Original Article: Investigation of the Effects of Covid-19 on Different Organs of the Body

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ABSTRACT

This study investigated the effects of Covid-19 on body postures. Specialists around the world are now conducting clinical trials and research to understand why some patients recovering from Covid-19 have long-term complications. The coronavirus primarily affects the respiratory system and can cause pneumonia and endanger human life. Other research shows that the disease can cause blood clots and inflammation in many parts of the body, and even in mild cases. Covid-19 can also be seen. This indicates the great need to take care of yourself against the disease. The recovery time from Covid-19 disease varies from person to person. Many people feel better in a few days or weeks, and most will recover within 12 weeks, but in some people, the symptoms may last longer. The likelihood of long-term symptoms does not appear to be related to how the disease occurred when you first contracted the coronavirus, and people who have experienced mild Covid-19 may also have long-term symptoms. The corona virus, especially its newer form, the delta corona, does not only attack the lungs; The heart, kidneys, brain, arteries, nerves, and skin are other organs that have been shown to affect the function of a new mutation in the Covid-19 virus.

Introduction

If you have Covid-19 disease, it is the same disease as the newly discovered coronavirus infection. You have a century [1-3]. However, if you go to the hospital with severe symptoms of shortness of breath and persistent cough and are hospitalized for intensive care, you are significantly and seriously exposed to all kinds of risks of this disease. According to studies conducted in the latest research, researchers have concluded that one in six people with this disease suffers from severe complications that threaten their lives.

An infection thus causes your immune system to fill your bloodstream with inflammatory proteins called cytokines [4]. They can destroy tissue and cause serious damage to vital organs of the human body, including the lungs, heart and kidneys. An autopsy study of 44 patients who died of coronary artery disease showed persistent virus particles in various parts of the body, including the brain and heart, up to 230 days after the onset of symptoms [5].

Recent studies show that the corona virus can

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spread to the brain and heart within a few days of infection and survive for months in the organs. This study by the US National Institutes of Health is one of the most comprehensive studies on how the virus multiplies in human cells and survives in the body. Due to the high prevalence of coronary heart disease in the world, researchers conducted a study to investigate the frequency of multi-limb disease in patients with Covid-19 admitted to the teaching hospitals of Shahid Beheshti University of Medical Sciences [6].

For this study, which was performed in the first half of 2021, 600 patients with COVID virus 19 admitted to Imam Hossein and Shohada Tajrish hospitals were studied. Of the 600 patients in the study, about 60% were male and about 93% were married, and the mean age of the patients was about 60 years [7].

The findings of this study indicate that the highest percentage of organ damage was lung damage (about 91%). Then damage to the number of blood cells (about 60%), liver (about 28%), heart (26.5%), kidneys (about 24%), gastrointestinal tract (22.5%), coagulation system (about 16%) and the olfactory and taste systems (about 9%) were the most affected by coronary heart disease [8].

Evaluations also showed that the majority of patients (about 32%) had damage to two organs, 29% had damage to three organs, 15% had damage to one organ, and about 24% had multi-organ damage. In this study, it was found that there was no statistically significant relationship between gender and multi-organ damage in coronary heart disease, while there was a significant relationship between mean age and multi-organ damage. This means that older people were more likely to have multi-organ injuries. Also, patients who underwent intubation (intubation) were more likely to have multiple organ injuries. People with a history of the disease also had more organ damage. In conducting this research, Sahar Mirbaha, Mohammad Mehdi Forouzanfar, Saeed Safari, Behrouz Hashemi, Anya Jafari and Atefeh Kaveh; Researchers from the Medical School of Shahid Beheshti University of Medical Sciences participated. Findings of this spring study in the form of a scientific article entitled "Frequency of multi-organ damage in patients with coronary heart disease; A cross-sectional study "has been published in the Iranian Journal of Emergency Medicine. In coronary heart disease, muscle weakness is one of the complications that gradually disappears. In some people it may take 2 weeks and in others it may last up to six months. Coronary complications may persist for weeks or months in some recurrences that are not permanent. Coronary side effects such as muscle weakness, body aches, cough or anorexia may be seen in some people until a few months after recovery, which gradually disappears [9-11]. There are such complications in some patients, which occur according to the person's immune system, the severity of the conflict, the course of the disease and the amount of antibody secretion. Muscle weakness is one of the complications that gradually disappears in some people for 2 weeks. Long-term side effects are not a sign of coronary heart disease, as they usually go away three to four weeks after the onset of symptoms, but some side effects remain and will go away over time. Studies show that some biological characteristics of men make them more vulnerable to coronary heart disease than women [12]. Among other things, the presence of ACE enzyme in men is higher than women, which is considered a factor in causing infection. On the other hand, in some studies, the presence of estrogen in women has been considered as a factor for faster recovery and reduction of the severity of the disease in women. However, the evidence suggests that most men are biologically vulnerable to Covid-19 disease [13].

The fact that the majority of men work as breadwinners means that they have more contact with the outside world than other family members and are at greater risk. They should assume that those around them are family, neighbors, co-workers, friends and acquaintances and infected. Only by accepting this principle will they pay attention to their personal protection and observe the maximum of hygienic principles and comprehensive precautions [14]. Observance of the principles of personal protection in the workplace based

on the relevant protocols in this age group is very important. Most high-risk occupations are either masculine, or even if both men and women are employed, more men are affected and have more severe symptoms. The incidence of morbidity and mortality was higher in men in health care than in women.

Employers should adopt infection control strategies based on an accurate risk assessment using an appropriate combination of engineering and management controls, safe working practices, and personal protective equipment to prevent worker exposure. To prevent exposure to the corona virus at work, employers are required to train workers in anti-pollution components, including personal protective equipment. Men in the workplace also need to take the principles of coronary heart disease seriously. In general, employees who are most exposed to coronavirus include health care workers, health workers, occupational health centers and occupational health centers, and burial staff. Staff of medical diagnostic laboratories, officials and staff of airports, airlines, railways and subways, all means of public transport, buses, taxis and border guards, staff of garbage collection, waste or sewage, garbage collectors, staff who travel regularly. Specially to infected areas. Thus, preventive and control measures to protect workers from exposure to coronary heart disease and its incidence depend on the type of work performed and the risk of exposure to it, including the potential for contact with infected people and contamination of the workplace. The majority of men are also responsible for purchasing essential household items and are at greater risk. Therefore, they should dedicate the purchase only to the supply of basic materials needed. These main goods include detergents, disinfectants, and health and medicine and food. Note that the supply of any goods is not more important than the above goods. Also, minimize the number of purchases and try to buy the required items in one place [15].

