Comparison of radiologic findings between SARS-CoV-2 and other respiratory tract viruses in critically ill children during the COVID-19 pandemic

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Statements and Declarations

Declaration of interest and funding: All authors certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

Conflicts of interest: Authors declare that they have no conflict of interest.

Ethical Standards and responsibilities of authors: The study has been approved by the appropriate ethics committee and has therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. This article does not contain any studies with human participants performed by any of the authors. For this type of study formal consent is not required. Authors declare that the manuscript has not been submitted to more than one journal for simultaneous consideration. They also declare the manuscript has not been published previously (partly or fully).

This work is authorized by the Ministry of Health (Ethics Committee-20-568), and the approval of the local ethics committee (Ethics Committee no: 568) was obtained.

Ethics approval: The approval was obtained from Institutional Review Board.

Consent to participate: Approval was obtained from the family of the participants.

Consent for publication: Approval was obtained from the family of the participants.

Comparison of radiologic findings between SARS-CoV-2 and other respiratory tract viruses in critically ill children during the COVID-19 pandemic

Abstract

Background/aim: This study was planned since the radiological distinction of COVID-19 and respiratory viral panel (RVP) positive cases is necessary to prioritize intensive care needs and not to leave non-COVID-19 cases aside. With that purpose, the objective of this study was to compare radiologic findings between SARS-CoV-2 and other respiratory airway viruses in critically ill children with suspected COVID-19 disease.

Materials and methods: This study was conducted as a multicenter, retrospective, observational, and cohort study in 24 pediatric intensive care units between March 1 and May 31, 2020. SARS-CoV-2 or RVP polymerase chain reaction (PCR) positive patients' chest X-ray and thoracic computed tomography (CT) findings were evaluated blindly by pediatric radiologists.

Results: We enrolled 225 patients in the study. Eighty-one of them were Coronovirus disease-19 (COVID-19) caused by severe acute respiratory syndrome coronavirus-2(SARS-CoV-2) positive patients. The median age of all patients was 24 (7-96) months; it was 96 (17-156) months with COVID-19 positive patients and 17 (6-48) months for positive RVP factor ($p<0.001$). Chest X-rays were more frequently evaluated as normal in patients for SARS-CoV-2 positive results ($p=0.020$). Unilateral segmental or lobar consolidation was observed more frequently on chest X-rays in rhinovirus cases than other groups ($p=0.038$). CT imaging findings of bilateral peribronchial thickening and/or peribronchial opacity, were more frequently observed in RVP positive patients ($p=0.046$).

Conclusion: Chest X-ray and CT findings in COVID-19 patients are not specific and can be seen in other respiratory virus infections.

Keywords: SARS-CoV-2, COVID-19, respiratory system, tomography, pediatric intensive care units

1. Introduction

One of the world's biggest challenges during the coronovirus disease -19 (COVID-19) caused by severe acute respiratory syndrome coronavirus-2(SARS-CoV-2) pandemic is how to diagnose the disease in suspected patients and who needs the test. Currently, the test for the detection of SARS-CoV-2 is the polymerase chain reaction (PCR) test from a nasopharyngeal swab. The effectiveness of the tests depends on the accuracy of the test and how the test results will affect the treatment. Although reverse transcription polymerase chain reaction (RT-PCR) is a highly sensitive and specific test, it requires highly skilled personnel and special instruments. Otherwise the test results may be contaminated or give useless results. In addition, the sensitivity of the test may have variations depending on the duration from the beginning of disease symptoms and the severity of the disease. Therefore, the sensitivity of the test may change from 60% to 95% [1,2,3].

Chest X-rays are generally not preferred to CT scans because of their low sensitivity in detection of pulmonary infiltration. Initially, findings in chest CT was accepted as diagnostic in patients with or without respiratory distress, with a history of exposure to the virus, or in patients with other symptoms of COVID19. At beginning of COVID-19 pandemic, thorax CT was unique method, but then it was not only method and its not sufficient certain diagnosis in adults ages. Also, it is controversial in children for COVID-19 diagnosis. Thoracic CT has not been routinely performed in pediatric patients of suspected COVID-19. Apart from SARS-CoV-2, (COVID-19, caused by

severe acute respiratory syndrome cornavirus-2) there are many other viruses that can cause pneumonia, even death. They may create epidemics, pediatric acute respiratory distress syndrome (PARDS). Some examples are influenza virus, respiratory syncytial virus (RSV), rhinovirus, adenovirus, parainfluenza virus, metapneumovirus, bocavirus. However, unlike COVID-19, thoracic CT may not have diagnostic advantages in these diseases [4,5].

In reported observations have shown that viruses other than SARS-CoV-2 may also create ground-glass opacities (GGOs), multiple patchy consolidations, and peripheral or central involvement in the lung parenchyma similar to COVID-19 [6].

In this multicenter study, we investigated the diagnostic sensitivity and specificity of chest X-rays and thoracic CT imaging for the differential diagnosis and clinical significance in pediatric intensive care patients with suspected SARS-CoV-2 or respiratory tract viruses infections during the COVID-19 outbreak.

2. Materials and Methods

This study was planned as a retrospective multicentercohort study. Twenty-four pediatric intensive care units (PICUs) throughout Turkey participated in this study. Patients between the ages of one month and 18 years of age who were hospitalized in PICUs between March 1 and May 31, 2020 with respiratory system symptoms and positive real-time reverse transcriptase PCR (RT-PCR) tests for either SARS-CoV-2 or respiratory viral panel (RVP) viruses [including RSV, rhinovirus, influenza virus (including H1N1), adenovirus, and metapneumovirus, among others] were included in the study. Patients whose SARS-CoV-2 PCR tests were inconclusive or positive thoracic CT findings for SARS-CoV-2 but negative PCR tests were also excluded from the study.

