%)
Pleural effusion	2 (9.5%)
Pneumothorax	1 (4.8%)

**: Some of the patients had more than one symptom at the same time.*

PA: Posterior anterior

The number of patients who underwent computed tomography of the lungs was 67. PA chest X-ray was also performed in all of these patients. The PA chest X-ray was nature in 10 (35.7%) of the patients with significant findings on computed tomography of the lung. Presence of a pulmonary finding associated with COVID-19 was detected in 28 (41.8%) of the cases. The three most common findings were consolidation (n= 16/67; 23.9%), bilateral ground glass appearance (n= 16/67; 23.9%), and atelectasis (n= 15/67; 22.4%), respectively Table 2 (Figure 2).

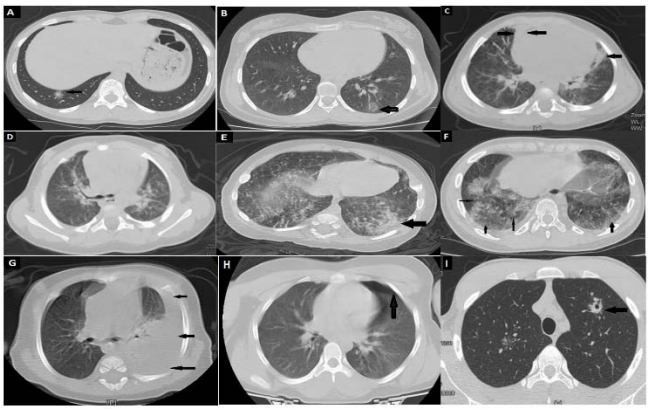

Figure 2. Computed Lung Tomography imaging findings of hospitalized patients with the diagnosis of COVID-19. Figure (A): A 12-year-old female patient with complaints of fever, headache and sore throat. Ground glass view around consolidation (Halo sign). Figure (B): A 13-year-old female patient who was asymptomatic. Consolidation area around the ground glass (Inverted halo sign). (C) and (D): A 10-month-old girl with complaints of fever and cough. Atelectasis and Tree-in-bud view. (E): A 6-month-old male patient with a diagnosis of hemophagocytic lymphohistiocytosis, with cough, fever and shortness of breath, died on the 14th day of his hospitalization while being treated in the intensive care unit. Consolidation area. (F): A 17-year-old male patient diagnosed with Down Syndrome and Acute Lymphoblastic Leukemia, with complaints of fever, cough and shortness of breath, and died on the 4th day of his hospitalization while being treated in the intensive care unit. Crazy paving pattern. (G): A 2-month-old female patient who was treated in the intensive care unit with complaints of fever and shortness of breath. Pleural effusion in left lung. (H): A 14-year-old male patient with dyspnea. Pneumothorax in left lung. (I): A 17-year-old male patient with complaints of fever, cough and sore throat. Cavitation in the left lung.

Table II: Computed lung tomography findings

CT findings	**Total n=67n, (%)**
Nature	39 (58.2%)
Significant finding	28 (41.8%)
Distribution of CT findings within itself*	**Total n: 28 n,%**
Bilateral ground glass	16 (57%)
Consolidation	16 (57%)
Atelectasis	12 (42.8%)
Bronchiectasis	7 (25%)
Nodule	5 (17.8%)
Halo sign	4 (14.2%)
Unilateral ground glass	4 (14.2%)
Pleural effusion	2 (7.1%)
Mosaic patern	1 (3.6%)
Pneumothorax	1 (3.6%)

**: Some of the patients had more than one computed lung tomography findings.CT: Computed tomography*

Compared to those with normal imaging, it was determined that the presence of significant comorbidity was higher, the need for intensive care and the length of hospital stay were prolonged, the complaints of cough and tachypnea were increased, and the acute phase reactants (ferritin, fibrinogen, CRP and procalcitonin) were high ($p<0.05$, Table 3) in patients with significant findings PA-CXR findings. Compared to those who were evaluated as normal, in imaging of patients with significant findings in computed tomography of the chest; Tachypnea, procalcitonin and CRP values were found to be significantly higher ($p<0.05$, Table 3).

