

# Novel coronavirus outbreak in Pakistan: challenges in imaging

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**Submitted**

March 15, 2020

**Accepted**

May 10, 2020

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**Citation:** Khan AN, Siddique U, Ghaus SG, Alam S, Gul S, Abid H. Novel coronavirus outbreak in Pakistan: challenges in imaging. [Review]. J Rehman Med Inst. 2020 Apr-Jun;6(2):24-6.

**ABSTRACT**

The article is meant to provide important information to Radiologists and Pulmonologists in evaluating patients of COVID-19 during this pandemic period. It describes the salient features of diagnosis and gives ideas about prognostication for this serious disease.

**INTRODUCTION**

Coronavirus outbreak, the novel coronavirus pneumonia (COVID-19), has been labeled a pandemic by the World Health Organization.<sup>1</sup> With less than 30 cases confirmed in Pakistan, number is suspected to increase, which is a great challenge facing Pakistan. It is highly likely that the number of cases in Pakistan will continue to rise substantially putting immense pressure on hospitals and intensive care units. Health department of Pakistan is active under government and emergency programs are being implemented at hospitals and public places all over the country. Pakistan has demonstrated time and again with dengue, polio and other diseases how all of the government and society's approaches can be made to work.

Diagnosis of COVID-19 includes dealing with symptoms, signs, laboratory tests and imaging. Imaging is critical in assessing severity and disease progression in COVID-19 infection. Major challenge in fighting with COVID-19 is that this situation is evolving rapidly, and the information provided keep on and even would be changing rapidly. Evidence shows that virus transmission can occur during the incubation period in asymptomatic patients. Moreover, high sputum viral loads have been found in a patient with COVID-19 even during the recovery phase.<sup>2</sup>

Although the radiological picture and CT findings described by authors for confirmed COVID-19 are nonspecific and can be seen in COVID-19 negative atypical infections and organizing pneumonia. Radiology still is the main go-to for pulmonologists and intensive care in suspected cases. A variety of imaging features have been described in similar coronavirus-associated syndromes. Radiologists play a role in diagnosing presence of pulmonary infiltrates in COVID-19. Radiologists should be aware of the imaging manifestations of the novel COVID-19 infection.

Radiographers are among the first-line health care workers who might be exposed to COVID-19. A set of comprehensive medical guidelines should be made for radiology community that may be of help as the radiological community has a central role in diagnosing and hence works to protect patients and health care providers. Diagnostic imaging facilities should have guidelines in place to manage individuals with known or suspected COVID-19 infection. The novel COVID-19 is highly contagious and is believed to transmit mostly through respiratory droplets, but there is uncertainty as to whether the virus can be transmitted by touching a surface or an item that is contaminated.

In this brief review, we discuss not only the radiologic features of coronavirus pneumonic imaging features, with a focus on the known imaging features of COVID-19 but also guidelines are suggested for radiology workers like precautions and safety measures for radiology department personnel in patients with known or suspected COVID-19. Radiological findings should be correlated with and observed as suggested by published material from American College of radiology,<sup>1</sup> BTSI,<sup>3</sup> ESR<sup>4</sup> and publications from China. Following important considerations and guidelines are mostly adapted from different recently published resources.

**1. Radiology referral form requirements:**

Ensure relevant clinical information is documented on radiology request for chest imaging like:

- Suspicion of COVID-19
- Infection risk - impacts on how, where and when patients are imaged
- Labs: WBC, Lymphocytes, CRP. Raised WCC / lymphopaenia - usually present in COVID-19-19. CRP - unusual to be COVID-19-19 +ve if CRP is normal
- Relevant respiratory history. Smoking history