Patients who had positive COVID-19 serology but negative PCR tests were excluded from the study. Patients having positive serologic findings for both COVID-19 and RVP PCR at the same time were also excluded from the study.

Patients were divided into two groups: SARS-CoV-2 positive (Group 1) and RVP positive (Group 2). The method targeting the RNA-dependent RNA polymerase (RdRp) gene using the Bio-Speedy COVID-19 RTqPCR Detection Kit (Bioeksen, Istanbul, Turkey) for SARS-CoV-2 and RVP [upper RVP was studied with five-tube multiplex for detection of influenza A virus; influenza A (H1N1) virus (swine-lineage); influenza B virus; human rhinovirus; human coronaviruses NL63, 229E, OC43, and HKU1; human parainfluenza viruses 1, 2, 3, and 4; human metapneumovirus A/B; human bocavirus; human RSV A/B; human adenovirus; enterovirus; human parechovirus; and Mycoplasma pneumonia] and internal control using Fast track resp 21; Multiplex real-time PCR for detection of pathogen genes by TaqMan® technology (Rotor-gene, California, USA) were used to analyze the patients' nasopharyngeal swab samples. If at least one of these tests was positive, it was accepted as significant. Flow chart of study was presented in Figure-1.

Pediatric risk of mortality score III (PRISM III), Pediatric logistic organ dysfunction score2(PELOD-2), and Pediatric multiple organ dysfunction score(P-MODS) can be used to dynamically assess pediatric patients and accurately determine the risk of death or potentially serious complications in critically ill patients of all age groups, including pediatric patients. Calculated with OSI (Oxygen Saturation Index) ([FiO2 × Mean airway pressure × 100] /SpO2) [7]. PRISM-III, PELOD-2, P-MODS and OSI scores were calculated in as accordance with the literature.

2.1 Radiological evaluation

In both groups, X-rays and CT scans that were performed within 48 hours of admission to the PICU were evaluated by two radiologists independently (A.G. and B.S.A., with eight and two years of experience in pediatric radiology, respectively) for both diagnostic purposes. The final decision was made by a senior pediatric radiologist for inconclusive results (S.F. with 22 years of experience in pediatric radiology). The radiologists were blinded to the diagnosis or PCR results of the patients.

The radiologists filled out a standard form of radiological for each patients. The form was inspired from an example of the reporting chart recommended by a group of international pediatric thoracic radiologists under the joint consensus "International Expert Consensus Statement on Chest Imaging in Pediatric COVID-19 Patient Management: Imaging Findings and Imaging Study Reporting, and Imaging Study [Recommendations] [8]. Chest x-ray findings were classified as typical (bilateral distribution peripheral and/or subpleural GGOs and/or consolidation), indeterminate (unilateral peripheral or peripherocentral GGOs and/or consolidation; bilateral peribronchial thickening and/or peribronchial opacities; multifocal or diffuse GGOs and/or consolidation without specific distribution) and atypical (unilateral segmental or lobar consolidation, central unilateral or bilateral GGOs and/or consolidation, single round consolidation, pleural effusion and lymphadenopathy) according to guideline. Typical (bilateral peripheral subpleural ground-glass infiltrates and/or consolidation and/or halo sign) and indeterminate findings (multifocal or diffuse ground-glass infiltration and/or consolidation, unilateral peripheral or peripheral central ground-glass infiltrations and/or consolidation and/or crazy paving pattern) for CT were evaluated

according to these criteria. Thoracic ultrasonography and magnetic resonance imaging examination results for investigation of those patients were not included in to the study.

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2.2 Statistical analysis and method

First, descriptive parameters (mean, median, number, and percentage) of the variables were evaluated. The numeric variables were checked to determine whether they fit the normal distribution. While comparing the two groups, Student's t-test was used for numerical variables with a normal distribution. The Mann-Whitney U test was used for numerical variables that were not normally distributed. The chi-square test was performed to compare categorical variables. A p-value <0.05 was considered as statistically significant. The Statistical Package for Social Sciences (SPSS Statistics for Windows. Version 17.0. Chicago:SPSS Inc.) was used for statistical analysis.

3. Results

A total of 225 pediatric patients who were PCR positive for COVID-19 or RVP were included in the study. Eighty one patients were positive for COVID-19 and 144 patients were positive for one of the other viral infectious agents studied in RVP. Among respiratory tract viruses, the most common cause was RSV detected in 56 patients, and the second most common agent was rhinovirus, which was positive in 33 patients. Figure 2 presents a pie chart showing the distribution of RVP agents detected in our study. The median age of all patients was 24 (7-96) months; it was 96 (17- 156) months with COVID-

19 positive patients and 17 (6-48) months for positive RVP factor($p<0.001$). One-hundred-thirty (57.8%) of all patients, 44 (54.3%) of COVID-19 positive cases, 86 (59.7%) of cases with positive RVP factor were male($p<0.431$). Thirty-four (42.0%) of the COVID-19 positive cases had a history of contact with COVID-19 patients. One-hundred-thirty-one (59%) patients, including 46 (58.2%) COVID-19 positive patients and 85 (59.4%) RVP positive patients, had additional diseases($p = 0.86$). PRISM and PELOD scores were statistically significantly higher in COVID-19 positive cases than in RVP positive cases. The median OSI was 6 (3.6-12) in all patients, and a statistically significant difference was determined compared to RVP positive patients 7.75 (5-13), and COVID-19 positive patients 3.65 (0-8.35) ($p = 0.016$). The most common symptoms reported by both groups were shortness of breath (76%), fever (47.1%), and cough (40%). Shortness of breath and fever symptoms were statistically significantly higher in RVP agents compared to COVID-19 positive patients. Age, gender, history of contact with a contaminated person, presence of other diseases, PRISM PELOD and OSI scores at presentation, and the most common symptoms at presentation are detailed in Table 1.