The impact of cultural issues on men

One of the most important challenges is the misconception of men that men are superior and stronger than women, and thus neglect to focus on their own health. It is with these beliefs that men are less likely to go to the health center and get tested, or less likely than women to follow defined hygiene principles such as frequent hand washing, wearing masks and gloves (Figure 1). The publication of statistics on the incidence and mortality of men due to coronary heart disease is one of the cases that can be effective in breaking this misguided approach to corona protection [16].

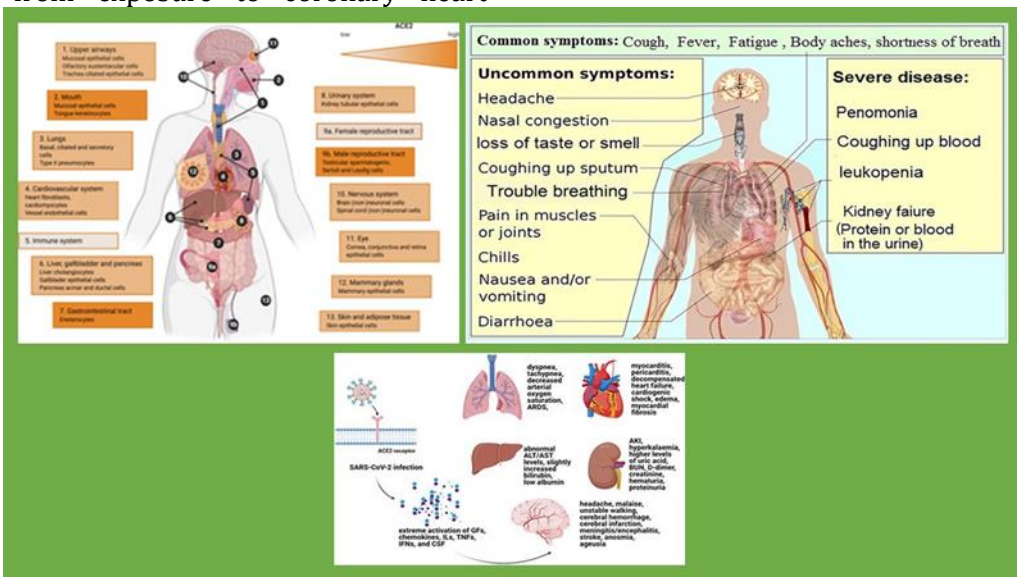

Figure 1: On the whereabouts of SARS-CoV-2 in the human body

Chronic diseases in middle-aged men

Although important diseases such as cardiovascular disease (hypertension, diabetes, coronary heart disease and cerebrovascular disease) are important causes of mortality, especially in the middle-aged and elderly, but these factors play a much greater role in men than women. And their prevalence and mortality is significantly higher than women. Due to the fact that a very important risk factor in the severity of morbidity and mortality due to coronary heart disease is the development of the above underlying diseases, men are at greater risk. On the other hand, due to the fact that a large percentage of men, especially in the middle-aged group with chronic non-communicable diseases such as cancers, diabetics, cardiovascular disease, chronic kidney disease, diseases of the nervous system and... are also at higher risk for disease. Corona and its consequences and need more attention and care [17].

Unhealthy behaviors in some men

As dangerous and deadly as coronary heart disease is, the adverse effects of unhealthy and inactive nutrition on health can lead to unpleasant consequences such as heart attack and stroke, diabetes, high blood pressure, obesity, high blood fats, fatty liver, depression decrease in muscle strength. Unhealthy. diet, inadequate physical activity and obesity are important causes of non-communicable diseases that unfortunately put men at risk for Covid-19 and low resistance to it. Men need to end their unhealthy behaviors during the corona outbreak to protect themselves against coronary heart disease and other complications of non-communicable diseases. Nothing helps to strengthen the immune system more than a complete and correct diet. It is also important to avoid sedentary living and adequate physical activity in this group during social distancing. Moderate-intensity physical activity, on the other hand, boosts the body's immunity to coronary heart disease; It is also effective in reducing the stress of this deadly disease (Figure 2). Proper exercise to improve heart and respiratory capacity and strengthen muscles requires a complete program for various dimensions of aerobic exercise, stretching exercises and strength training [18].

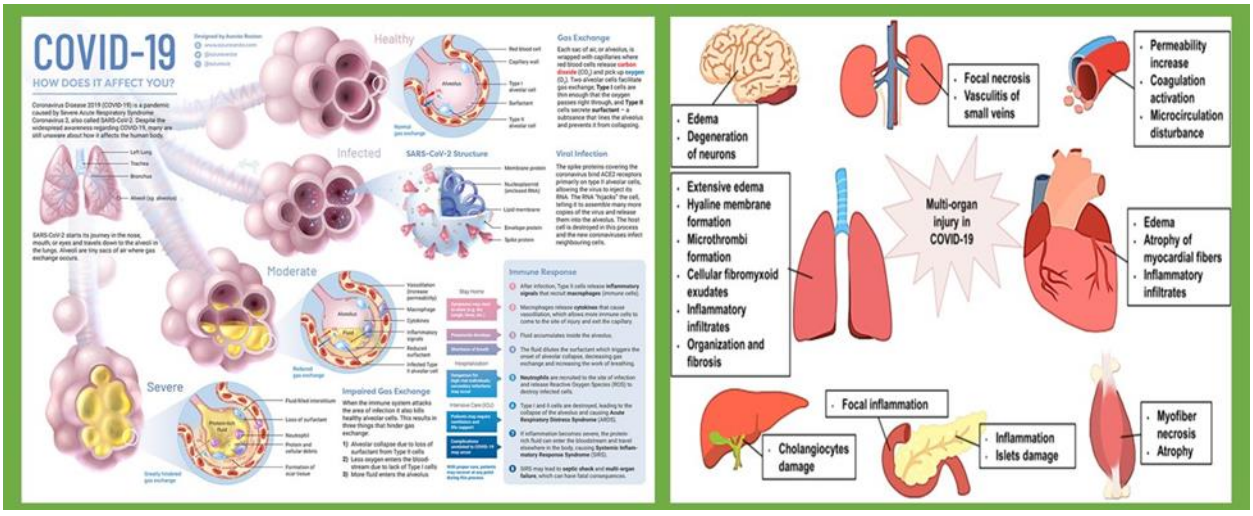

Figure 2: What does coronavirus do to the body?

