



# Coronavirus Disease in the Elderly Population: Structure, Pathogenic Process, Treatment and Prevention

Vahab Karamivand<sup>1,\*</sup>, Aida Mohammadi<sup>2</sup>

<sup>1</sup>School of Nursing and Midwifery, Kermanshah University of Medical Sciences, Kermanshah, Iran

<sup>2</sup>Student Research Committee, Kermanshah University of Medical Sciences, Kermanshah, Iran

**Email address:**

karamivandv@yahoo.com (V. Karamivand)

\*Corresponding author

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**Abstract:** *Background:* Currently, in countries with rapidly aging populations, the demand for medical care, health care, nursing and services is much higher than for others. Coronavirus outbreaks are a challenge for health care systems around the world. With the advent of Covid-19, new information about it is published every day. We know that Covid-19 has more severe effects on the elderly. Geriatric patients seem to be the most vulnerable group in COVID-19. The individuals with the most severe symptoms and the highest risk of death are the elderly and those with chronic illness. *Objective:* The aim of this study is to provide key points about the structure, pathogenesis and treatment of Covid-19 in the elderly. Because the elderly seem to be the most sensitive age groups due to their specific age conditions. *Result:* Research findings show that it is difficult for the elderly to recover from Covid-19 and that the disease has many complications. Due to various risk factors, the mortality of the elderly with Covid-19 is high. *Conclusion:* It is necessary to first design preventive protocols and then special treatment for the elderly living in homes and care centers to reduce mortality in this age group. This important step requires the cooperation of health care providers and families together. Given the existence of chronic diseases in the elderly and the long process of treatment in them, the best course of action is to design preventive programs and focus on it.

**Keywords:** Coronavirus, Elderly, Older Adults, Treatment, Diagnosis

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## 1. Introduction

Corona virus (COVID-19) presents with acute respiratory syndrome in any age group, and symptoms may vary from person to person. The first people to report COVID-19 were in the seafood market in Wuhan, Hubei Province, China, in December 2019, and the virus spread from person to person around the world and quickly became a pandemic. Worldwide, about 2 million people have been infected with COVID-19, and by mid-April 2020, more than 140,000 people had died [1]. Older adults with a variety of diseases and people with complex health conditions suffer from the most severe COVID-19 outcomes [2]. This review article provides recommendations for further protection of the elderly and vulnerable groups.

## 2. Coronavirus Structure and Pathogenic Process

Corona viruses are in the form of tiny spherical particles with a diameter of 150-100 nm. Inside the virus, its genome, which is a positive single-stranded RNA, is the largest RNA gene in viruses. RNA is positive in that it can be infectious on its own, but to a very small extent and rarely only under certain conditions. This RNA genome, which is located in the virus, can cause changes in its sequence that cause mutations in the virus that lead to changes in pathogenicity and viral virulence and its susceptibility to antiviral antibodies [3]. Although this mutation occurs during the genome amplification phase, it does not occur as much as the genomic changes in the influenza virus, because the influenza virus is more likely to recombine with other animal

viruses due to the fragmentation of the genome [4]. In the case of coronavirus, the changes occur due to a mistake in the polymerase enzyme that copies the RNA strand, and sometimes these errors cause severe mutations in the virus, causing changes in host susceptibility and pathogenicity and rapid growth, but most mutations cause mild mutations. Minor changes are made to the virus. The RNA genome is surrounded by a layer of proteins that make up the viral envelope, which is surrounded by a lipid envelope that the virus acquires as it matures and germinates from intracytoplasmic membranes [5].

In order for the Covid-19 virus to enter the cell, it must attach to the angiotensin-converting enzyme receptor, and when it enters the cell, the initial infection begins. One of the main ways for the virus to enter the cell is by binding to ACEA2 and TMPRSS2 receptors. And can be prevented by inhibiting protein-degrading enzymes. ACE2 receptors are widely distributed throughout the body and are present in most tissues and are specifically present in lung cells. Despite the high dispersion of ACE2 receptors in most tissues, only receptors on the intestinal and lung surfaces have favorable conditions for the virus to enter the cell and initiate primary infection. [6]. Covid-19 shows limited clinical manifestations associated with the upper respiratory tract, and it is thought that because nasal and oral cells do not have the gene expressing ACE2, these clinical signs are limited. The small intestine and pulmonary junctions correspond to the clinical signs of diarrhea followed by nausea and cough early in the period. Coronavirus infection reduces the expression of angiotensin-converting enzyme (ACE2) in lung cells [7]. Decreased ACE2 function after viral infection leads to dysfunction of the renin-angiotensin system, which affects blood pressure and fluid / electrolyte balance, and increases vascular inflammation and permeability in the airways [8]. Covid-19 disease also releases inflammatory cytokines such as (interleukin-beta)  $1\beta$ -IL, 6-IL, 8-IL, and 2-IL into the bloodstream. The secretion of these cytokines and chemokines attracts immune cells, especially monocytes and T lymphocytes, to the site of infection, the airways, which, with cell swelling, reduces the efficiency of gas exchange in the lungs. Involvement of immune cells in the airways may lead to lymphopenia and an increase in the neutrophil to lymphocyte ratio, which is seen in 80% of patients with CoV2-SARS infection. Viruses can spend most of their lives secretly in the cytoplasm of a cell and are difficult to distinguish from foreign viruses [9].