3.1 Chest X-rays of the patients (COVID-19/RVP)

A total of 213 patients had chest X-Ray exam. The chest X-Rays of 78 (36.6%) patients, 38 (51.4%) with COVID-19 positive and 40 (28.8%) with RVP positive results showed findings in normal range ($p = 0.020$) (Figure 3). Bilateral peribronchial thickening or pulmonary opacities were detected in 30 (21.6%) of the RVP positive patients and seven (9.5%) of the COVID-19 positive cases, with a statistically significant difference ($p = 0.042$). Multifocal or diffuse ground glass infiltration and/or consolidation [46 (21.6%)] and unilateral peripheral or peripheral central ground glass infiltration and/or

consolidation [27 (12.7%)] were the most common findings on chest radiographs without statistically significant differences between the groups (p = 0.223, p = 0.359, respectively) (Figure 4). There was no statistically significant difference in the other radiological parameters, such as bilateral peripheral subpleural ground-glass infiltrates and/or consolidation, unilateral segmental or lobar consolidation, central unilateral or bilateral ground-glass infiltration and/or consolidation, pleural effusion, and lymphadenopathy (p =0.520, p =0.563, p =0.589, p =1000, p =1000, respectively). Chest X-ray findings and statistical comparisons of the patients according to the groups are presented in Table 2.

Chest X-rays in COVID-19 positive patients had more normal findings compared to rhinovirus and RSV positive patients, and this difference was statistically significant (p = 0.029) (Figure 3). Unilateral segmental or lobar consolidation was more common in rhinovirus cases [six (18.8%)], and the difference was statistically significant (p = 0.038). Bilateral peribronchial thickening and/or peribronchial opacities, multifocal or diffuse ground-glass infiltrations and/or consolidation, unilateral peripheral or peripheral and central ground-glass infiltration and/or consolidation, and central unilateral or bilateral ground-glass infiltration and/or consolidation were common in all groups. There were no statistically significant differences for these chest X-ray features (p = 0.054, p = 0.793, p = 0.335, p = 0.230, respectively). Chest X-ray findings and statistical comparisons of the patients according to the groups are detailed in Table 2.

3.2 Computed tomography of the patients (COVID-19/RVP)

The CT scans of 11 (25.6%) of the COVID-19 positive and 8 (21.6%) of the RVP positive patients [for a total of 19 (23.8%) patients] were normal from the total of 80 patients evaluated with CT without statistically significant difference (p = 0.880) (Figure 5). Multifocal or diffuse ground-glass infiltration and/or consolidation [30 (37.5%)],

bilateral lower lobe predominantly peripheral and/or subpleural ground-glass infiltration and/or consolidation [10 (12.5%)], unilateral peripheral ground-glass infiltration and/or consolidation [six (7.5%)], effusion [16 (20%)], and lymphadenopathy [14 (17.5%)] were all common in both groups, with no statistically significant differences (p =1.000, p =0.097, p =0.681, p =0.082, p =0.074, respectively) (Figure 6). Findings such as halo sign in five (6.3%), crazy paving sign in four (5%), and discrete small nodules (tree-in-bud or centrilobular) were detected in 7 (8.8%) patients. Although these findings were more common in COVID-19 positive patients than in RVP positive patients, there were no statistically significant differences between the groups (p = 0.058, p = 0.120, p = 0.442, respectively). The CT parameters of the patient groups and the comparisons between the groups are presented in Table 2.

In the evaluation between the COVID-19/RSV/rhinovirus three groups, unilateral segmental or lobar consolidation was more common in rhinovirus cases than in the others [three (25.0%)]. (p = 0.010). There were no statistically significant differences between the three groups in findings such as multifocal or diffuse ground-glass infiltration and/or consolidation without specific distribution and unilateral peripheral or peripheral central ground-glass infiltrates and/or consolidation (p = 0.473, p = 0.980, respectively). It was determined that 78(36.6%) of patients whose x-rays were taken did not have pneumonia. No evidence of pneumonia was detected in the X-Ray radiographs taken in 38(51.4%) of the COVID-19 positive patients and 40(28.8%) of the RVP positive patients. There was a significant difference between the groups (p=0.020). Chest X-Rays taken in more than half of COVID-19 positive patients were normal. In 19(23.8%) of all patients, 11(25.6%) of COVID-19 positive patients and 8(21.6%) of RVP positive patients of chest CT was

normal and there was no statistical difference (p=0.880). The CT parameters of the patient groups and the comparisons between the groups are given in Table 2.

4. Discussion

In lung involvement, chest X-rays are often the first radiological method preferred due to low radiation exposure. The most common involvement of COVID-19 pneumonia on chest X-rays in children is peribronchial thickening and multifocal ground-glass infiltrates [5,9,10]. In our study, even if the half of the radiographs showed no abnormality, multifocal or diffuse ground-glass infiltration and/or consolidation and unilateral peripheral or peripheral central ground glass infiltration and/or consolidation were the most common findings observed on chest X-rays in initial evaluation of two days. In previous studies, the most common findings on chest X-rays of COVID-19 positive pediatric patients were reported as peribronchial thickening (58–86%), ground glass infiltrations (19–50%), and consolidation (18– 35%) [8,11]. The most common findings on chest X-rays of COVID-19 positive pediatric patients were like those in our study. Chest X-ray and CT findings were evaluated blindly by pediatric radiologists. They concluded that the chest x-ray abnormalities were not specific to COVID-19. Patients with COVID-19 had less number of peribronchial thickening and/or opacity than RVP-positive patients [11,12].