Risk factor for smoking in men

According to the Ministry of Health, in the end, in all societies, men smoke much more than women. A history of smoking causes much more severe and deadly symptoms when developing coronary heart disease; Because tobacco smoke prevents oxygen from reaching the lungs. Due to lung damage and malfunction in smokers, these people will be more severely affected by the virus. The prevalence of Covid-19 disease increases the feeling of the need to quit smoking, and there are good reasons that quitting smoking during the Covid-19 pandemic can increase the chances of fighting the virus. These conditions should be used to change the

behavior of men, especially young men to quit smoking [19].

Corona disease testing and its importance

There are different types of Covid-19 virus testing. These tests can be used to diagnose active infection or to diagnose infection or immunity of the body. Because people with Covid-19 can transmit the virus to others, it is important to identify people with an active infection to reduce the spread of the disease. In people who have symptoms, the test can also determine if the symptoms are caused by Covid-19, a different respiratory virus, or another disease. Early detection of Covid-19 in people in need of treatment can help with the most effective form of treatment. COVID is a 19-disease caused by infection with the coronavirus known as SARS-CoV-2. The virus is transmitted between people and has been spreading rapidly since its initial discovery in China in late 2019. Due to the worldwide spread of Covid-19, the World Health Organization declared in March 2020 that the disease was a global epidemic. The health effects of Covid-19 can be very different [20]. Some people who are infected with the virus are asymptomatic and may not feel sick. Other people have mild symptoms or severe, potentially life-threatening effects. The Covid-19 virus test for active infection can be used for diagnosis, screening or monitoring.

Investigation of the effects of COVID on the organs of the body

Skin manifestations

One of the rare symptoms reported in COVID patients is 19 skin rashes. The reported skin rash is in the form of erythematosus, widespread urticarial, and chickenpox-like blisters that occur without itching or with slight itching in the trunk area. These lesions usually heal within a few days and no association has been reported between them and the severity of the disease. Cases of acrocyanosis and dry gangrene have also been reported. Skin manifestations in some cases have been in the form of "Lyudo reticularis" [21]. Microthrombosis, which occurs in other organs such as the cardiopulmonary system, is likely to cause skin manifestations that range from transient liodo-reticularis in mild cases to acrocyanosis in severe cases. The immune response to infection is thought to cause vasodilation. It is not yet known whether skin symptoms are a secondary consequence of a respiratory infection or are due to a skin infection. A combination of these mechanisms is likely to be involved in this process (Figure 3). Histological examination of the rash, platelet count, coagulation studies and evaluation of fibrin degradation products in these patients will be enlightening.

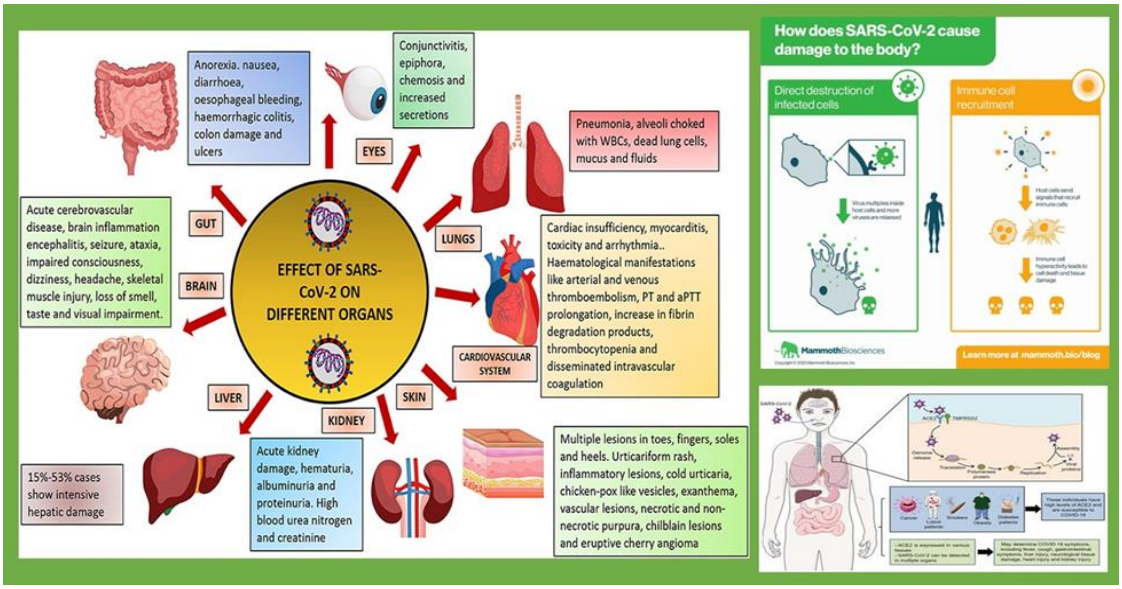

Figure 3: How SARS-CoV-2 impacts the ody

Cardiovascular disease

The cardiovascular manifestations of SARS-CoV-2 infection, which occurs in approximately 8 to 12% of Covid-19 patients, are of considerable concern. Acute heart damage, defined by a significant rise in cardiac troponin levels in a blood test, has been reported as the most common heart abnormality in Covid-19. Other published reports indicate myocarditis and cardiac arrest. The most common mechanisms responsible for myocardial injury appear to be due to direct involvement of myocardial cells (cardio myocytes) with SARS-CoV-2 and immune-mediated inflammation such as cytokine storm [22]. In the cardiovascular system, as in the pulmonary system, the SARS-CoV-2 receptor is called ACE2, so the expression of this receptor and it signaling pathways is considered as one of the possible mechanisms of myocardial damage in infection with this virus. Respiratory dysfunction and hypoxemia due to Covid-19 disease can also cause damage to the heart muscle. Symptoms often increase in people with underlying cardiovascular disease or those who develop acute heart damage following SARS-CoV-2 infection, and these people have a poor prognosis. Many antiviral drugs can also cause heart failure, arrhythmias, or other cardiovascular disorders; Therefore, the risk of cardiac toxicity should be considered during treatment of Covid-19, especially with antivirals. Information on other cardiovascular manifestations in Covid-19 is currently very limited.

