

# Radiological Perspective of Covid-19 Pneumonia in Tertiary Care Hospital, Karachi

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Perspective of  
Covid-19  
Pneumonia

Munir Hussain Siddiqui, Jawwad us Salam, Sadia Iqbal, Afshan Siddiqui, Salma Salman and Tabe Rasool

## ABSTRACT

**Objective:** To evaluate the radiographic patterns in COVID associated pneumonia in a tertiary care hospital of Karachi.

**Study Design:** Analytic study

**Place and Duration of Study:** This study was conducted in specifically designed COVID wards and HDU in Dow University Hospital, Karachi between 1st June 2020 to 15th July 2020, by reviewing the admission records of COVID diagnosed patients.

**Materials and Methods:** A total of 150 patients presented with pulmonary symptoms were evaluated for chest radiographs.

**Results:** Out of 150 COVID detected patients, 80 were males (53.33%) and 70(46.66%) were females with a mean age of 51.14±15.96 years. Frequent radiographic patterns were diffuse infiltrates occupying more than half lung field 56(37.33%), diffuse infiltrates less than half of lung field 45 patients (30%), lobar pneumonia in 9(6%) and cardiomegaly with basal infiltrates were observed in 7 patients (4.6%). Dominant symptoms were shortness of breath on exertion 105 patients (70%), fever 60(40%). The most common signs observed were hyperventilation 105(70%) and crepitation's 30(20%). The most common comorbidities observed in the study were Uncontrolled Diabetes 114(74%), Hypertension 76(50.6%), and ischemic heart disease 52(34.66%).

**Conclusion:** The majority of COVID detected with pneumonia were male, common radiographic patterns were pulmonary infiltrates. Lobar pneumonia and pleural effusion were rare findings and typically seen in severe disease where patients need mechanical ventilation.

**Key Words:** Pneumonia, COVID-19, coronavirus infections, clinical features, radiographic features.

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## INTRODUCTION

The Covid-19 infection came out as global plunder at the end of 2019 emerging from the city of Wuhan from China.<sup>1,2</sup> WHO officially announced it as a pandemic on 11 March 2020 spreading with a furious pace involving six continents across the world.<sup>3</sup> The clinical spectrum of Covid infection comprises multisystem involvement including CNS, GIT but predominantly involving the respiratory tract.<sup>4</sup>

Department of Medicine (& Allied), Dow International Medical College, Dow University of Health Sciences. Ojha Campus, Suparco Road, Karachi.

Correspondence: Dr. Munir Hussain Siddiqui, Associate Professor of Medicine, Dow International Medical College, Dow University of Health Sciences. Ojha Campus, Suparco Road, Karachi.

Contact No: 0345-2160441, 0332-2862759

Email: muneer\_hus\_sid@yahoo.com

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The primary symptomatology associated with Covid-19 infection include fever, dry cough, sore throat, fatigue and Pneumonia. Sometimes patients present with gastrointestinal symptoms for example diarrhea and abdominal pain. Advanced cases of COVID 19 disease can be complicated as ARDS, septic shock, metabolic acidosis, and coagulopathies<sup>5</sup> In some cases thromboembolic phenomenon is also noted. This thromboembolic phenomenon can present as blockage of major blood vessels of vital organs, which can lead to Myocardial Infarction, Acute kidney injury or Cerebrovascular accidents.

Most patients with covid-19 infection have a mild upper respiratory tract infection and do not progress to pneumonia.

The chest radiograph may be normal in up to 63% of people with covid-19 pneumonia, particularly in the early stages.

The standard diagnostic tool for confirmation of infection recommended by WHO is the reverse transcription-polymerase chain reaction RT-PCR. However, the contribution of imaging studies is under constant evolution both in terms of chest x-ray and CT scan.<sup>6</sup> Most recently, chest x-ray has been recognized as a first-line imaging technique by Italian Society of

Radiology (SIRM) while chest CT reserve for identification of Covid-19 in selected cases.<sup>7-9</sup> A normal chest radiograph does not completely exclude the covid-19 pneumonia. Not a single feature of covid-19 infection on a chest radiograph is specific or diagnostic, but a combination of multifocal lung changes for example ground glass opacities or typical consolidation, which are most commonly seen bilaterally, may be the diagnostic feature.

