

# An Article on Pneumonia in Covid-19

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## Introduction:

Coronaviruses are large group of viruses that cause illness in humans and animals. Rarely, animal coronaviruses can evolve and infect people and then spread between people such as has been seen with and SARS outbreak in 2003 which started from China. The outbreak of Novel coronavirus disease (COVID-19) was initially noticed in a seafood market in Wuhan city in Hubei Province of China in mid-December, 2019, has now spread to 215 countries worldwide WHO declared COVID-19 a pandemic on 11th March, 2020. ACE-2 receptor has been identified as a functional receptor for SARS-CoV and is highly expressed on the pulmonary epithelial cells. Ranges from 1 to 14 days. Median incubation period around 5 days. Period of infectivity: from 2 days before symptom onset to around 7 to 10 days after Symptom onset. **Autopsy findings have revealed that** endothelial damage of pulmonary vasculature & micro vascular thrombosis and extensive alveolar and interstitial inflammation (known as diffuse alveolar damage) DAD. Macro vascular Thrombosis in Pulmonary and other Large and Medium sized Vessels cause large areas of Consolidation in the Lungs. One study found that 66 out of 70 people who had COVID-19 pneumonia still had lung lesions visible by CT scan when they left the hospital. A recent study Trusted Source followed up on 71 individuals 15 years after they had SARS, which develops from a related coronavirus. The researchers found that lung lesions decreased significantly in the year after recovery. However, after this recovery period, the lesions plateaued. Most people who get COVID-19 have mild or moderate symptoms like coughing, a fever, and shortness of breath. But some who catch the new coronavirus get severe pneumonia in both lungs. COVID-19 pneumonia is a serious illness that can be deadly.

## Pneumonia:

Pneumonia is a lung infection that causes inflammation in the tiny air sacs inside your lungs. They may fill up with so much fluid and pus that it's hard to breathe. You may have severe shortness of breath, a cough, a fever, chest pain, chills, or fatigue.

Antitussive and pain relievers that reduce fever. In the most serious cases, patient need hospitalization for help breathing with a machine called a ventilator.

Pneumonia is a complication of viral infections such as COVID-19 or the flu, or even a common cold. But bacteria, fungi, and other microorganisms can also cause it.

## Novel coronavirus-infected pneumonia:

The illness tied to the new coronavirus was originally called novel coronavirus-infected pneumonia (NCIP). The World Health Organization renamed it COVID-19, which is short for coronavirus disease 2019.

## COVID-19 Pneumonia Symptoms:

A fever, a dry cough, and shortness of breath are common early signs of COVID-19. Patient may suffer from,

- Fatigue
- Chills
- Nausea or vomiting
- Diarrhoea
- Belly pain
- Muscle or body aches
- A headache
- Loss of smell or taste

- A sore throat
- Congestion or a runny nose
- Pinkeye
- Skin rashes

If COVID-19 infection starts to cause pneumonia, patient may notice things like:

- Rapid heartbeat
- Shortness of breath or breathlessness
- Rapid breathing
- Dizziness
- Heavy sweating

### **Pneumonia after COVID-19**

About 15% of COVID-19 cases are severe. That means they may need to be treated with oxygen in a hospital. About 5% of people have critical infections and need a ventilator.

People who get pneumonia may also have a condition called acute respiratory distress syndrome (ARDS). It's a disease that comes on quickly and causes breathing problems.

The new coronavirus causes severe inflammation in your lungs. It damages the cells and tissue that line the air sacs in your lungs. These sacs are where the oxygen you breathe is processed and delivered to your blood. The damage causes tissue to break off and clog your lungs. The walls of the sacs can thicken, making it very hard for you to breathe.

### **Categorization of Severity of COVID-19:**

#### **Mild**

- Symptoms such as dry cough, sore throat, mild fever, body ache etc suggestive of **Upper respiratory infection** only
- Normal saturation, No Dyspnoea, Tachypnea, Tachycardia

#### **Moderate**

- Patients with Pneumonia but without signs of severe disease
- Saturation between 90 to 93 % on room air
- Respiratory Rate > 24/ min in adults

#### **Severe**

##### **Patient with severe pneumonia with**

- Severe Respiratory Distress
- Saturation < 90% on room air
- Hypotension
- Unconsciousness or altered sensorium
- Cyanosis

### **COVID-19 pneumonia imagine and specific respiratory complications for consideration**

In typical cases of COVID-19 pneumonia, the chest X-ray (CXR) shows multiple bilateral peripheral opacities (figure 1A). In some patients, the morphological pattern of lung disease on CT scan with regions of ground-glass opacification and consolidation, which variably comprise foci of oedema, organising pneumonia and diffuse alveolar damage, are not too far removed from those in patients with an acute inflammatory pneumonitis (figure 1B–F). The radiological changes in COVID-19 pneumonia do not appear to resolve fully in all patients and in some, inflammation matures to form residual pulmonary fibrosis (figure 2).