kidney disease

Preliminary reports indicate a low prevalence of acute renal injury in patients with Covid-19. Recently, however, a higher incidence of kidney damage has been reported. In a study of 59 patients with Covid-19, it was found that 34% of patients developed widespread albuminuria on the first day of hospitalization and 63% of them developed proteinuria during their hospital stay. Decreased renal density on CT scan, which indicates inflammation and edema in the kidney, has also been observed in some individuals. Recently, there have been reports of blood in urine, blood urea nitrogen and high serum creatinine. The exact mechanism of renal involvement is not known, however hypothetical mechanisms including sepsis leading to cytokine storm or direct cell damage by SARS-CoV-2 have been proposed. Recently, this virus has been identified in the urine samples of several infected patients, which suggests the kidney as one of the targets of this new virus [23].

Liver disease

Evidence suggests that 2-11% of Covid-19 patients develop liver disease, and in 14-53% of cases there are abnormal levels of alanine aminotransferase (ALT) and aspartate aminotransferase (AST) during disease progression. Liver damage in mild cases of Covid-19 is often transient and can return to normal without any special treatment. But patients with severe Covid-19 disease appear to have higher liver dysfunction.

Liver damage in patients with Covid-19 infection may be directly due to viral infection of the liver cells, immune-mediated inflammation such as cytokine storm, and hypoxia due to pneumonia. In addition, liver damage may be due to drug toxicity and lead to liver failure in patients with the critical form of Covid-19.

Nervous disorder

In severe cases of Covid-19 disease, there are reports that the virus may enter the brain through the olfactory nerves in the roof of the nose, damaging the neurons that control the respiratory center in the brainstem and causing neurological complications. These neurological manifestations range from relatively specific symptoms such as loss of sense of smell or taste, myopathy and stroke to nonspecific symptoms such as headache, dizziness, loss of consciousness or seizures [24].

Eye disease

Although human-to-human transmission of the virus occurs mainly through respiratory droplets, SARS-CoV-2 has also been detected in

other body fluids. Evidence suggests that conjunctival secretions and tears in patients with Covid-19 infection may contain viral RNA genomes. Researchers in China have suggested that the virus may be transmitted from the eye to the respiratory tract through the lacrimal duct. Therefore, ophthalmologists and medical staff are advised to wear goggles and gloves when dealing with people with or possibly Covid-19 disease.

Thyroid disease

Evidence suggests that patients with Covid-19 have low levels of TSH and TT3, and that a decrease in their TSH and TT3 levels is positively associated with the severity of Covid-19 disease. Due to the fact that serum TSH levels in patients with severe Covid-19 form are significantly lower than in patients with non-Covid-19 pneumonia, it may indicate the unique effect of Covid-19 on TSH-secreting cells. Two mechanisms may lead to these changes; One is the direct effect of the virus on pituitary cells and the other is the indirect effect in which various systemic changes such as activation of various proinflammatory cytokines caused by virus infection or its treatment led to hormonal changes in the pituitary axis of the endocrine glands. Following the report of subacute thyroiditis as a self-limiting inflammatory thyroid disease in patients with Covid-19, physicians are advised to be aware of the potential for these clinical manifestations of SARS-CoV-2 infection [25].

Complications of diabetes

There is a two-way relationship between Covid-19 and diabetes. On the one hand, diabetes is associated with an increased risk of severe Covid-19, and on the other hand, sudden diabetes and severe metabolic complications of diabetes, such as diabetic ketoacidosis, for which very high doses of insulin are allowed, have been observed in patients with Covid-19. Based on observations of people who develop diabetes spontaneously after becoming infected with SARS-CoV-2 or people who come to the hospital with very high blood sugar and ketones, researchers suggest that people only have diabetes. It is not vulnerable to SARS-CoV-2, but may also trigger diabetes in some people. The virus can cause a severe inflammatory condition that impairs the ability of the pancreas to release insulin and reduces the ability of the liver and muscles to detect hormones. However, it is not yet clear whether changes in glucose metabolism in these patients persist or disappear as the infection clears up. In addition, it is not clear whether this is type 1, type 2 diabetes or a new type of diabetes. Answering these questions is a priority in order to quickly learn about clinical care, follow-up and monitoring of patients [26].

Cerebrovascular accidents

It has been reported that cerebrovascular injuries often occur in patients with severe pneumonia and disorders of several organs, and these people have very poor outcomes. But evidence shows that stroke has also been observed in adults under the age of 50 with Covid-19 who have not even had a risk factor for cerebrovascular accidents. On the other hand, the clinical manifestations and outcome of patients who have a stroke with Covid-19 disease are much worse than those who do not have Covid-19.

In connection with the pathophysiology of cerebrovascular injuries in patients with Covid-19, several cases are raised. Autopsy results of patients with Covid-19 showed that their brain tissue was hyperemic and edematous and some neurons were degenerated. Covid-19 disease has been reported to be progressively associated with increased hyper coagulation (Figure 4), leading to neurovascular complications. Other mechanisms include viral neurotrophic, hypoxia, endothelial dysfunction, and inflammation, so that in many patients with Covid-19 inflammatory markers such as dimer and interleukin-6 increase [27].