Unlike others (9–12%)[12], the rate of COVID-19 positive patients with normal chest radiography (51.4%) was higher in recent study. However, a study by Palabiyik et al[13]. actually did find normal chest radiograhy in 54% of patients as like us (51.4%) [11,13]. In this study, multifocal or diffuse ground-glass infiltration and/or consolidation

and unilateral peripheral or peripheral central ground glass infiltration and/or consolidation were the most common findings observed on chest X-rays.

The use of CT imaging in the diagnosis of COVID-19 infection in children is limited due to high-dose radiation exposure. While the CT scan is normal in most children 19(23.8%) and this all patients had chest x ray findings of disease when there are findings, the most common are bilateral 10(12,5) and unilateral 6(7,5) peripheral ground-glass infiltrations, crazy paving patterns 4(5), halo signs 5(6,3), and inverted halo signs. Children of all ages are susceptible to COVID-19. However, clinical manifestations are less severe than in adults and probably as a consequence the radiologic findings are less marked. Imaging should not be considered as a screening tool for diagnosis in children. If imaging is needed, chest radiograph is the first imaging modality of choice. CT findings of COVID-19 pneumonia are varied, and their specificity is low (25%) [14,15,16]. While patchy ground-glass infiltrations were identified in studies conducted in the early stages of the pandemic, lower lobe predominance and bilateral and multifocal involvement came to the forefront in subsequent studies[17,18].

Unlike a study by Steinberger et al.[19], in our study, the rates of CT examinations negative (of what) with normal CT imaging findings were relatively low 11 (25%) in COVID-19 positive patients. This may be related to the fact that all of the patients included in our study needed intensive care clinically and were followed in the PICU. In previous studies, the most common abnormal findings in CT scans of COVID-19 positive pediatric patients were ground-glass infiltration (86–88%), consolidation (14–58%), crazy paving pattern (29%), inverted halo sign (29%), and halo sign (29%) [19]. In the study by Steinberger et al., 86% of the patients were reported to have abnormal findings in the peripheral lung areas, while other studies reported that the abnormal findings

detected on CT were in the lower lobes (64-86%) [19,20] . In our study, abnormal CT imaging findings predominantly involved the lower lobes 8 (18.6%), and the peripheral location of the lesions was seen at a lower rate than in previous studies. CT should be reserved for complex cases, suspected complications or possible differential diagnoses, particularly in children with associated medical conditions. We can further evaluate lesions such as crazy pavement sign, halo sign, lung cavitation, which are not visible on X-Ray but in thorax CT. The most common finding on CT scans with COVID-19 was multifocal or diffuse GGOs without specific distribution in our study and this finding was seen in RVP patients with a similar ratio.

In this study, Foust et al. [8] Based on the International Expert Consensus Statement on Chest Imaging in Pediatric COVID-19 Patients. The Radiology Cardiothoracic Imaging consensus in 2020 reported some similarities between imaging findings of COVID-19 and other respiratory infections. In this consensus, only bilateral peribronchial thickening was found to be useful in differentiating RVP factor-associated pneumonia from COVID-19 pneumonia. However, this finding was not remarkable in CT examinations and we could not specifically address whether it was related with treatment or not.

4.1 Limitations

There are some limitations to this study. The RT-PCR result was applied as the reference standard alone. COVID-19 antibody testing could not be performed in all our cases. Another limitation is that only the first radiological images of all patients included in the study were evaluated. Since the patients subsequent images were not evaluated, changes such as healed or worsened lesions could not be compared. Patients with

positive test results were included in this study even if radiological imaging was normal. They either had a comorbid disease or were previously completely healthy

5. Conclusion

This observations have shown that viruses other than SARS-CoV-2 may also create ground-glass opacities (GGOs), multiple patchy consolidations, and peripheral or central involvement in the lung parenchyma similar to COVID-19. Although X-ray is a mandatory for management of semptomatic respiratory diseases in children, our study results show that CT is not suitable even appropriate to exclude COVID-19; therefore, RVP should be studied alongside the RT-PCR test. Specific COVID-19 treatment should not be initiated in cases with only thoracic CT findings; COVID-19 PCR and RVP should be studied, and supportive treatment should be given until the diagnosis is confirmed. Chest X-ray and CT findings in COVID-19 are non-specific and can be seen in any lower airway infection or pneumonia. Therefore, chest radiographs and CT have a limited role in differentiating COVID-19 from other childhood lung infections. Our study found that the specificity of thoracic CT was low, and it should not be used in children as long as possible due to radiation-related side effects. It is strongly recommended that thoracic CT should not be performed for diagnosis unless there is severe PARDS.

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Acknowledgments

We would like to thank the study group for their valuable contribution to the study on "Comparison of Radiological Findings of SARS-CoV-2 and Other Respiratory Viruses in Critically Ill Children During the COVID-19 Pandemic".