Table III: Comparison of clinical and laboratory data of the cases according to the presence of findings in PA Chest and Computed Tomography

Parameters	CT Imaging Finding		P	PA chest X-ray Finding		p*
	Absent (n=39)	Present (n=28)		Absent (n=154)	Present (n=21)	
Age (months), Mean±Sd	131.2±63.1	109.3±80.5	0.291	113.7±64.6	109.3±88.3	0.899
Gender (Male/female)	18/21	11/17	0.576	88/66	10/11	0.410
COVID-19 Clinic	38 (97.4%)	23 (82.1%)	0.075	148 (96.1%)	13 (61.9%)	**0.001**
COVID-19 PICU	1 (2.6%)	5 (17.9%)		6 (3.9%)	8 (38.1%)	
Length of stay (days) Mean±SD	4.6±2.3	6.2±4	0.075	3.2±2.5	7.7±5.3	**0.001**
Comorbidity presence, n (%)	5 (12.8%)	8 (28.6%)	0.108	17 (11%)	11(52.4%)	**0.001**
Cough (n=20), n (%)	10 (25.6%)	10 (35.7%)	0.374	26 (16.9%)	10 (47.6%)	**0.003**
Fever (n=19), n (%)	11 (28.2%)	8 (28.6%)	0.974	30 (19.5%)	8 (38.1%)	0.086
Fatigue (n=12), n (%)	9 (23.1%)	3 (10.7%)	0.193	30 (19.5%)	3 (14.3%)	0.796
Nausea/vomiting (n=6), n (%)	1 (2.6%)	5 (17.9%)	0.075	4 (2.6%)	4 (19%)	**0.008**
Headache (n=13), n (%)	6 (15.4%)	7 (25%)	0.326	19 (12.3%)	6 (28.6%)	0.087
Diarrhea (n=6), n (%)	3 (7.7%)	3 (10.7%)	0.688	10 (6.5%)	3 (14.3%)	0.193
Sore throat (n=7), n (%)	5 (12.8%)	2 (7.1%)	0.690	9 (5.8%)	2 (9.5%)	0.624
Tachypnea (n=7), n (%)	0 (0%)	7 (25%)	**0.001**	1 (0.6%)	9 (42.9%)	**0.001**
WBC (ref: 3,7-10,1 10^9/L)	6.7±2.8	7.9±5.3	0.446	6.9±3.2	8.5±5.8	0.307
Neutrophile (ref: 1,63-6,96 10^3/µL)	3.2±1.8	3.7±3.2	0.829	3.4±2.4	4.6±3.9	0.273
Lymphocyte (ref: 1,09-2,99 10^3/µL)	2.6±1.6	3.4±3.9	0.770	2.7±2	3±4	0.262
Neutrophile/Lymphocyte ratio	1.6±1.6	2.4±3.5	0.453	1.8±2.5	3.4±4.1	0.070
LDH (ref: 0-248 U/L)	234±81	307.2±180.8	0.092	262.4±112.7	391.8±193.7	**0.001**
AST (ref: 0-50 U/L)	29.3±19.3	34.9±20	0.186	33.1±21.4	42±22.3	0.071
ALT (ref: 0-50 U/L)	16.2±13.8	17.9±13.5	0.087	23±61.5	23.3±17.2	0.061
Ferritin (ref: 22-322 ng/mL)	84.9±142	283.8±594.4	0.542	128.8±450.5	425±665.3	**0.001**
Fibrinogen (ref: 170-420 mg/dL)	248.7±111.2	286.4±127.3	0.148	234.9±87.6	342.7±153.8	**0.002**
D-Dimer (ref: 0,08-0,583 ng/mL)	3.6±16.5	1.1±1.9	0.311	2.7±12.6	1.5±2.2	**0.002**
Procalcitonin (ref: 0-0,12 ng/mL)	0.02±0.1	4.3±19.6	**0.011**	0.1±0.5	6.6±24.1	**0.001**
CRP (ref: 0-0,05 mg/L)	0.5±1.9	2.5±4.5	**0.007**	0.6±2.1	4.6±6	**0.001**