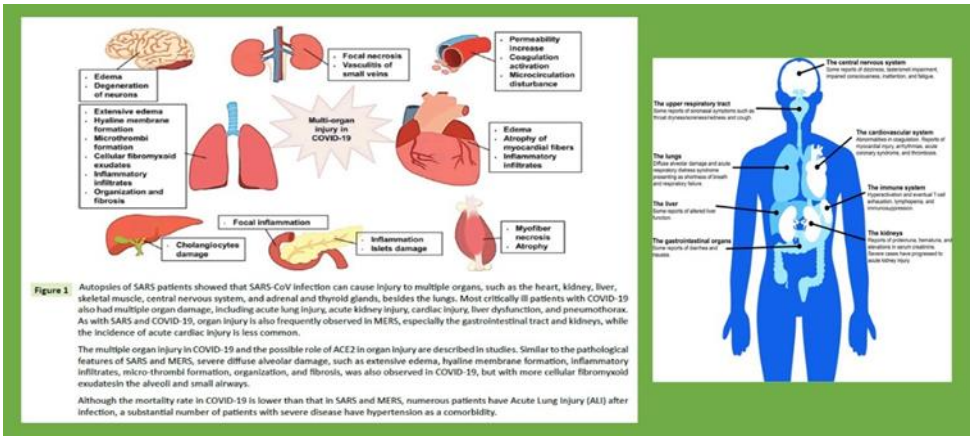

Figure 4: Main Organs Involved in COVID-19

On the other hand, in cases where the etiology of stroke is unknown, the virus seems to play a direct role. However, as there are still many questions about the association of Covid-19 disease with cerebrovascular injury and the mechanisms of stroke in these patients are unknown, more studies are needed. While most people with Covid-19 recover and return to normal health, some patients may have symptoms that may persist for weeks or even months after recovery. Even people who are not hospitalized and have a mild illness can experience persistent or late symptoms.

Covid-19 organ damage

Although Covid-19 is a disease that primarily affects the lungs, it can also damage other organs. Organ damage may increase the risk of long-term health problems. The organs that may be affected are:

Heart: Imaging tests performed months after recovery of Covid-19 show permanent damage to the heart muscle, and even people who have experienced only mild symptoms of Covid-19 may be at risk for heart failure or other heart complications.

Lungs: The type of pneumonia (inflammation of the lungs) that is often associated with Covid-19 can cause long-term damage to the small air sacs (alveoli) in the lungs. The resulting tissue damage can lead to long-term respiratory problems.

Brain: Even in young people, Covid-19 can cause strokes, seizures, and Glynbar's syndrome (temporary paralysis). Covid-19 may also increase the risk of Parkinson's disease and Alzheimer's disease.

Blood clots and blood vessel problems: Covid-19 can increase the risk of blood cell clotting and cause heart attacks and strokes, but it is believed that most of the heart damage caused by Covid-19 is from very small clots. It occurs when it blocks small blood vessels (capillaries) in the heart muscle. Other parts of the body that are affected by blood clots include the lungs, legs, liver and kidneys. Covid-19 can also weaken blood vessels and cause them to leak, which can lead to long-term liver and kidney problems.

Mood problems and fatigue: People with severe symptoms of Covid-19 are often forced to undergo mechanical treatment in the intensive care unit of a hospital, such as ventilators [28].

Surviving and surviving this experience can lead to post-traumatic stress disorder, depression and anxiety. Because it is difficult to predict the long-term outcome of the new Covid-19 virus, scientists have studied the long-term effects of related viruses, such as the virus that causes acute respiratory syndrome (SARS).

Many people who recover from SARS develop chronic fatigue syndrome, which is a complex disorder that worsens with physical or mental activity, and does not improve with rest. The same may be true of people who have had Covid-19. However, many of the long-term effects of Covid-19 and their significance are still unknown. The US Centers for Disease

Control is continuing its research in this area, and with the release of new data, it is updating the clinical care of Covid-19 as well as the public health response to the disease. A group of patients with Covid-19 experience persistent symptoms and complications such as limb injury. Researchers have given reasons for some of them. Scientists are trying to identify the symptoms of the disease, their prevalence, their duration of persistence, people at risk and how to treat and prevent them.

Joint pain, chest pain, skin rash, cough, fatigue, headache, insomnia, dizziness, persistent fever, brain fog, and lack of concentration are problems that may occur after acute Covid-19 infection. The virus can damage brain cells, and inflammation in the brain or body can cause neurological complications. Other viral infections can also cause brain fog. In case of shortness of breath, the doctor pays attention to pulmonary and cardiac complications. Patients who are severely ill with Covid-19 may have shortness of breath, but people with mild cases are also at risk [29].

Cardiac arrhythmia

The virus can damage the heart, and doctors are concerned about long-term damage. How the heart improves after Covid-19 can help determine if an irregular heartbeat is occurring in the patient.

Hypertension

- Some patients have high blood pressure in cases where the illness is mild and even people who have been healthy before.
- This could be due to the virus' effect on blood vessels and heart cells.
- What groups are most at risk for coronavirus?

Covid-19 is most affected by the following groups:

- People over 60 years' old.
- People with a long history of illness such as heart disease, lung disease, diabetes, cancer or high blood pressure.
- People with weakened immune systems (Immunosuppressed).

The effect of coronavirus on pregnancy, lactation and childbirth

We do not know at this time whether pregnant women are more likely to be infected with the Covid-19 virus than the general public. And if so, do pregnant women experience a more serious illness? Pregnant women experience changes in their bodies that may increase their risk of infection. Women have a longer history of disease when they are infected with the Covid-19 family of viruses and other infectious respiratory infections, such as the flu, and pregnant women always need to protect themselves against any disease. Medical experts have not yet determined whether pregnant and lactating women can transmit the corona virus through the uterus during childbirth and breastfeeding [30]. It is now recommended that mothers who are definite or carriers of the virus be temporarily separated from their infants.

This separation helps reduce the risk of mother-to-child transmission of the virus. Breastfeeding women can talk to their doctor about the advantages and disadvantages of breastfeeding. These women should take the following precautions:

- Use a face mask if possible while breastfeeding.
- Wash your hands properly before babysitting or breastfeeding.
- Wash your hands properly before touching the breast or removing a bottle containing milk.
- Wash milk bottles every time after use.
- They should also ask another person who is not sick to help feed the baby with breast milk.