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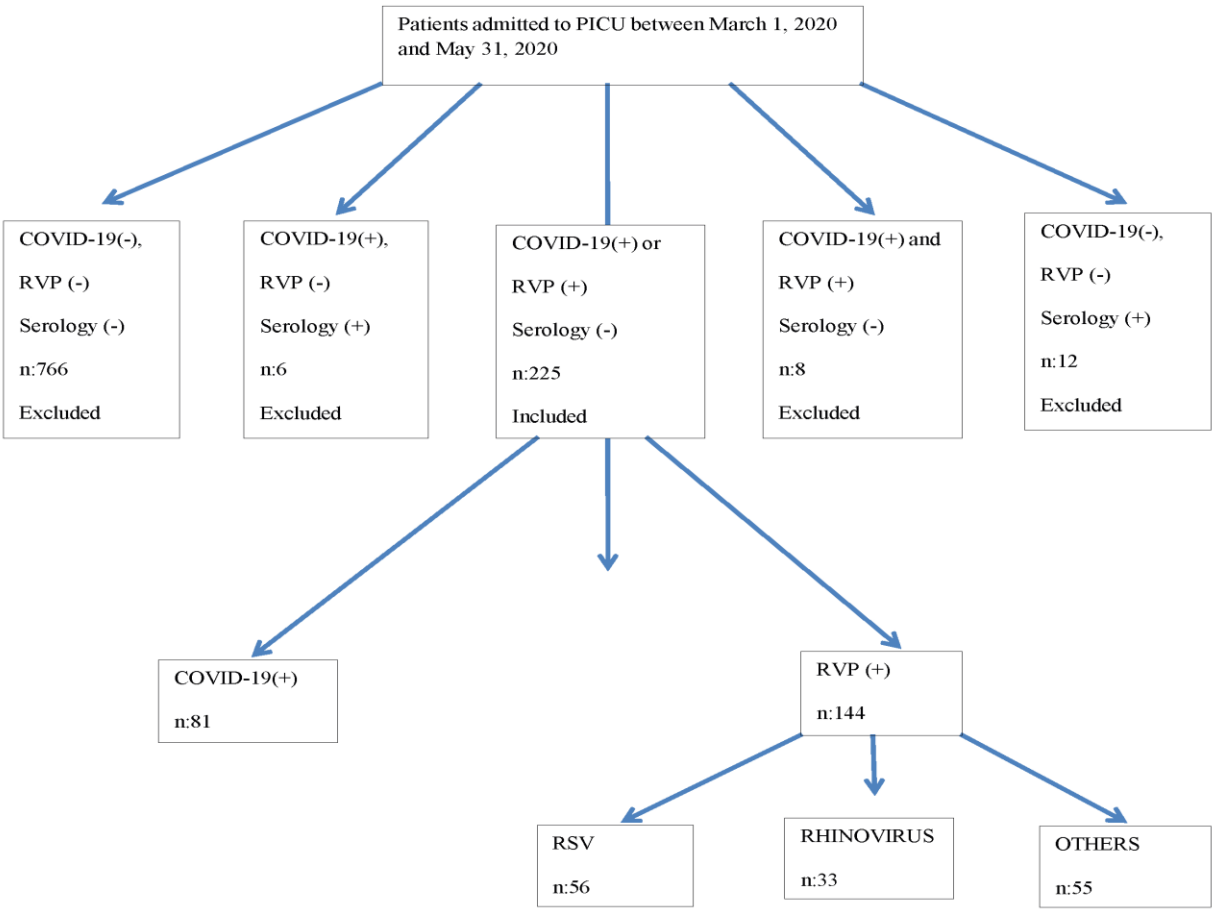
Figure 1. The diagram is as follows. Study flow chart included or excluded patients.



RVP: Respiratory Viral Panel, RSV: Respiratory Syncytial Virus

Figure 2. Respiratory Viral Panel. Viral etiologies detected in patients. The diagram is as follows.

RSV:56, **Rhinovirus**:33, **Influenza-A**:15, **Influenza-B**:10, **Parainfluenza:**9, **Bocavirus:**6, **Others**:15