**: Mann-Whitney U test Mean±Sd: Mean±Standard Deviation, CT: Computed tomography, COVID: Coronavirus disease, WBC: White blood cell, LDH: Lactate dehydrogenase, AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, CRP: C-reactive protein ref: Reference range, PICU: Paediatric intensive care unit*

When the relationship between the presence of findings in the posterior anterior chest X-ray and computed tomography of the chest and the severity of the disease was examined; it was found that as the severity of the disease increases, the frequency of findings increases in both imaging modalities ($p<0.05$). When the patients were divided into groups as under 1 year old, 1-10 years old and 10-18 years old according to age groups and compared in terms of presence of significant lung findings in radiological imaging, it was determined that the group with the highest presence of significant findings was the group under the age of 1 ($p<0.05$, Table 4).

Table IV: Comparison of the presence of imaging findings with disease severity and age

		Asymptomatic N, %	Light N, %	Mild N, %	Severe N, %	p*	Under 1 year old N, %	1-10 years old N, %	10-18 years old N, %	p*
PA chestX-ray	Natural	70 (100%)	70 (89.7%)	13 (61.9%)	1 (16.7%)	0.001	14 (66.7%)	68 (97.1%)	72 (85.7%)	0.001
	Finding exists	0 (0%)	8 (10.3%)	8 (38.1%)	5 (83.3%)		7 (33.3%)	2 (2.9%)	12 (14.3%)	
CT	Natural	13 (92.9%)	23 (67.6%)	3 (21.4%)	0 (0%)	0.001	2 (20%)	13 (76.5%)	24 (60%)	0.015
	Finding exists	1 (7.1%)	11 (32.4%)	11 (78.6%)	5 (100%)		8 (80%)	4 (23.5%)	16 (40%)	

**: Chi-square test: PA: Posterior anterior, CT: Computed tomography*

DISCUSSION

One of the systems first targeted by the coronavirus infection is the respiratory system. Therefore, lung imaging methods are frequently used for initial evaluation and follow-up in suspected or confirmed cases of COVID-19 in adults. Before the clinical signs and symptoms of the disease appear prominently, some of the findings can be seen on computed tomography[11]. Since the disease is usually asymptomatic or progresses mildly in children, lung imaging findings are often indistinct compared to adults, and therefore cannot be detected on direct chest radiography[12]. Comprehensive knowledge of imaging modality selection and radiological findings at various stages of the disease will assist paediatricians in early diagnosis, severity, prognosis, and appropriate treatment.

When the literature is examined, no relationship has yet been shown between gender and COVID-19 in children. Erat et al. determined that 52.2% of the patients were female, Bayramoğlu et al. reported 51.4% female, Lu et al. 60.8% male, and Mohammadi et al. 63% male1[3-16]. In our study, 57.2% of the patients included in the study were boys. When the studies in the literature are examined, the rates vary according to gender.

The relationship between age and COVID-19 is unknown. In the study conducted by Erat et al., the mean age of the patients was 11 years, 50.7% of them were over 10 years old, Lu et al. reported that the mean age was 6.7 years and 57.3% of them were between 1-10 years, Palabıyık et al. found the mean age to be 9 years[13,15,17]. The mean age of paediatric COVID-19 cases evaluated in our study was found to be 100±67 months. When the patients included in our study were evaluated according to age groups, it was determined that the majority of the patients were between 1-10 years old (41.2%) and over 10 years old (46.5%). There are differences in the data found in the literature regarding age. During the epidemic, kindergartens, schools and universities were closed, depending on the country and time. These closures have been applied from time to time in various combinations. This affects the age range of the affected paediatric population in the country and time of the study.