Similar to bacterial pneumonias, covid-19 pneumonia can cause increase in density of the lungs unilateral or bilateral. This may be easily seen as opacities in the lungs on chest X rays, but the intensity of this opacity depends on the severity of the disease. It conceals the lung markings that can be normally seen in chest x-rays; though, this may be deferred in appearing or may be absent.

Peripheral, coarse, horizontal white lines, bands, or reticular changes which can be defined, as linear opacities can also be seen in combination with ground glass opacities.

After the lung markings are partly masked by the increased whiteness, a ground glass pattern (ground glass opacity) forms on xrays. This can be a subtle and might need confirmation with a consultant radiologist. Once the lung markings are totally vanished due to the whiteness, it is called as consolidation (this is frequently seen in severe COVID-19 disease).

The British Society of Thoracic Imaging said that there is “no role for computed tomography imaging in the diagnosis of covid-19 unless the patient is seriously ill (NEWS score >3) OR if PCR is unavailable” and the American Society of Thoracic Radiology (STR) declares that “routine screening computed tomography for the identification of covid-19 pneumonia is currently not recommended by most radiology societies.”

However, it is interesting to note that CT is more reliable as compared to chest x-ray in term of sensitivity (97-98%).<sup>10-12</sup> But at the same time, difficulties encountered while performing a CT scan (like radiation exposure and repeated standard disinfection of equipment and lack of availability) has opened and pivoted way for a chest radiograph to be considered as the most widely utilized radiological tool. In addition to that, cross infectivity can be minimized to a major extent with the utilization of portable x-ray units on account of reduced patient mobilization and quick availability of results.<sup>7-9</sup>

Furthermore, radiological changes in Covid pneumonia can present with a variable spectrum such as peripheral (unilateral, bilateral) or diffuse involvement preferably involving middle and lower zones.<sup>13,14</sup> In particular, the most repeatedly observed manifestation in Covid pneumonia include ground-glass opacities, unilateral or bilateral lobar consolidations, peripheral infiltrates and

diffuse opacities while the least noticed x-ray changes are cavitation, pneumothorax, and pleural effusion.<sup>14,15</sup> The present study is designed to understand different x-ray changes associated with Covid-19 which will not only help in early identification of cases in whom the RT-PCR is false negative but will also contribute towards the timely management, ultimately results in a better outcome.

## MATERIALS AND METHODS

We conducted this observational, retrospective and descriptive study, in the department of Covid specified wards and HDU at Dow University Hospital, Karachi. The study conducted between 1st June 2020 to 15th July 2020, by reviewing the record of 150 COVID-19 diagnosed patients admitted with their documented signs, symptoms, and investigations including chest radiographs. Data entered in a prescribed proforma and then evaluated with 150 patients have a correlation between their symptoms, signs, blood CBC, acute phase reactant, and ABG's with chest radiographs. All of them were on conventional therapy comprising of antibiotics, anticoagulation, and methylprednisolone, with patients refractory to, were offered treatment with antiviral (remdesivir), IL-6 inhibitors (tocilizumab), or convalescent plasma therapy. Two consultants analyzed the radiographic patterns, symptoms, and signs assessed. The results were analyzed by SPSS version 19 with descriptive statistics.

## RESULTS

**Table No.1: Radiographic patterns**

S. No.	Radiographic patterns	Number of patients	%age
1	Pulmonary infiltrates > half of lung field	56	37.33
2	Pulmonary infiltrates less than half of lung field	45	30
3	Lobar pneumonia	9	6
4	Normal x ray	10	6.66
5	Infiltrate's with cardiomegaly	7	4.66
6	Reticulonoular shadow	3	2
7	Infiltrates in hemi thorax	2	2
8	Infiltrates with pleural effusion	2	2
9	Collapse of lung	1	0.66
10	Apical infiltrates	0	
11	Cavitatory lesions	0	

A total of 150 patients were admitted during the study period from 1st June till 15th July 2020. Majority were males (N= 80, 53.33%) while rest were females (N=70, 46.66%). The mean age was  $51.14 \pm 15.96$  years (Range: 7-84 years). Radiographic patterns are described in Table 1.

Frequent radiographic patterns were diffuse infiltrates occupying more than half lung field 56(37.33%) (figure 1), diffuse infiltrates less than half of lung field 45 patients (30%) (figure 3), lobar pneumonia in 9(6%) (figure2) and cardiomegaly with basal infiltrates were observed in 7 patients (4.6%). Dominant symptoms were shortness of breath on exertion 105 patients (70%), fever 60(40%). The most common signs observed were Hyperventilation 105(70%) and crepitation's 30(20%). The most common comorbidities observed were Uncontrolled Diabetes 114(74%), Hypertension 76(50.6%), and ischemic heart disease 52(34.66%).