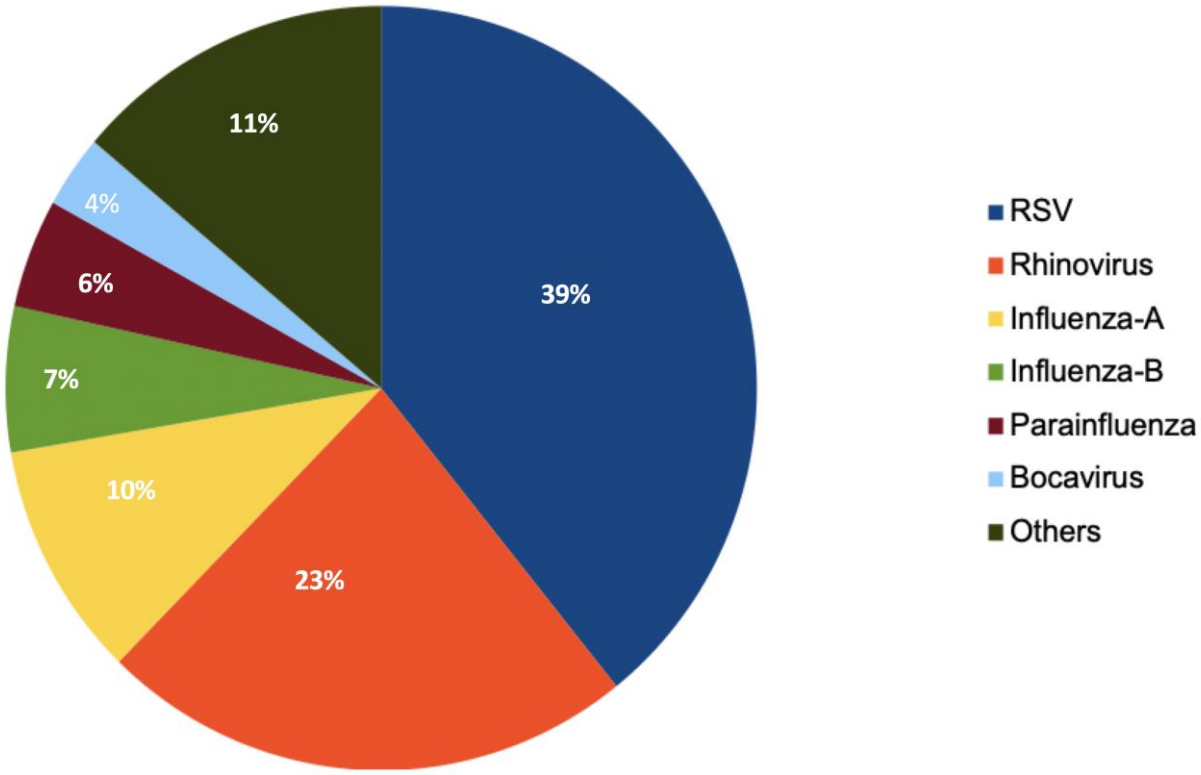


Figure 3

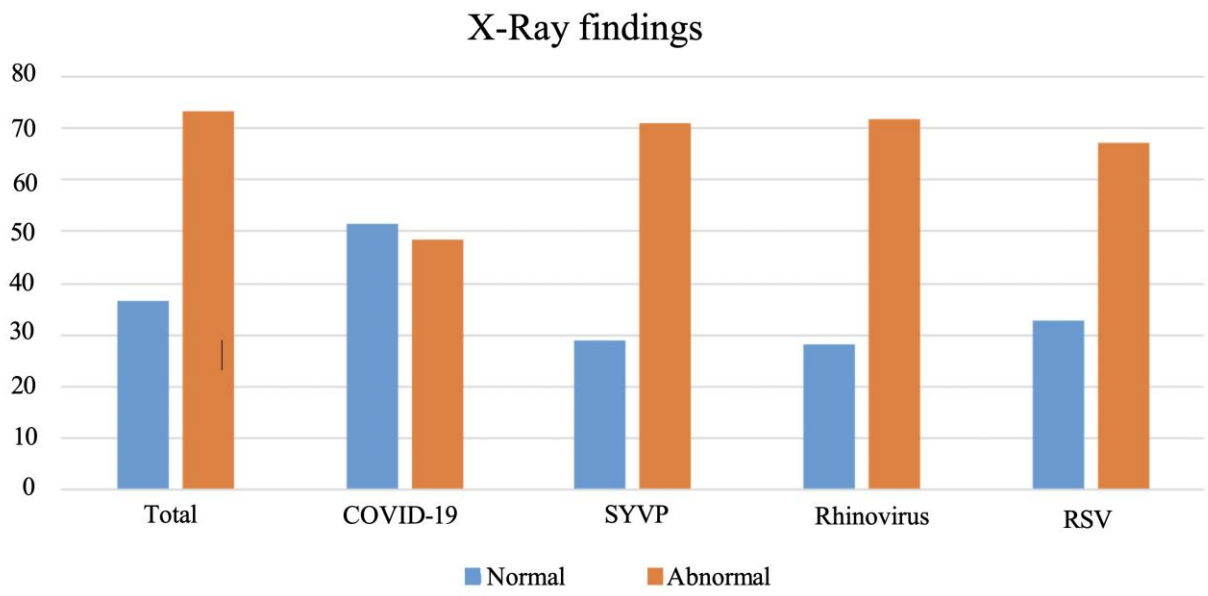
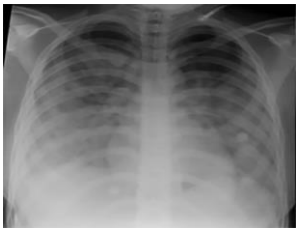


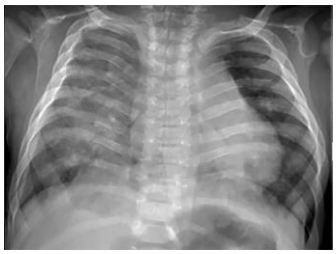
Figure 3. Findings of normal and abnormal chest X-ray ratios in COVID-19 and other viruses infected patients and total patients

Figure 4

A) Patient 221. 14 years old girl with autoimmune polyglandular syndrome. Bilateral mainly peripheral ground glass opacities was seen at middle and lower zones, on chest X-ray, diagnosed as COVID-19.



B) Patient 40. 1-year-old boy with Schinzel Giedion syndrome. Multifocal infiltrations were seen on X-ray, predominantly on right side. Hyperinflation was prominent especially in left lung. Rhinovirus was detected at RVP tests.



C) Patient 171. 1-month-old immigrant boy who had a history of contact with COVID-19 positive patient, Chest X-ray showed bilateral peribronchial opacities and overinflation. Diagnosis of RSV pneumonia was made after RVP tests.