Lu et al found that 15.8% of the patients had asymptomatic infection, 19.3% had mild infection, and 64.9% had pneumonia[15]. Bellino et al. determined that 53.4% of the patients were asymptomatic, 32.4% had mild infection, 3.9% had severe infection, and 0.1% of the patients died[18]. Hoang et al. found the rate of hospitalization in the paediatric intensive care unit to be 3.3% and the mean hospitalization period to be 11.6 days[19]. It was observed that the majority (44.4%) of the paediatric COVID-19 patients evaluated and hospitalized in our study had mild disease, 2.7% had severe disease, and two patients (1.1%) died.

Erat et al. reported the most common findings on PA chest X-ray to be consolidation (7.2%), peribronchial distribution (4.3%), and bronchial wall thickening (4.3%), respectively[13]. Palabiyik et al[17]. reported a

pathological finding associated with COVID-19 in 46% of patients, and Bayramoğlu et al. 14 have detected pathological imaging findings in 18.8% of the patients, ground glass density in 7.3%, pleural effusion in one patient (1.4%), and peribronchial thickening in one patient (1.4%). In our study, the number of patients who underwent PA chest X-ray was 175 (93.6%). Among the patients who had a chest X-ray, the rate of those with significant findings was 12%, while the remaining patients were considered normal. In patients with symptoms, consolidation (9.1%), ground glass density (6.3%) and atelectasis (2.9%) were detected, respectively. The most common findings seen together are ground glass density and consolidations (4%). In the light of these findings, in cases where COVID-19 disease is suspected, we think that the determination of ground glass density and consolidation areas in the PA chest X-ray performed by the physician when necessary, as a result of the combined evaluation of the anamnesis, physical examination and symptoms, may be among the guiding parameters in terms of diagnosis and treatment decision.

Computed lung tomography is applied to paediatric COVID-19 patients in terms of both diagnosis and prognosis. In the study of Erat et al., the rate of computed tomography of the lung was found to be 44.9% in patients with COVID-19[13]. In this study, the most common findings in computed tomography of the lung were found to be ground glass densities (8.6%) and consolidations (7.2%), respectively. In the study of Lu et al., the most common computed tomography finding in paediatric patients was found to be ground glass density (32.7%)[15]. After the ground glass density, the most common findings were classified as unilateral consolidation (18.7%) and bilateral consolidation (12.3%). In the study of Mohammadi et al., the most common findings were consolidation (37%), ground glass density (29%), and air bronchograms (22.2%)[16]. Katal et al. compiled studies evaluating paediatric patients diagnosed with COVID-19 and published a meta-analysis including 850 patients[20]. As a result of the study, it was determined that 73.5% of the patients had abnormal computed tomography findings. The most common findings in the patients were ground glass density (32.8%) and consolidation (24.9%), respectively. Other common findings were shown as halo sign, interstitial opacities, bronchial wall thickening and cobblestone appearance. In our study, computed tomography of the lungs was performed in 67 (35.8%) of the patients. Consolidation (23.9%), bilateral ground glass density (23.9%) and atelectasis (22.4%) were the most common findings in patients undergoing computed tomography, just as in PA chest X-ray. When the most common findings were examined, bilateral ground glass, consolidation and atelectasis were observed in 5.9% of the patients. In the literature, the most common ground glass densities and consolidations were found in computed lung tomography, which is generally applied to paediatric cases. Based on the data found in our study, we think that in indications required in patients with clinical findings compatible with COVID-19 disease but not diagnosed with laboratory tests, these findings, which can be seen in computed tomography of the chest, can be used in addition to PA chest X-ray as a guiding parameter in the diagnosis and clinical progression of the disease, in cases where PA chest X-ray cannot provide sufficient information.