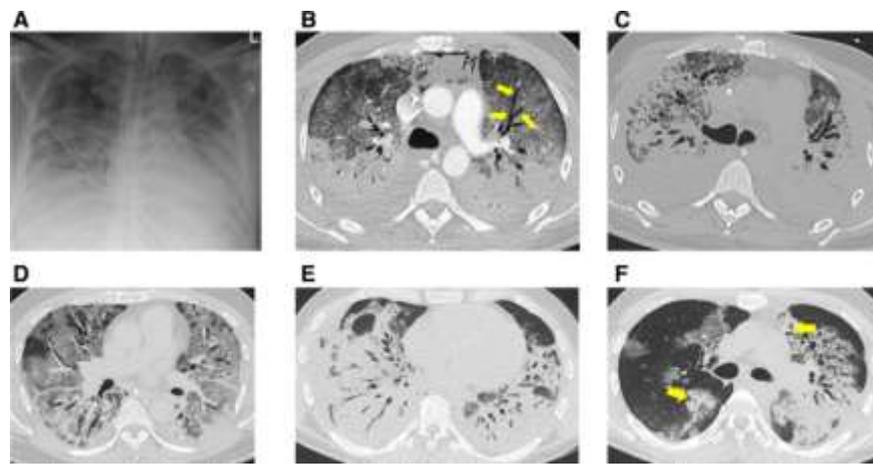


Figure 1

(A) Plain chest radiograph in a male patient with COVID-19 pneumonia referred for extracorporeal membrane oxygenation support. (B) CT images showing broadly symmetrical air space opacification with dependent dense parenchymal opacification and extensive ground-glass opacification with thickened interlobular and intralocular septa (the ‘crazy-paving’ pattern) in the non-dependent lung. Note that the airways are conspicuous against the ground-glass opacification but, importantly, taper normally (arrows) and have smooth walls. (C) CT performed 10 days later again showing widespread air space opacification but now with ‘varicose’ dilatation (non-tapering) of airways in the left upper lobe indicative of developing pulmonary fibrosis. (D) Classical ‘crazy-paving’ appearance in COVID-19. There is patchy but very extensive ground-glass opacification with superimposed fine thickening of interlobular and intralocular septa throughout both lungs. Relatively limited dense parenchymal opacification is present in the dependent lung bilaterally, likely to reflect variable combinations of the consolidated and atelectasis lung. (E) A patient with COVID-19-related acute respiratory distress syndrome (ARDS) with image section through the lower zones showing characteristic findings of ARDS with symmetrical air space opacification but with a gradient of increasing density from the ventral to the dorsal lung. (F) Image just below the carina demonstrating foci of non-dependent consolidation (arrows), conceivably denoting areas of organising pneumonia.



Figure 2

CT in COVID-19 extubated survivor: a study performed during recovery (26 days after onset of COVID-19 pneumonia). Image section at the level of the carina demonstrating widespread ground-glass opacification and considerable architectural distortion. There is definite CT evidence of fibrosis—note the varicose dilatation (‘traction bronchiectasis’) of the anterior segmental bronchus in the right upper lobe (arrows).

## Relation between Pneumonia and COVID-19



a) X-ray images of chest diagnosed as COVID-19



b) X-ray images of chest diagnosed as Pneumonia



c) X-ray images of chest diagnosed as healthy

### Risk Factor

Anyone can get COVID-19 pneumonia, but it's more likely in people who are 65 or older. Those who are 85 or older are at the highest risk.

People who live in nursing homes or who have other health problems like these also have higher chances of more severe illness with COVID-19:

- Moderate to severe asthma
- Lung disease
- High blood pressure
- Heart disease
- Diabetes
- Liver disease
- Renal failure
- Severe obesity, or a body mass index (BMI) of 40 or higher

Someone who has a weakened immune system may be more likely to get severe COVID-19 illness, too. This includes smokers, people being treated for cancer, people who have had a bone marrow transplant, people who have HIV or AIDS that's not under control, and anyone who takes medications that slow the immune system, like steroids.