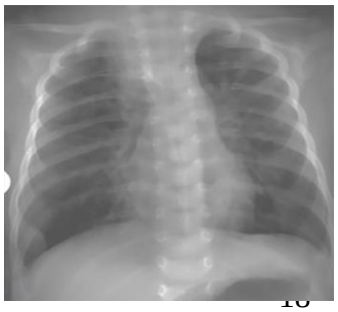


Figure 5

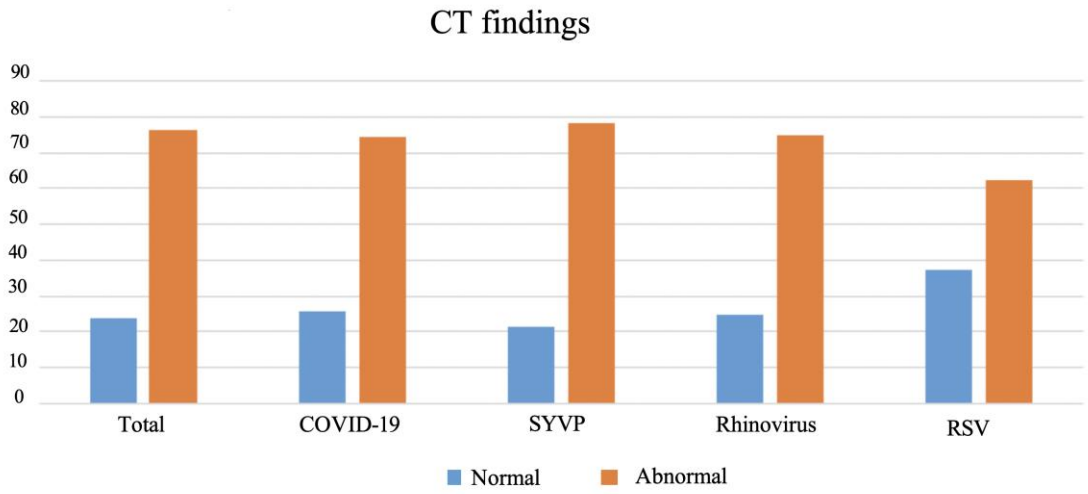
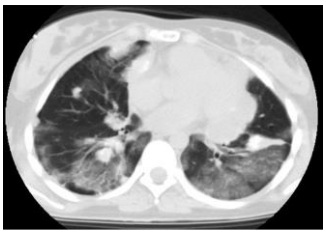
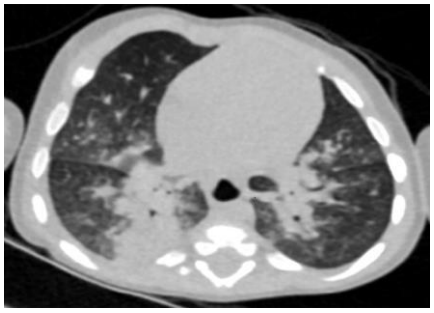


Figure 5. Normal and abnormal thorax computed tomography ratios in COVID-19 and other viruses infected patients and total patients

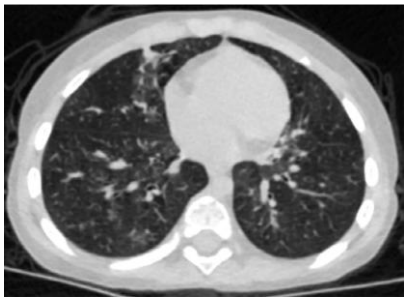
Figure 6



A) Patient 190. 17 years old girl, metastatic Ewing's sarcoma. Lower lobe predominance peripheral ground glass infiltrations and metastases in both lungs and mediastinum. PCR test for COVID-19 was positive.



B) Patient 40. 1-year-old boy with Schinzel Giedion syndrome (same patient with figure 1B). Patchy consolidations at parahilar regions in both lungs. Rhinovirus was detected at RVP tests.



C) Patient 27. 3 years old girl with immune deficiency syndrome (chronic granulomatous disease). Peribronchovascular infiltrations in both lungs. Diagnosis of RSV pneumonia was made after RVP tests.

TABLE 1.

Demographic and Clinical Characteristics of Patients Infected with Coronavirus Disease-19 and Other Respiratory Tract Viruses.

		COVID-19/RVPpositive PCR'			COVID-19/ Rhinovirus/RSV			
	Total (n:225)	COVID-19(n:81)	RVP(n:144)	p values	COVID-19	Rhinovirus(n:33)	RSV(n:56)	p values
Demographic characteristics								
Age(month)*,(IQR median	24(7-96)	96(17-156)	17(6-48)	**<0.001**	96(17-156)	11(4-36)	8(3-33)	**<0.001**
Male, no.(%)**	130(57.8)	44(54.3)	86(59.7)	0.431	44(54.3)	14 (42.4)	18 (32.1)	0.271
Severity of the disease								
PRISM III* score	7(3-12.5)	8(4-14)	6(3-12)	**0.026**	8(4-14)	8(3-11)	4(2-10.5)	**0.006**
PELOD-2*score	2(1-11)	10(4-11)	1(0-10)	**<0.001**	10(4-11)	3.5(1-11)	1(0-2)	**<0.001**
OSI*	6(3.6-12)	3.65(0-8.35)	7.75(5-13)	**0.016**	3.7(0-8.4)	5.8(4.8-0.2)	7(6-8)	0.126
FiO2*	50(40-60)	40(40-60)	50(40-60)	**0.003**	40(40-60)	50(40-60)	50(40-60)	0.113
Patient	50(22.2	34(42.0)	16(11.1)	**<0.00**	34(42.0)	7(21.2)	7(12.5)	**<0.001**

contact**	)			**1**				
Comorbidity**	131(59)	46(58.2)	85(59.4)	0.860	46(58.2)	17(53.1)	29(51.8)	0.736
Cough**	90(40.0)	29(35.8)	61(42.4)	0.335	29(35.8)	11(33.3)	32(57.1)	**0.023**
Fever**	106(47. 1)	44(54.3)	62(43.1)	0.104	44(54.3)	9(27.3)	25(44.6)	**0.028**
Shortness of breath**	172(76)	47(58)	125(86.8)	**<0.00 1**	47(58)	26(78.8)	53(94.6)	**<0.001**
Low SpO2**(<92%)	57(25.8)	17(21.0)	40(27.8)	0.261	17(21.0)	9(27.3)	12(21.4)	0.758
Crackles**	139(61. 8)	37(45.7)	102(70.8)	**<0.00 1**	37(45.7)	18(54.5	43(76.8)	**<0.001**
Rhonchi**	93(41.3)	20(24.7)	73(50.7)	**<0.00 1**	20(24.7)	16(48.5)	35(62.5)	**<0.001**
Lymhopenia**	98(44.1)	40(50)	58(40.8)	0.130	40(50)	10(31.3)	19(33.9)	**0.017**
Leukopenia**	41(18.2)	17(21)	24(16.7)	0.096	17(21)	4 (12.1)	6(10.7)	**0.038**
Anemia**	120(54. 5)	44(55)	76(54.3)	0.217	44(55)	15(46.9)	29(53.7)	0.113
Thrombocytopen ia**	51(22.9)	20(25.3	31(21.5)	0.633	20(25.3	5(15.2)	7(12.5)	0.140