Conclusion

It is not clear whether Covid-19 causes problems during pregnancy. Or can it affect the baby's health after delivery? And is Covid-19 transmitted from a pregnant woman to a fetus or baby? None of the infants whose mother had Covid-19 tested positive. In none of these cases, which involved a small number, was the virus detected in amniotic fluid or breast milk. We do not yet know if the mother's fetus with Covid-19 is at risk. A number of infants whose mothers contracted Covid-19 during pregnancy have reported problems (such as preterm labor) during pregnancy or childbirth, but it is not clear whether these results were related to maternal infection. Covid-19 can have long-term effects, including neurological problems, one of which is Parkinson's disease. The link between Covid-19 and Parkinson's disease is undeniable. Covid-19 does not seem to be the only acute illness a person can survive. Many people will suffer from the long-term side effects of Covid-19. If it turns out that such serious diseases as Parkinson's are a complication of Covid-19, the importance of preventing the virus is doubled. Researchers say the number of patients with Parkinson's disease who later died of Covid-19 is increasing. Evidence from a study of 43 patients suggests an association between Covid-19 and Parkinson's disease.

References

[1] A. Yarahmadi, K. Kamrava, A. Shafee, M. Milanifard, M. Aghajanpour, Mohebbi A., *J. Pharm. Res. Int.*, **2019**, 1-6. [Crossref], [Google Scholar], [Publisher]

[2] T.S.H. Abadi, M. Askari, K. Miri, M.N. Nia, *Iran. J. Military Med.*, **2020**, *22*, 526-233. [Crossref], [Google Scholar], [Publisher]

[3] M. Abbasi, A. Nakhostin, F. Namdar, N. Chiniforush, M. Hasani Tabatabaei, *J. Lasers Med. Sci.*, **2018**, *9*, 82-86. [Crossref], [Google Scholar], [Publisher]

[4] A. Alipour, A. Ghadami, Z. Alipour, H. Abdollah Zadeh, *J. Health Psychol.*, **2020**, *8*, 163-175. [Crossref], [Google Scholar], [Publisher]

[5] N. Alrabadi, S. Shawagfeh, R. Haddad, T. Muktesh, S. Abu Hammad, D. Al-rabadi, R. Abu Farha, S. AlRabadi, I. Al-Faouri, *J. Pharm. Health Serv. Res.*, **2021**, *12*, 78-86. [Crossref], [Google Scholar], [Publisher]

[6] M. Aminzadeh, R. Mohebi far, Y. Azamines, M. Faraji, *J. Health*, **2015**, *6*, 169-179. [Crossref], [Google Scholar], [Publisher]

[7] N. Asadi, F. Salmani, S. Poorkhajuie, M. Mahdavifar, Z. Royani, *J. Psychiatry Clin. Psychol.,* **2020**, *26*, 306-319. [Crossref], [Google Scholar], [Publisher]

[8] S. Azizi Aram, S. Bashar poor, *Quarterly J of Nursing Management*, **2020**, *9*, 8-18. [Crossref], [Google Scholar], [Publisher]

[9] B. Mahmoodiyeh, S. Etemadi, A. Kamali, S. Rajabi, M. Milanifard, *Ann. Romanian Soc. Cell Biol.*, **2021**, *25*, 2559–2572. [Crossref], [Google Scholar], [Publisher]

[10] B. Shakiba, N. Torabi, R. Alimoradzadeh, R. Maghsoudi, *Journal of Iranian Medical Council*, **2022**, *5*, 227-228. [Crossref], [Google Scholar], [Publisher]

[11] M. Barzideh, A. Choobineh, S. Tabatabaei, *Occup. Med.*, **2012**, *4*, 17-27. [Crossref], [Google Scholar], [Publisher]

[12] D.C. Beachboard, J.M. Anderson-Daniels, M.R. Denison, *J Virol*, **2015**, *89*, 2080-2089. [Crossref], [Google Scholar], [Publisher]

[13] M.G.S. Borba, F.F.A. Val, V.S. Sampaio, M.A.A. Alexandre, G.C. Melo, M. Brito, M.P.G. Mourão, J.D. Brito-Sousa, D. Baía-da-Silva, M.V.F. Guerra, L.A. Hajjar, *JAMA network open*, **2020**, *3*, e208857. [Crossref], [Google Scholar], [Publisher]

[14] F. Afkar, S. Golalipour, M. Akanchi, S.M. Sajedi, A. Zandi Qashghaie, *NeuroQuantology*, **2022**, *20*, 632-642. [Crossref], [Google Scholar], [Publisher]

[15] F. Zabihi, M.A. Abbasi, R. Alimoradzadeh, *Ann. Romanian Soc. Cell Biol.*, **2021**, *25*, 2573–2579. [Crossref], [Google Scholar], [Publisher]

[16] F. Karimzadeh, S.M. Sajedi, S. Taram, F. Karimzadeh, *J. Prosthet. Dent.*, **2021**. [Crossref], [Google Scholar], [Publisher]

[17] Y. Furuta, B.B. Gowen, K. Takahashi, K. Shiraki, D.F. Smee, Barnard D.L., *Antiviral Res.*, **2013**, *100*, 446-454. [Crossref], [Google Scholar], [Publisher]

[18] M.J. Gadlage, J.S. Sparks, D.C. Beachboard, R.G. Cox, J.D. Doyle, C.C. Stobart, M.R. Denison, *J. Virol.*, **2010**, *84*, 280-290. [Crossref], [Google Scholar], [Publisher]