### 3. Transmission

So far, there is no exact information about the ways of transmission of this type of virus and most of the available information is based on the ways of transmission of other members of the corona virus family. The virus is usually transmitted from person to person through close contact (less than 2 meters away) and through contact with droplets and respiratory secretions of an infected person. Also, due to the transmission of the virus due to hand contact with infected

surfaces and then touching the mouth or eyes, caution is required. Typically, the transmission of respiratory disease viruses from an infected person to a healthy person occurs most often when the infected person has symptoms, but there are reports that the coronavirus in an asymptomatic infected person can also be transmitted to a healthy person. This feature provides the conditions for an epidemic in different communities [9]. In Covid-19, the latency phase is between 12-14 day. In other words, in the latent period, the virus is present in the body but there are no symptoms of the disease. It should be noted that the virus can be transmitted from an asymptomatic infected person to a healthy person during the incubation period and can also and infect it. Therefore, in the latent period, the test of carrier is positive [10]. The tendency of the virus to infect the lower respiratory tract, especially in debilitated elderly people who have direct contact and care with asymptomatic health care workers, is a serious threat to the health of the elderly in long-term care centers and nursing homes [11].

### 4. Clinical Manifestations

The presence of underlying diseases in the elderly as well as changes due to the aging process in various systems of the body, including the immune system can affect the nature and severity of clinical symptoms of the disease in the elderly [12]. According to the results of research, the most common symptoms in the elderly with Covid-19 are hyperthermia, cough, dyspnea, fatigue, anorexia, sputum, chest tightness, diarrhea, muscle aches, sore throat, nausea, dizziness, Vomiting, nausea, nasal congestion and runny nose, headache and confusion. However, many elderly patients with coronavirus may appear "silent" after being infected with the virus, or with nonspecific symptoms such as decreased activity, drowsiness, inability to eat, apathy, confusion, delirium, Loss of awareness of the environment, speech disorders, urinary incontinence, falls following loss of balance and fainting [13]. They may even be admitted to the hospital for the first time with trauma and secondary injuries such as injuries and fractures following a fall during activity or walking, and later Covid-19 is diagnosed during examination and testing. Like other viral respiratory diseases, such as SARS, MERS, and community-acquired pneumonia, Covid-19 usually affects the lungs first [14]. Early symptoms include haperthermia, cough, and dyspnea. These symptoms can occur within 2 or even more than 14 days of contact with the virus. Covid-19 causes different symptoms with varying severity. These symptoms are sometimes so severe that they cause death. Clinical symptoms are more severe in the elderly with diseases such as diabetes and hypertension, and the mortality rate is higher. This difference in the nature of the disease is due to the effect of the Covid-19 virus on the lungs [15].

### 5. Diagnosis

With the number of COVID-19 infections flying off the charts, accurate and rapid diagnosis has evolved as a tool to

detect and control the virus. Currently, various diagnostic tools have been approved by the WHO, which has recommended the collection of upper respiratory specimens using NP swabs. If not available, the CDC and WHO recommend the collection of OP, sputum, tracheal aspirate, bronchoalveolar lavage, blood, stool, and autopsy materials and lungs. However, the use of this test is limited to specific laboratories. This test identifies the IgM and IgG antibodies produced by the patient in response to SARS-CoV-2 infection.

Elderly people who have recently developed symptoms such as shortness of breath and cough and fever should be screened for Covid-19. But sometimes, in addition to respiratory symptoms in some elderly people, the symptoms may be mental and cardiovascular. Definitive diagnosis is currently performed by RT-PCR.