**2. Precautions at Radiology Department:**

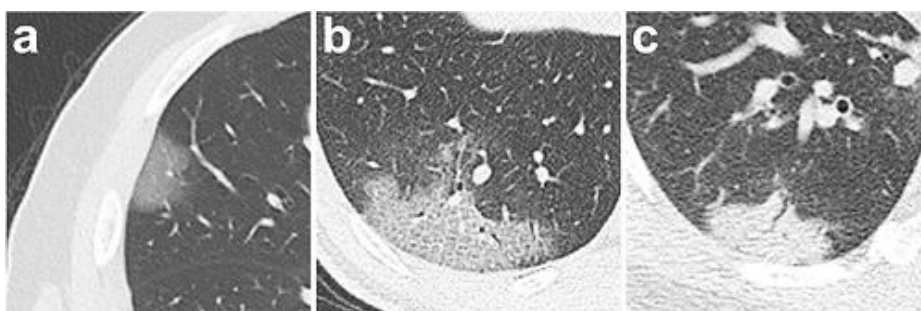
- a. Educating the radiology staff for thorough understanding of the routes of virus transmission for theirs and patients' safety is essential.

- b. Infection Control
- c. Keeping distance.
- d. Minimizing risk to staff.
- e. Portable X ray: for the purpose of diagnostic imaging in individuals with suspected or confirmed COVID-19, should be used to limit transportation of patients and dedicated radiographic equipment can decrease the risk for transmission from known infected individuals.
- f. Patient transfer to radiology: Droplets have the greatest risk of transmission within 3 ft (91.44 cm), but they may travel up to 6 ft (183 cm) from their source [19]. So, if a patient needs to be transported to the radiology department, he or she should wear a surgical mask during transport to and from the department.
- g. CT should not be used to screen for or as a first-line test to diagnose COVID-19. CT should be used sparingly and reserved for hospitalized, symptomatic patients with specific clinical indications for CT. Appropriate infection control procedures should be followed before scanning subsequent patients.
- h. Deep cleaning following Radiograph and CT scanning.

- Consolidations, Ground glass haze, patchy infiltrates.
- Peripheral predominance
- Bilaterality

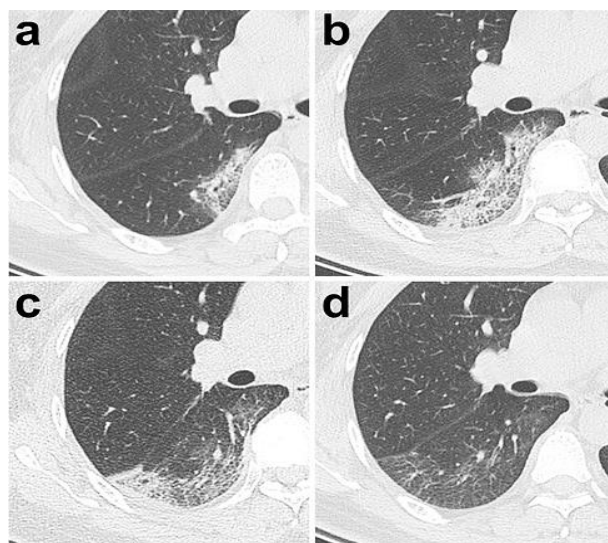
Clinical presentation of COVID-19 usually is acute illness with fever, flu like symptoms, cough and dyspnea. A recently published report in The Lancet described the clinical manifestations of COVID-19 in 41 patients<sup>5</sup> showed abnormal chest imaging findings were observed in all patients, with almost all having bilateral disease at initial imaging. This early report on the presentation of the COVID-19 patients indicated bilateral subsegmental areas of air-space consolidation, whereas in non-intensive care unit patients, transient areas of subsegmental consolidation were seen early, with bilateral ground-glass opacities being predominant later in the course of the disease. Another report on 99 individuals described similar imaging findings, with bilateral lung involvement in 75% and unilateral involvement in 25%.<sup>6</sup> Another study of five individuals in a family cluster described bilateral patchy ground-glass opacities, with more extensive involvement in older age members. No pleural effusion or cavitation has been reported so far, but pneumothorax was reported in 1% of patients (1 of 99) in a study by Chen and fellows.<sup>6</sup>

3. **Radiological Findings:**



**Figure.1:** Chest CT findings of COVID-19 pneumonia on transaxial images.<sup>7</sup>

- (a) GGO (b) Crazy-paving pattern (GGO with superimposed inter- and intralobular septal thickening).
- (c) Consolidation.