Free COVID testing is available in most communities. Some locations require an appointment while others are drive-up. Check with local health department about testing availability.

## Diagnosis of COVID-19 Pneumonia:

Diagnosis of COVID-19 pneumonia based on symptoms and lab test results and oxygen saturation.

In mild cases CBC, CRP, RFT, LFT, D Dimer, RBS, ECG X-Ray Chest.

In Moderate cases Investigations suggested in Mild Cases **Plus**

- RBS, FBS/PP2BS and HbA1C if patient is diabetic or RBS is high
- Serum Electrolytes
- Serum Ferritin
- **Inflammatory markers** like CRP, Serum Ferritin, should be done at discretion of treating doctor
- Markers suggesting Cytokine storm should be done based on clinical suspicion by treating doctor
- IL 6 levels not to be repeated after administration of Tocilizumab

## Radiological features COVID-19

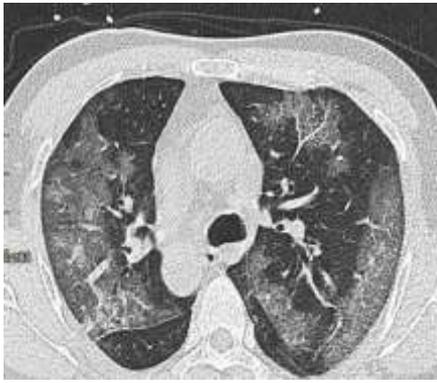
- Typical Chest Imaging findings in COVID -19 Include
  - **Chest Radiography:** Hazy opacities often rounded in morphology with peripheral and lower lung distribution
  - **Chest CT:** Multiple bilateral ground glass opacities, often rounded in morphology with peripheral and lower lung distribution
  - **Lung Ultrasound:** Thickened pleural lines, B Lines (multifocal discrete or confluent) consolidative patterns with or without air bronchograms



Ground glass opacity. Posterior-anterior chest radiograph of patient. Features include ground glass opacity in both mid and lower zones of the lungs, which is predominantly peripheral (white arrows) With preservation of lung marking. Linear opacity can be seen in the periphery of the left mid zone (black arrow)

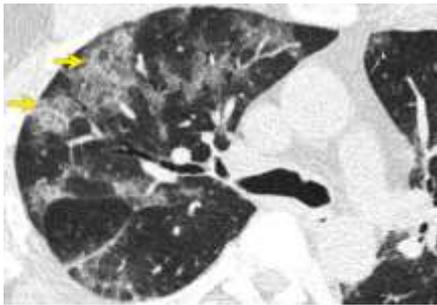


Consolidation. Anterior-posterior (AP) chest radiograph of patient B, a man in his 50s, with severe covid-19 pneumonia, showing bilateral dense peripheral consolidation and loss of lung markings in the mid and lower zones (outlined arrows)



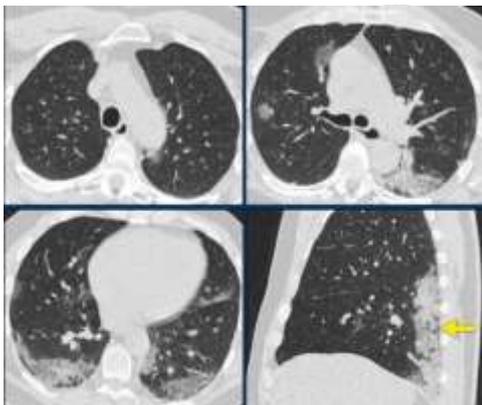
Ground glass (GGO) pattern is the most common finding in COVID-19 infections.

They are usually multifocal, bilateral and peripheral, but in the early phase of the disease the GGO may present as a unifocal lesion



#### Crazy paving

Sometimes there are thickened interlobular and intralobular lines in combination with a ground glass pattern. This is called crazy paving.