**Figure No.1: Common Radiological patterns bilateral diffuse lung infiltrates**



**Figure No.2: Lobar pneumonia**



**Figure No.3: Diffuse bilateral infiltrates**

## DISCUSSION

Patients with COVID-19 infection can be present with fever, cough, and dyspnea. Though lethargy is common as in most of the viral infections but rhinorrhea, sore throat, and diarrhea are not common. Various reports have stated that initial imaging might show normal findings in 15% of individuals, so a normal chest imaging examination does not exclude the infection.<sup>5</sup>

A case series retrospective study of 64 patients admitted with covid-19 infection in Hong Kong indicate that 31% (20 patients) had normal chest xrays on admission. Out of those 35% (n=7) developed typical radiological changes on follow-up x rays. This study also proposed that peak radiological changes on chest radiography are seen between days 10 to 12 after onset of the symptoms.

A study published in Lancet described the clinical manifestations of corona virus disease in 41 patients.<sup>16</sup> showed abnormal chest imaging findings were observed in almost all the patients, with 40 having bilateral disease at initial imaging. In our study about 90 % of patients had pulmonary disease with the majority of them had pulmonary infiltrations bilaterally and only 2 patients have unilateral lung involvement. In this study, 30% of patients had more than half of the lung field involvement while only 6% of patients had pneumonic consolidation.

With reference to five case series studies,<sup>17,18,19</sup> and some case reports 20 have investigated the radiological features of COVID-19 infection. Pneumonia associated with COVID-19 disease has nonspecific and sometimes vague radiographic features. The typical findings include multifocal bilateral pulmonary infiltrations with patchy consolidations, prominent peripherally subpleural distribution, and preferred posterior part or lower lobe predilection.<sup>14</sup> We observe similar findings in our patients with predominant bilateral infiltrates (Figures-1).

Similar to our findings a quantitative meta-analysis of 2847 patients in China and Australia, and a multinational descriptive study of 39 different case reports of 127 patients, found that covid-19 pneumonia changes are frequently bilateral on chest xrays (72.9%, 95% confidence interval 58.6 to 87.1) and have ground glass opaqueness in 68.5% of cases (95% CI 51.8 to 85.2), though, those data are collective so it is very difficult to associate the radiological features to the duration and severity of the disease.

In a case series of 1099 admitted patients through laboratory established covid-19 infection from all over the China, of those 274 patients who had chest x rays on admission 162 (59.1%) showed clear cut abnormalities, most frequently "bilateral patchy opacities" (n=100, 36.5%). Out of 1099 patients 975 had computed tomography done but it remained unclear

that how many of the chest xrays were false negatives for covid 19 infecton.

Bilateral consolidation can be seen in severely ill patients, this usually merged to form a single massive consolidation with pleural effusion, known as “White Lung”.<sup>21,22</sup> This massive consolidation is seen only in 7 of our patients, so it indicates that massive consolidation is not a common complication in our region.

Pleural effusion, lung cavitation, lymphadenopathy, and calcification are rarely reported.<sup>23</sup> Similarly, these complications were hardly seen in our studied patients. Pericardial effusion is rare to identify in COVID-19 patients, with an incidence of approximately 5%, which may indicate the occurrence of severe inflammation.<sup>24</sup> Pericardial effusion and cardiomegaly were not seen in our study group.

## CONCLUSION

The imaging features in COVID-19 are inconstant. There is a significant overlap with those of other pathologies, namely Pleural Effusion, Cardiomegaly, cavitory lesions, and collapse of the lungs. Evidence suggests that chest imaging mainly x-rays will show abnormality in about 85% of patients, with 75% of patients having bilateral lung involvement which manifests as subpleural and peripheral areas of pulmonary infiltrates and consolidation. The outcome of the disease couldn't be predicted by seeing the Chest x-ray alone.

### Author's Contribution:

Concept & Design of Study: Munir Hussain Siddiqui  
Drafting: Jawwad us Salam, Sadia Iqbal

Data Analysis: Afshan Siddiqui, Salma Salman, Tabe Rasool

Revisiting Critically: Munir Hussain Siddiqui, Jawwad us Salam

Final Approval of version: Munir Hussain Siddiqui

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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