[19] E. Ghaibi, M.R. Soltani Manesh, M. Bushra, Z. Gilani, K. Salimi Nabi, F. Zarif, *Eurasian Journal of Chemical, Medicinal and Petroleum Research,* **2022**, *1*, 49-57. [Crossref], [Google Scholar], [Publisher]
[20] E Ghaibi, M.R. Soltani Manesh, H. Jafari Dezfouli, F. Zarif, Z. Jafari, Z. Gilani, *Eurasian Journal of Chemical, Medicinal and Petroleum Research*, **2022**, *1*, 33-39. [Crossref], [Google Scholar], [Publisher]
[21] K. Goyal, P. Chauhan, K. Chikara, P. Gupta, M.P. Singh, *Asian J. psychiatry*, **2020**, *49*, 101989. [Crossref], [Google Scholar], [Publisher]
[22] R.L. Graham, A.C. Sims, S.M. Brockway, R.S. Baric, M.R. Denison, *J. Virol*, **2005**, *79*, 13399-13411. [Crossref], [Google Scholar], [Publisher]
[23] H. Alizadeh Otaghvar, K. Afsordeh, M. Hosseini, N. Mazhari, M. Dousti, *Journal of Surgery and Trauma*, **2020**, *8*, 156-160. [Crossref], [Google Scholar], [Publisher]
[24] H. Alizadeh Otaghvar, S. Moghaddam, A. Molaei, *J. Med. Chem. Sci.*, **2021**, 369-375. [Crossref], [Google Scholar], [Publisher]
[25] H. Jahandideh, A. Yarahmadi, S. Rajaieh, A.O. Shirazi, M. Milanifard, A. Yarahmadi, *J. Pharm. Ree. Int.*, **2020**, *31*, 1-7. [Crossref], [Google Scholar], [Publisher]
[26] H. Mirfakhraee, S. Golalipour, F. Ensafi, A. Ensafi, S. Hajisadeghi, *NeuroQuantology*, **2022**, *20*, 5118-5126. [Crossref], [Google Scholar], [Publisher]
[27] H. Mirjalili, H. Amani, A. Ismaili, M.M. Fard, A. Abdolrazaghnejad, *J. Med. Chem. Sci.*, **2022**, *5*, 204-214. [Crossref], [Google Scholar], [Publisher]
[28] H.A. Otaghvar, R. Rezapour-Nasrabad, M.A. Ebrahimzadeh, M. Yaghoubi, A.R. Khalatbary, D. Nasiry, A. Raoofi, A. Rostamzadeh, *J. Wound Care*, **2022**, *31*, S36-S44. [Crossref], [Google Scholar], [Publisher]
[29] H. Xu, L. Zhong, J. Deng, J. Peng, H. Dan, X. Zeng, T. Li, Q. Chen, *Int. J. Oral Sci.*, **2020**, *12*, 8. [Crossref], [Google Scholar], [Publisher]
[30] Y.A. Helmy, M. Fawzy, A. Elaswad, A. Sobieh, S.P. Kenney, A.A. Shehata, *J. Clin. Med.*, **2020**, *9*, 1225. [Crossref], [Google Scholar], [Publisher]
[31] E.A. Holmes, R.C. O'Connor, V.H. Perry, I. Tracey, S. Wessely, L. Arseneault, C. Ballard, H. Christensen, R.C. Silver, I. Everall, T. Ford,A. John, T. Kabir, K. King, I. Madan, S. Michie, A.K. Przybylski, R. Shafran, A. Sweeney, C.M. Worthman, L. Yardley, K.Cowan, C. Cope, M. Hotopf, E. Bullmore, *Lancet Psychiat.*, **2020**, *7*, 547-560. [Crossref], [Google Scholar], [Publisher]
[32] A.R. Hosseini Khalili, J. Thompson, A. Kehoe, N.S. Hopkinson, A. Khoshbaten, M.R. Soroush, S.E. Humphries, H. Montgomery, M. Ghanei, *BMC Pulm. Med.*, **2008**, *8*, 15. [Crossref], [Google Scholar], [Publisher]
[33] A. Johnson, *Eurasian Journal of Chemical, Medicinal and Petroleum Research*, 2023, 2, 1-9. [Crossref], [Google Scholar], [Publisher]
[34] J.P. Montani, V.B. Vliet, *Angiotensin*, Springer, 2004, *163.1*, 3-29. [Crossref], [Google Scholar], [Publisher]
[35] B. Shakiba, N. Torabi, R. Alimoradzadeh, R. Maghsoudi, *Journal of Iranian Medical Council*, **2022**, *5*, 227-228. [Crossref], [Google Scholar], [Publisher]
[36] H. Kalantari, A.H.H. Tabrizi, F. Foroohi, *Gene Rep.*, **2020**, *21*, 100910. [Crossref], [Google Scholar], [Publisher]
[37] I. Karampela, M. Dalamaga, *Arch. Med. Res.*, **2020**, *51*, 741-742. [Crossref], [Google Scholar], [Publisher]
[38] R.N. Kirchdoerfer, A.B. Ward, *Nat. Common.*, **2019**, *10*, 2342. [Crossref], [Google Scholar], [Publisher]
[39] K. Lo Han, *Eurasian Journal of Chemical, Medicinal and Petroleum Research*, 2022, *1*, 64-70. [Crossref], [Google Scholar], [Publisher]
[40] K. Lo Han, *Eurasian Journal of Chemical, Medicinal and Petroleum Research*, **2022**, *1*, 1-9. [Crossref], [Google Scholar], [Publisher]
[41] M. Abbasi, A. Nakhostin, F. Namdar, N. Chiniforush, M. Hasani Tabatabaei, *J. Lasers Med. Sci.*, Spring, **2018**, *9*, 82-86. [Crossref], [Google Scholar], [Publisher]
[42] M. Milanifard, G. Hassanzadeha, *J. Contemp Med. Sci.*, **2018**, *4*, 26-29. [Crossref], [Google Scholar], [Publisher]
[43] M. Yavari, S.E. Hassanpour, H.A. Otaghvar, H.A. Abdolrazaghi, A.R. Farhoud, *Arch. Bone Jt Surg.*, **2019**, *7*, 258. [Crossref], [Google Scholar], [Publisher]