CT-changes over time		
<b>Early stage</b>	0-4 days	GGO, partial crazy paving, lower number of involved lobes
<b>Progressive stage</b>	5-8 days	Progressive (5-8 days): Extension of GGO, increased crazy paving pattern
<b>Peak stage</b>	10-13 days	Consolidation
<b>Absorption stage</b>	≥14 days	Gradual resolution

### Summary of potential chest radiograph findings in covid-19 pneumonia

- The chest radiograph may be normal in up to 63% of people with covid-19 pneumonia, particularly in the early stages
- Changes include ground glass (68.5%), coarse horizontal linear opacities, and consolidation. These are more likely to be peripheral and in the lower zones, but the whole lung can be involved
- Ground glass appearance is common in earlier presentations and may precede the appearance of consolidation
- Bilateral lung involvement is most common (72.9%)
- Signs suggestive of potential comorbidities on chest radiography might be obscured by signs of covid-19 pneumonia

### Treatments for COVID-19 Pneumonia:

Pneumonia may need treatment in a hospital with oxygen, a ventilator to help breathe, and intravenous (IV) fluids to prevent dehydration.

Clinical trials are looking into whether some drugs and treatments used for other conditions might treat severe COVID-19 or related pneumonia, including dexamethasone, a corticosteroid.

**In mild Cases:**

- Cold sponging for fever
- Tablet paracetamol 500mg one or one and half tablet
- Give Tab Paracetamol for symptomatic treatment of fever. If fever is not controlled with a maximum dose of Tab. Paracetamol four times a day, consult the treating doctor who may consider advising other drugs like non-steroidal anti-inflammatory drug (NSAID) (ex: Tab. Naproxen 250 mg twice a day).
- Antibiotics if indicated (Azithromycin/Doxycycline or as per treating doctor)
- Supportive treatment
  - Bed Rest
  - Vitamin supplements
  - Electrolyte solutions
  - Proton Pump Inhibitors
  - Inhalational Budesonide (given via inhalers with spacer at a dose of 800 mcg twice daily for 5 to 7 days) to be given if symptoms (fever and/or cough) are persistent beyond 5 days of disease onset
  - Systemic oral steroids not indicated in mild disease
  - If symptoms persist beyond 7 days (persistent fever, worsening cough etc.) consult the treating doctor for treatment with low dose oral steroids
  - Continue the medications for other co-morbid illness after consulting the treating physician

**In Moderate Cases:**

- Symptomatic treatment such as antipyretic (Paracetamol) for fever and pain, anti-tussive for cough
- Adequate hydration to be ensured
- Treatment of co-morbid conditions
- Oxygen Support: Target SpO<sub>2</sub>: 92-96% (88-92% in patients with COPD).
- The initial device chosen for administering oxygen (nasal prongs, simple face mask, or masks non-rebreathing reservoir bag) depends upon the severity of hypoxia and work of breathing
- In general simple nasal cannula is used, triple layered medical mask should be applied over it
- Injectable antibiotics like Inj Ceftriaxone
- **Anticoagulation**  
Prophylactic dose of Un-Fractionated Heparin (UFH) or Low Molecular Weight Heparin (LMWH) (e.g., enoxaparin 0.5 mg / Kg body wt per day SC)  
There should be no contraindication or high risk of bleeding [Contraindications: End Stage Renal Disease (ESRD), active bleeding, emergency surgery]  
Consider unfractionated heparin in ESRD
- **Anti-inflammatory or immunomodulatory therapy**  
Consider IV methylprednisolone 0.5 to 1 mg/kg OR  
IV Dexamethasone 0.1 to 0.2 mg/kg usually for a duration of 5 to 10 days
- **Review the duration of administration as per clinical response.** Patients may be initiated or switched to oral route if stable and/or improving

**COVID-19 Pneumonia Prevention:**

If you're in a high-risk group for COVID-19 pneumonia, take these steps to prevent infection:

- Wash hands often. Scrub with soap and water for at least 20 seconds.
- If you can't wash hands, use a hand sanitizer gel that's at least 60% alcohol. Rub it all over hands until they're dry.
- Try not to touch your face, mouth, or eyes until you've washed your hands.
- Avoid anyone who's sick. Stay home and avoid others as much as you can.
- Wear a cloth face mask if you have to go out.
- Regularly clean and disinfect surfaces in your home that you touch often, such as countertops and keyboards.

While there are COVID vaccines now available, they do not protect you from pneumonia. The pneumonia vaccine protects against a kind of bacteria, not the coronavirus. Still, it can support your overall health, especially if you're older or have a weak immune system.

## Summary

COVID-19 is a major health challenge throughout the world. Experts and authorities are working to develop and administer vaccines and enact other preventive measures.

The goal is for everyone to have access to a COVID-19 vaccine. While waiting for it to become available, follow all guidance from public health authorities and medical experts.

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