Diagnosis of COVID-19 should be required in any elderly person who has a new fever or respiratory symptoms such as a dry cough or difficulty breathing in a growing community. However the older patients may have atypical presentations like unexplained hypoxia, delirium, tachycardia. Seasonal flu testing and other respiratory pathogens may or may not be routinely performed based on the common circulation in the community. A study that analyzed the results of specimens obtained from various methods showed increased positive test results from samples obtained by bronchoalveolar lavage (BAL) fluid at 93% compared to 63% and 72% positive test results from samples obtained from sputum and nasal swabs, respectively.

## 6. Treatment

It is best to have a separate hospital for Covid-19 patients to reduce the risk of transmission to other patients. For suspicious patients, it is better to consider separate rooms until the final diagnosis, and patients who test positive should be admitted to a separate ward.

### 6.1. General Treatment

Due to shortness of breath, caloric intake increases in patients and should be considered a high-calorie diet. To maintain blood biochemistry and balance of the internal environment of the body, it is necessary to check the sodium-potassium-creatinine-urea tests, etc., if necessary. On the other hand, due to respiratory changes, it is necessary to monitor arterial blood gases in these patients.

### 6.2. Sputum Drainage

Hearing the sound of rale is a common finding in these patients and indicates the accumulation of secretions in the airway and may cause further airway obstruction. Occasionally, for physiological and pathological reasons, the cough reflex is reduced in the elderly, and airway suctioning may be required to remove the discharge.

### 6.3. Hydroxychloroquine

Hydroxychloroquine is a drug used to treat lupus and

malaria. Hydroxychloroquine probably prevents SARS-CoV-2 from entering the cell; there is limited information, mostly from case reports and small studies.

Hydroxychloroquine sulfate 200 mg or chloroquine phosphate 250 mg equivalent to 150 mg.

Gram the base amount (2 tablets every 12 hours on the first day and one tablet every 12 hours for at least 5 days.

Depending on the patient's clinical condition and at the physician's discretion) if chloroquine does not improve the initial symptoms.

Continue for a maximum of 10 days.

*Is hydroxychloroquine safe and effective for the treatment of COVID-19?*

Hydroxychloroquine is primarily used to treat malaria and several inflammatory diseases such as lupus and rheumatoid arthritis. Cheap and easily available.

Early reports from China and France indicated that severe symptoms of COVID-19 would improve rapidly if hydroxychloroquine was administered.

Currently, in a paper published in JAMA in December 2020, researchers report that hydroxychloroquine has no clinical advantage for adults compared with placebo because COVID-19 has not been admitted with respiratory disease. NIH Treatment Guidelines Use hydroxychloroquine for COVID-19, which is recommended for both inpatients and outpatients.

### 6.4. Cultra Tablets

Lupinavir / Ritonavir (50/200 mg every 12 hours 2 times a day for at least 7 days and up to

14 days

Atazanavir / Ritonavir tablets (300/100 One daily tablet with food or Atazanavir 400 mg daily Minimum

7 and a maximum of 14 days

Interferon beta-1b (1 b-β IFN) 250 micrograms by subcutaneous injection every other day in the amount of 5-7 doses.

Interferon beta-1a (1a-β IFN) 44 micrograms by subcutaneous injection every other day for 5-7 doses.

The role of corticosteroid administration in the treatment of Covid-19.

Based on the available evidence, corticosteroids have a proven therapeutic role in Covid disease.

They do not, but some studies have shown its beneficial effects.

Members of the Scientific Committee of the Ministry of Health and Medical Education recommend only if symptoms improve.

Patient and persistent need for oxygen Despite supportive therapies and <90% SpO<sub>2</sub>, corticosteroids can be administered at low doses.

Prescribe:

Dexamethasone 8 mg intravenously daily for a maximum of 10 days.

Or Oral prednisolone tablets (0 mg / kg for a maximum of 10 days) 5 and 50 mg prednisolone tablets. The full daily dose can be given after breakfast

**Important Note:** Higher doses of dexamethasone not only are less effective at this stage of the disease but may have side effects. It also has a disadvantage. Intravenous injection should be done slowly. Dexamethasone tablets are half a milligram and according to recommended dose, this number of pills is not recommended orally. In patients with gastrointestinal tolerance and hemodynamics. Oral prednisolone can be used stably.

### 6.5. Remdesivir

Remdesivir is a nucleotide analog drug that inhibits the RNA of viral polymerases. It has extensive activity against viral families, including philoviruses (e.g., Ebola) and coronaviruses (e.g., SARS-CoV and MERS-CoV. Alternately for at least 5 days) intravenously. Be prescribed.

It may be used to treat adults and children 12 years of age and older who weigh at least 88 pounds and are hospitalized for COVID-19. Experiments show that Remdesivir can speed up recovery time on average.