Elevated CRP**	148(68.2)	56(72.7)	92(65.7)	0.363	56(72.7)	14(43.8)	36(66.7)	**0.017**
Elevated Procalcitonin **	52(41.9)	22(40.7)	30(42.9)	0.958	22(40.7)	3(33.3)	11(34.4)	0.536
Respiratory Failure**	183(81.3)	50(61.7)	133(92.4)	**<0.001**	50(61.7)	31(93.9)	50(89.3)	**<0.001**
Circulatory failure**	61(27.1)	20(24.7)	41(28.5)	0.648	20(24.7)	13(39.4)	6(10.7)	**0.006**

1 *; Median(IQR; 25%–75%), **; number (%) , RVP: Respiratory Viral Panel, RSV:

2 Respiratory Syncytial Virus, OSI: Oxygen Saturation Index, FiO_2: Fraction Of Inspired

3 Oxygen

TABLE 2

Radiological Comparison of Lung Involvement of Coronavirus Disease-19 and Other Respiratory Tract Viruses.

	Total	COVID-19	RVP(Total)	P values	Rhinovirus	RSV	P values
Chest-X-Ray	n:213	74	139		32	55	
Bilateral distribution peripheral and/or subpleural GGOs and/or consolidation	11(5.2)	5(6.8)	6(4.3)	0.520	1(3.1)	1(1.8)	0.276
Unilateral peripheral or periferocentral GGOs and/or consolidation	27(12.7)	12(16.2)	15(10.8)	0.359	4(12.5)	3(5.5)	0.335
Bilateral peribronchial thickening and/or peripheral opacities	37(17.4)	7(9.5)	30(21.6)	**0.042**	7(21.9)	13(23.6)	0.054
Multifocal or diffuse GGOs and/or consolidation without specific distribution	46(21.6)	12(16.2)	34(24.5)	0.223	4(12.5)	11(20)	0.793
Unilateral segmental or lobar consolidation	16(7.5)	4(5.4)	12(8.6)	0.563	6(18.8)	5(9.1)	**0.038**

Central unilateral or bilateral GGOs and/or consolidation	22(10.3)	6(8.1)	16(11.5)	0.589	5(15.6)	7(12.7)	0.230
Single round consolidation (round pneumonia+-air bronchogram)	0(0)	0(0)	0(0)	-	0(0)	0(0)	-
Pleural effusion	27(12.7)	9(12.2)	18(12.9)	1.000	5(15.6)	5(9.1)	0.762
Lymphadenopathy	2(0.9)	1(1.4)	1(0.7)	1.000	1(3.1)	0(0)	0.630
No findings suggestive of pneumonia	78(36.6)	38(51.4)	40(28.8)	**0.020**	9(28.1)	18(32.7)	**0.029**
CT	n:80	43	37		12	8	
Bilateral peripheral and/or subpleural GGOs and/or consolidation lowe lobe predominant pattern	10(12.5)	8(18.6)	2(5.4)	0.097	0(0)	0(0)	0.055
Halo sign	5(6.3)	5(11.6)	0(0)	0.058	0(0)	0(0)	0.139
Unilateral peripheral or periferocentral GGOs and/or consolidation	6(7.5)	4(9.3)	2(5.4)	0.681	1(8.3)	1(12.5)	0.980
Bilateral peribronchial thickening and/or peribronchial opacities	8(10)	3(7)	5(13.5)	0.461	0(0)	1(12.5)	0.506

Multifocal or diffuse GGOs and/or consolidation without specific distribution	30(37.5)	16(37.2)	14(37.8)	1.000	3(25)	3(37.5)	0.473
Crazy paving sign	4(5)	4(9.3)	0(0)	0.120	0(0)	0(0)	0.190
Unilateral segmental or lobar consolidation	5(6.3)	1(2.3)	4(10.8)	0.176	3(25)	0(0)	**0.010**
Central unilateral or bilateral GGOs and/or consolidation	3(3.8)	0(0)	3(8.1)	0.095	1(8.3)	1(12.5)	0.075
Discrete small nodules (tree in bud, centricolbular)	7(8.8)	5(11.6)	2(5.4)	0.442	1(8.3)	0(0)	0.574
Lung cavitation	2(2.5)	1(2.4)	1(2.7)	1.000	0(0)	0(0)	0.508
Pleural effusion	16(20)	5(11.6)	11(29.7)	0.082	2(16.7)	0(0)	0.824
Lymphadenopathy	14(17.5)	4(9.3)	10(27)	0.074	4(33.3)	0(0)	0.063
No findings suggestive of pneumonia	19(23.8)	11(25.6)	8(21.6)	0.880	3(25)	3(37.5)	0.897

1

2 X-ray: Chest X-Ray, CT: computed tomography, GGOs: Ground-Glass Opacities, RSV:

3 Respiratory syncytial virus