**Figure.2:** Typical evolution of CT findings in COVID-19 patient<sup>7</sup>

- (a) At presentation (day 3), a small region of subpleural GGO with partial consolidation demonstrated in the right lower lobe (b) Day 7, there was an enlarged region of GGO with superimposed inter-and intralobular septal thickening (crazy-paving pattern) with partial consolidation (c) Day 11, partial resolution of the initial GGO, with a new area of subpleural consolidation (d) Day 20, continued resolution with minimal residual GGO and parenchymal bands were observed.

**Role of Artificial Intelligence:** As patients with COVID-19 have varying imaging findings, radiologist presence is necessary and solely relying on artificial intelligence for diagnosis can be misleading especially considering similar CT findings in COVID-19 and nonCOVID-19 pneumonias. However, since multiple CT scans are done during the treatment, artificial intelligence can have a role in comparing multiple images as suggested by China's Ping An's chief scientist Xiao Jing.<sup>8</sup> He suggested that AI can effectively improve diagnostic accuracy and doctors' image-reading efficiency.

Although further investigations on the clinical and radiologic aspects of the COVID-19 are ongoing, imaging will continue to be a crucial component in patient management. Overall, the imaging findings are highly nonspecific and might overlap with the symptoms of H1N1 influenza, cytomegalovirus pneumonia, or atypical pneumonia. Clinical correlation here helps with the acute clinical presentation and history of contact with a COVID-

19 infected patient or history of recent travel to an eastern Asian country (eg, China, South Korea, or Japan).

Health Ministry of Pakistan and health care imaging facilities need to be prepared for the rising incidence of new cases of COVID-19. If appropriately prepared, radiology workers can take measures to manage the impact of the COVID-19 outbreak on the facility and personnel. Continued data collection and studies based from Pakistan are needed for imaging findings to be compared from those of already published studies from China.

A multidisciplinary committee comprising of representatives from health ministry, provincial health ministers and radiological society of Pakistan should convene to outline guidelines for imaging facility personnel to prevent virus spread thorough the department equipment or human-to-human contact, Implementation of which can provide protection against further transmission of the virus to patients and staff members.

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## REFERENCES

1. Kooraki, S, Melina Hosseiny M, Lee Myers L, Gholamrezanezhad A. Coronavirus (COVID-19) Outbreak: What the Department of Radiology Should Know. *J Am Coll Radiol.* 2020;17:447-51.
  2. Rothe C, Schunk M, Sothman P, Bretzel G, Froeschl G, Wallrauch C, et al. Transmission of 2019-nCoV infection from an asymptomatic contact in Germany. [Letter to the Editor]. *N Engl J Med.* 2020 Mar 5;382;10.
  3. [https://www.bsti.org.uk/media/resources/files/BSTI\\_COVID19\\_Radiology\\_Guidance\\_v1\\_13.03.20\\_9kzNSRs.pdf](https://www.bsti.org.uk/media/resources/files/BSTI_COVID19_Radiology_Guidance_v1_13.03.20_9kzNSRs.pdf)
  4. European Society for Radiology (ESR). Important resources for radiologists regarding COVID. [Accessed 2020 March 10]. Available from: <https://www.myesr.org/covid-19-resources>.
  5. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet.* 2020;395:497- 506.
  6. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet.* 2020;395:507-13.
  7. Pan F, Ye T, Sun P, Gui S, Liang B, Li L, et al. Time course of lung changes at chest CT during recovery from Coronavirus Disease 2019 (COVID-19). *Radiology.* 2020; 295:715-21.
  8. Bioworld. China uses AI in medical imaging to speed up COVID-19 diagnosis. [webpage]. [Accessed 2020 March 5]. Available from: <https://www.bioworld.com/articles/433530-china-uses-ai-in-medical-imaging-to-speed-up-covid-19-diagnosis>.
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