### 6.6. Corticosteroids

Corticosteroids can normally be potentiated as anti-cytokine agents. Corticosteroids bind to the glucocorticoid receptor, inhibiting proinflammatory cascades, if they amplify anti-inflammatory signals. The promising use of dexamethasone in reducing mortality in qibla liquefaction has been reported. In 6425 patients with moderate to critical COVID-19, 2104 were treated with dexamethasone versus 4321 with standard care. Compared with the standard care standard, the mortality rate of drug-treated COVID-19 was reduced by one-third and in other cases by only one-fifth with oxygen.

### 6.7. Dexamethasone

Glucocorticoids may moderate lung damage with inflammation and thus reduce the progression to respiratory failure and death. In a controlled, open-label trial of patients admitted with COVID-19, patients were randomly assigned to receive oral or intravenous dexamethasone (6 mg once daily) or SOC alone for 10 days. In the dexamethasone group, the mortality rate compared to the SOC group in patients receiving invasive mechanical ventilation (29.3% vs. 41.4%) and among those receiving oxygen without invasive mechanical ventilation (23.3% vs. 26.2%) The percentage was lower among those who did not accidentally receive respiratory support (17.8% vs. 14.0%).

Many doctors, since the epidemic 19-COVID Many patients are treated with corticosteroids. This method makes sense for those who are too immune to a viral infection.

Dexamethasone and other corticosteroids such as (prednisone, methylprednisolone) are potent anti-inflammatory drugs.

NIH COVID-19 treatment guidelines recommend the use of dexamethas More than doctors, it took everyone a while 19-COVID treats the use of RAV with corticosteroids. This method makes biological sense for people who are overly

immune to the virus.

Dexamethasone and other corticosteroids such as (prednisone, methylprednisolone) are potent anti-inflammatory drugs.

NIH COVID-19 Treatment Instructions The use of dexamethasone in a particular person admitted with COVID-19 is highly recommended. This suggestion is to improve the results of the recovery test. In this study, more than 6,000 patients were randomly assigned to use COVID-19 using either injection or standard treatment. one in certain patients with severe COVID-19.

### 6.8. Anticoagulants

These drugs, like corticosteroids, are used for patients with severe symptoms. The purpose of this work is to prevent the formation of blood clots in the body of patients, which is one of the serious complications of Covid 19.

Almost all people with COVID19 are hospitalized to receive medication to prevent blood clots.

The plasma donor produces about enough plasma to treat one to three patients. Plasma donation should be such as to weaken the immune system and cause the person to become infected.

### 6.9. Ticoplanin

It is an antibiotic used to treat bacterial infections, is active against SARS-CoV, and is one of the drugs used to treat COVID-19. Against viruses such as Ebola, influenza virus, flav virus, hepatitis C virus, HIV and coronaviruses such as MERS-CoV and SARS-CoV are effective. Ticoplanin acts at the beginning of the virus life cycle, destroys the pH, does not block the viral spike protein by cathepsin L in late thought, causes the RNA gene to be edited.

Favipiravir (FPV) is an oral anti-influenza drug in which RNA polymerase is dependent on RNA (RdRP) because if activated in the phosphorylated form, it is converted in the cell and acts as an RNA polymerase inhibitor. It is also a broad-spectrum drug that inhibits the proliferation of flavivirus, polio virus, rhinovirus, film virus and arena viruses. Dosage for the first day: 1600 mg twice a day, second to fifth days: 600 mg twice a day, but for the treatment of COVID-19 600 mg with 1600 mg loading for more than 14 days.

The oxygen saturation of patients without lung disease is 92-96%. HFNC and CPAP can persist for a long time for patients who do not respond to normal oxygen. NIV is only recommended for patients with hypercapnic insufficiency.

Evidence for effective treatment of Covid-19 is now rapidly advancing. Outpatients can be managed at home. Instead, people with hypoxia, respiratory distress, need more care and even ventilation. So the most important way is prevention.

Actions that can help reduce symptoms include:

Get plenty of rest.

Drink plenty of water.

Take acetaminophen to reduce fever. In the case of

acetaminophen, the total daily dose used should not exceed 3,000 mg.

*Why is it so difficult to provide treatment for viral diseases?*

An antiviral drug must be able to target a specific part of the virus life cycle that is necessary for reproduction. In addition, an antiviral drug must be able to kill the virus without destroying the occupied human cell. And viruses are very compatible. Because they reproduce rapidly, they have a good chance of mutating (changing their genetic information) with each new generation and potentially creating resistance to any drug or vaccine they produce.