When the literature was searched, no study was found that compared findings on PA chest X-ray with other parameters in paediatric COVID-19 cases. When the patients with and without findings on chest X-ray were compared, no difference was observed between the two groups in terms of age and gender. It was determined that the rate of finding findings in

PA chest radiographies of patients hospitalized in the COVID-19 Paediatric Intensive Care Unit was significantly higher. In addition, it was found that patients with findings on PA chest X-ray were hospitalized for a statistically significantly longer time, and an increase in the presence of comorbid disease history, cough and tachypnea findings were detected. Among the laboratory parameters, LDH, ferritin, fibrinogen, procalcitonin and CRP values were found to be higher than those with normal PA chest X-ray.

When Erat et al. compared the patients with findings on computed tomography of the chest with other patients in terms of the data obtained, they found that there was no significant difference between the two groups in terms of age, gender, white blood cell count, lymphocyte count, CK and LDH values, but the CRP value was significantly higher than the patients without symptoms[13]. Ma et al. compared the laboratory data of the patients with the findings of computed tomography of the lungs and found that the CRP levels of the patients with findings were higher[21]. In our study, however, no significant correlation was found between the presence of significant findings in computed tomography of the chest and age, gender, and the clinic where the patient was hospitalized. The rate of detecting pulmonary findings in patients with only tachypnea among the patient complaints was significantly higher than the other group. In terms of laboratory data, CRP and procalcitonin values were significantly higher in patients with findings on computed tomography of the lungs compared to those without.

Yayla et al. compared the radiological lung imaging findings according to the severity of the disease[22]. While there was no finding in the PA chest X-ray of asymptomatic and mild patients, a significant finding related to COVID-19 was found in the PA chest X-ray in 96% of those with moderate and 83% of those with severe disease. Similarly, in patients who underwent computed tomography of the chest, no finding was found in those who had asymptomatic and mild disease. However, 59% of patients with moderate severity and 80% of those with severe symptoms were found to have symptoms[22]. Similarly, in our study, as the severity of the disease increases, the rate of detecting findings increases. Among the patients who had a chest X-ray, no symptoms were found in those who had the disease asymptomatically, while findings were detected in 10% of the patients who had mild and 83.3% of the patients who had severe disease. While it is 7% in asymptomatic patients who underwent computed tomography of the chest, this rate gradually increases with the severity of the disease and reaches 100% in patients with severe disease. In addition, when we examined the data between the age of the patients and the imaging findings, the rate of detecting findings related to COVID-19 in PA chest X-ray and Computed Lung Tomography was increasing, especially in children under 1 year of age, compared to children in other age groups. Early detection of the risk of developing serious disease is important to prevent complications and mortality[23]. We think that radiological imaging methods can contribute in this sense in critically ill patients.

The data we obtained show us that there is a very strong relationship between the severity of the disease and the presence of radiological findings, and as the clinical severity increases, the probability of detecting findings in PA chest radiography and computed tomography increases. Erat et al[13]. They found that pediatric patients diagnosed with COVID-19 were on average 11 years old, of whom 13% were under one year old. Lu et al.[15] found that the mean age of the patients was 6.7, and the rate of patients under the age of one was 18.1%. In addition, the fact that more imaging findings were detected in children under the age of 1 may help us to get

a better idea about the picture of the disease in the lung, perhaps by performing imaging independently of the clinical situation in patients in this age group.

CONCLUSIONS

When the radiological data obtained as a result of our study are evaluated holistically; we think that the most common radiological findings in paediatric COVID-19 cases are consolidation and ground glass density, the findings detected in the radiological images also increase as the severity of the disease increases, more imaging findings can be detected in children under 1 year of age compared to other age groups, tomographic imaging method can be preferred when necessary in patients with normal PA chest X-ray, the patients with findings on chest X-ray may have longer hospital stays and need for intensive care as well and care should be taken in the follow-up of such patients. We believe that with future studies, our imaging information of COVID-19 patients will increase, and perhaps a common opinion will be formed on this issue.

Ethics Committee Approval: The study was conducted based on the rules of Declaration of Helsinki and approved by the Institutional Ethics Committee of Dicle University, Faculty of Medicine (15.12.2021- 517).

Conflict of Interest: The authors declared no conflicts of interest.

Financial Disclosure: The authors declared that this study has received no financial support.

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