[44] S. Mahmoodi, M. Hesabi, A. Emami sigaroudi, E. Kazemnejad leili, A. Monfared, JHNM, **2015**, *25*, 63-72. [Crossref], [Google Scholar], [Publisher]
[45] M.B. Abhari, P.F. Afshar, R. Alimoradzadeh, H. Mirmiranpour, *Immunopathol. Persa*, **2019**, *6*, e10-e10 [Crossref], [Google Scholar], [Publisher]
[46] M. Mileski, U. Pannu, B. Payne, E. Sterling, R. McClay, *Healthcare*, **2020**, *8*, 114-134. [Crossref], [Google Scholar], [Publisher]
[47] M.M. Fard, *GMJ Med.*, **2021**, *5*, 391-395. [Crossref], [Google Scholar], [Publisher]
[48] N. Shahkarami, M. Nazari, M. Milanifard, R. Tavakolimoghadam, A. Bahmani, *Eurasian Chem. Commun.*, **2022**, *4*, 463-472 [Crossref], [Google Scholar], [Publisher]
[49] N. Shahkarami, M. Nazari, M. Milanifard, R. Tavakolimoghadam, A. Bahmani, *Eurasian Chem. Commun.*, **2022**, *4*, 463-472 [Crossref], [Google Scholar], [Publisher]
[50] N. Zaimzadeh, S. Ziaie, N. Mohammadzadeh, H. Alizadeh Otaghvar, A. Mottaghi, *Razi J. Med. Sci.*, **2018**, *25*, 59-68. [Crossref], [Google Scholar], [Publisher]
[51] N. Zaimzadeh, S. Ziaie, N. Mohammadzadeh, H. Alizadeh Otaghvar, et al., *Razi Journal of Medical Sciences*, **2018**, *25*, 87-96. [Crossref], [Google Scholar], [Publisher]
[52] F. Najafi, F. Kerjasama, E. Gangoozehi, *Iran. J. Rehabilitation Res. Nursing*, **2018**, *4*, 53-59. [Crossref], [Google Scholar], [Publisher]
[53] S.Z. Nazardani, S.H. Nourizadeh Dehkordi, A. Ghorbani, *Eurasian Journal of Chemical, Medicinal and Petroleum Research*, **2023**, *2*, 10-16. [Crossref], [Google Scholar], [Publisher]
[54] A. Nurmeksela, S. Mikkonen, J. Kinnunen, T. Kvist, *Res. Sq.*, **2020**, *1*, 1-22. [Crossref], [Google Scholar], [Publisher]
[55] P. Dini, B. Shakiba, R. Alimoradzadeh, N. Torabi, M.W.C. Watch, *J. Affect. Disord.*, **2021**, *281*, 502. [Crossref], [Google Scholar], [Publisher]
[56] R. Alimoradzadeh, H. Mirmiranpour, P. Hashemi, S. Pezeshki, S.S. Salehi, *J. Neurology & Neurophysiol.*, **2019**, *10*, 1-5. [Crossref], [Google Scholar], [Publisher]
[57] R. Alimoradzadeh, M. Mokhtare, S. Agah, *Iran. J. Ageing*, **2017**, *12*, 78-89. [Crossref], [Google Scholar], [Publisher]
[58] R. Alimoradzadeh, M.A. Abbasi, F. Zabihi, H. Mirmiranpour, *Iran. J. Ageing*, **2021**, *15*, 524-533. [Crossref], [Google Scholar], [Publisher]
[59] F. Rebout, *Eurasian Journal of Chemical, Medicinal and Petroleum Research*, **2022**, *1*, 20-32. [Crossref], [Google Scholar], [Publisher]
[60] F. Rebout, *Eurasian Journal of Chemical, Medicinal and Petroleum Research*, **2022**, *1*, 58-63. [Crossref], [Google Scholar], [Publisher]
[61] H.A. Rothan, S.N. Byrareddy, *J. Autoimmune.*, 2020, *109*, 102433. [Crossref], [Google Scholar], [Publisher]
[62] S. Golalipour, Z. Soleimanydarinsoo, N. Qaderi, H. Ghazipoor, M. Salahi, *NeuroQuantology*, **2022**, *20*, 1519-1527. [Crossref], [Google Scholar], [Publisher]
[63] S.H. Salehi, K. As'adi, S.J. Mousavi, S. Shoar, *Indian J. Surg.*, **2015**, *77*, 427-431. [Crossref], [Google Scholar], [Publisher]
[64] S.H. Salehi, M.J, Fatemih, K. Aśadi, S. Shoar, A. Der Ghazarian, R. Samimi, *Burns*, **2014**, *40*, 300-304. [Crossref], [Google Scholar], [Publisher]
[65] N. Samiei, H.K. Ghane, Y. Khaled, *SVOA Dentistry*, **2021**, *2*, 254-257. [Crossref], [Google Scholar], [Publisher]
[66] P. Serrano, M.A. Johnson, A. Chatterjee, B.W. Neuman, J.S. Joseph, M.J. Buchmeier, P. Kuhn, K. Wüthrich, *J. Virol.*, 2009, 83, 12998-13008. [Crossref], [Google Scholar], [Publisher]
[67] S.P. Smieszek, B.P. Przychodzen, M.H. Polymeropoulos, *Int. J. Antimicrob. Agents*, **2020**, *55*, 106004. [Crossref], [Google Scholar], [Publisher]
[68] C.D. Spinner, R.L. Gottlieb, G.J. Criner, J.R.A. López, A.M. Cattelan, A.S. Viladomiu, O. Ogbuagu, P. Malhotra, K.M. Mullane, A. Castagna, L.Y.A. Chai, *Jama*, **2020**, *324*, 1048-1057. [Crossref], [Google Scholar], [Publisher]
[69] A.J. Stoessl, K.P. Bhatia, M. Merello, *Mov. Disord. Clin. Pract.*, **2020**, *7*, 355-356. [Crossref], [Google Scholar], [Publisher]

[70] V. Monteil, M. Dyczynski, V.M. Lauschke, H. Kwon, G. Wirnsberger, S. Youhanna, H. Zhang, A.S. Slutsky, C.H. del Pozo, M. Horn, N. Montserrat, J.M. Penninger, A. Mirazimi, *EMBO Mol. Med.*, **2020**, *13*, e13426. [Crossref], [Google Scholar], [Publisher]

[71] M. Zbuzant, *Eurasian Journal of Chemical, Medicinal and Petroleum Research*, **2022**, *1*, 10-19. [Crossref], [Google Scholar], [Publisher]

[72] M. Zbuzant, *Eurasian Journal of Chemical, Medicinal and Petroleum Research*, **2022**, *1*, 40-48. [Crossref], [Google Scholar], [Publisher]