The WHO initially recommended the use of acetaminophen and ibuprofen to help reduce the fever and pain associated with this coronavirus infection, but has now stated that acetaminophen can be used instead of ibuprofen. Rapid changes in recommendations create uncertainty. Because some physicians are concerned about NSAIDs, the first choice of acetaminophen still seems cautious, with an overall dose of more than 3,000 mg per day.

However, if you suspect or know you have COVID-19 and cannot take acetaminophen, or have taken the maximum dose and still need relief from symptoms, over-the-counter ibuprofen should not be specifically avoided.

#### 6.10. Vitamin D and C

There is some evidence that vitamin D can protect against COVID-19 infection and the development of serious symptoms. For example, people with low vitamin D levels may be more prone to upper respiratory tract infections. A meta-analysis found that people who had low levels of vitamin D and took vitamin D supplements were less likely to develop acute respiratory infections than those who did not.

Vitamin D may protect against COVID-19 in two ways. First, it helps to strengthen our body's natural defenses against viruses and bacteria. Second, it helps prevent an exaggerated inflammatory response.

Our bodies make vitamin D when exposed to the sun. Five to 10 minutes of sun exposure on some or more days of the week without sunscreen on your hands, feet or back will enable you to get enough vitamins. Good dietary sources of vitamin D include fatty fish (such as tuna, mackerel and salmon), foods fortified with vitamin D (such as dairy, soy milk and cereals), cheese and egg yolks.

The recommended dose of vitamin D in the diet is 600 IU daily for adults 70 years and younger and 800 IU daily for adults 70 years and older. Daily supplements containing 1000 to 2000 IU of vitamin D are safe for most people. For adults, the risk of adverse effects is higher than 4000 IU per day.

Some people with COVID-19 have been treated with high doses of intravenous vitamin C (IV) in the hope that it will speed recovery. Under these circumstances, there is no convincing scientific evidence that it is effective for the effects of COVID-19.

There is also no evidence that he is taking vitamin C to help with the COVID-19 virus. In situations where standard doses of vitamin C are generally harmless, high doses can

cause side effects, including a threatening condition, increasing the risk of muscle stones.

## 7. Prevention

People over 60 with any of the following conditions:

- 1) Chronic heart and liver disease. Diabetes, high blood pressure, dialysis people.
- 2) Chronic respiratory diseases, such as asthma, COPD, bronchitis, emphysema, cystic fibrosis, severe asthma.

Chronic neurological diseases such as Parkinson's, MS, learning disabilities, cerebral palsy.

Spleen problems such as sickle cell disease.

Weak immune systems against HIV and AIDS, or medications such as steroids or chemotherapy.

- 1) A person who has an organ transplant and is taking immunosuppressive drugs.
- 2) People with cancer undergoing active chemotherapy or radiotherapy, blood cells or bone marrow at any stage of treatment.

### 7.1. Dos

Get in touch with family and friends over the phone, internet and social media.

Use telephone or online services for other essential services, drug delivery, banking, food delivery, etc.

Wash your hands with soap and water for at least 20 seconds, especially after a cough, sneeze or sneeze, or in a public place. If soap and water are not available, use an antiseptic that contains alcohol and at least 70% alcohol.

When coughing or sneezing, use a handkerchief or sleeve to cover your mouth.

- 1) Avoid touching surfaces in public places - elevator / lift buttons, door handles, railings. If you have to touch something, use a handkerchief or sleeve to cover your hand or finger.
- 2) Avoid losing, avoid hugging and kissing.
- 3) Keep a distance of at least 1 meter (3 feet) with everyone.

Contact your doctor to find out about additional COVID-19 outbreaks in your community and long-term home remedies.

- 1) Have enough household items and food available to stay home for a significant amount of time.
- 2) Cleaning and disinfecting the house to kill germs: Routine cleaning of surfaces you normally touch (eg, tables, door handles, light switches, handles, tables, toilets, faucets, sinks And cell phones) Practice using available disinfectants.

### 7.2. Do Not

Never touch the eyes, nose and mouth with unwashed hands.

- 1) Avoid traveling if necessary.
- 2) Do not go to the hospital for a health check-up and use the telephone to call your doctor.

3) Stay away from large communities.

## 8. Conclusions

Due to the harmful effects of this disease in all age groups, especially in the elderly, it is necessary to first design preventive protocols and then special treatment for the elderly living in homes and care centers to reduce mortality in this age group. This important step requires the cooperation of health care providers and families together. Given the existence of chronic diseases in the elderly and the long process of treatment in them, the best course of action is to design preventive programs and focus on it.

## Conflict of Interest

The authors declare that they have no conflict of interest.

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