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"Corona infection and the extent of the body ability to acquire long term immunity against the virus"

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By

Fatima Qais Omran

Safa Salam Adil

Mariam thamer Shaker

Supervised by

Dr. Ruqaya Munther

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بِسْــمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوا مِنكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ

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Abstract

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a highly transmissible and pathogenic coronavirus that emerged in late 2019 and has caused a pandemic of acute respiratory disease, named 'coronavirus disease 2019' (COVID-19), which threatens human health and public safety. In this survey , we describe the basic virology of SARS-CoV-2, including genomic characteristics and receptor use, highlighting its key difference from previously known coronaviruses. We summarize current knowledge of clinical, epidemiological and pathological features of COVID-19,. epidemiological and pathological features of COVID-19, We also discuss the potential wildlife hosts and zoonotic origin of this emerging virus in detail.

1.1 Introduction

Corona viruses are enveloped viruses possessing apositive-sense single stranded RNA genome and a capsid with helical symmetry. These viruses have the largest genome (26 to 32 kilobases) among RNA viruses. These viruses were termed Corona virus due to their crown-like morphology under electron microscope. Corona viruses infect humans,   other mammals, and birds and can cause respiratory, enteric, hepatic, and neurologic diseases as well as kidney and cardiac problems. So far, seven species of corona viruses are known to cause human disease. Most human corona virus diseases had a zoonotic origin (Gao etal,2020 ; Oran & Topol,2020) .

The four human corona virus (HCoV)-229E,HCoV-NL63, HCoV-OC43, and HCoV-HKU1 are endemic and prevalent. Other human corona viruses include severe acute respiratory syndrome corona virus (SARS-CoV), Middle East

respiratory syndrome corona virus (MERS-CoV), and the newly identified severe acute respiratory syndrome corona virus2 (SARS-CoV-2) that are highly transmissible and pathogenic in humans. HCoV-229E, HCoV-NL63, HCoV-OC43 and HCoV-HKU1 usually cause mild symptoms,like common cold and/or diarrhea, while SARS-CoV, MERS-CoV and SARS-CoV-2 cause severe lower respiratory tract infection with a higher chance to develop acute respiratory distress as well as extra-pulmonary symptoms (Lai etal,2020) .

SARS firstly appeared in 2002 and MERSin 2012. SARS patients experience fever, dry cough, dyspnea (laboured breathing), headache, and hypoxemia. Progressive respiratory failure due to alveolar damage can result in death in some patient. The first case of MERS, also known as camel flu, was reported from Saudi Arabia in June 2012 in a patient with severe respiratory illness and acute kidney injury. Then more cases of MERS-CoV infection reported in Saudi Arabia and the spread of MERS was reported in several other countries. Typical symptoms of MERS include fever, cough, diarrhea , and shortness of breath. Some patients with MERS exhibit serious respiratory disease which may result in death . Molecular investigation indicated that bats in Saudi Arabia are infected with several corona viruses and virus from one bat showed 100% nucleotide identity to virus from the human index case-patient indicating that bats might play a role in human infection (Niazkar etal,2020 ; Oran & Topol EJ ,2021; CDC,2022).

Epidemiologic evidences suggest that MERS transmission occurs through direct contact with live camels or humans with symptomatic MERS, as well as individuals with asymptomatic MERS. At now, the large-scale coronavirus disease 19 (COVID19) is the largest coronavirus pandemic that started on 12 December 2019 from a local seafood market in Wuhan, China. Both SARS-CoV-2 (COVID19 virus) and SARS-related corona viruses use the same cell receptor

(angiotensin converting enzyme-II) for entering host cells. The virus genome sequences obtained from five patients at an early stage of the COVID19 outbreak share 79.6% sequence identity to SARS-CoV. In addition, whole genome of SARS-CoV-2 has 96% identity to a bat coronavirus. No obvious genetic recombination was found in the genome of SARS-CoV-2. SARS-related corona viruses are thought to be transmitted from bats to humans in origin. Furthermore , some bat SARS- related corona viruses have been previously shown to have the potential to infect humans (Cascella ,2020; Romiti etal,2021; Wang etal,2021) .

1.2 transmission and main symptoms

SARS-CoV-2 is transmitted to human directly through respiratory droplets of infected people or indirectly through contact with virus-contaminated surfaces and substances. Main clinical symptoms of COVID19 include (fever, dry cough, dyspnea, headache and pneumonia). Progressive respiratory failure due to alveolar damage leads to death in some patients. Decreased numbers of lymphocytes and sometime other leukocytes occurs in patients. All available evidence suggests that SARS-CoV-2 has a zoonotic origin (Greenhalgh etal,2021).

Common symptoms COVID-19 fever [68.0%], dry cough [74.9%], lethargy, sore throat and body aches, headache (30% to 45.5%) 2), shortness of breath [60.9%], nasal congestion,conjunctivitis [26.2%], taste disturbance (88%) and olfactory (85.6%) Acute Kidney Damage (AKI) is 40%. A small number of patients had diarrhea and vomiting. Although the symptoms disappear in about 5 weeks on average, in some people the symptoms persist for 2 months or more (Miller   etal,2021)   .
Nervous signs and symptoms related to central nervous system attack appear simultaneously with respiratory symptoms or alone. Clinical studies report

olfactory and taste dysfunction as the most common symptom in patients with COVID-19. Women are significantly more affected by olfactory and taste disorders than men . In a study, gastrointestinal symptoms in 23.6% of patients had respiratory symptoms in 44.3 % of cases and 32.1% in respiratory and gastrointestinal symptoms. However, older people are prone to severe infections including pneumonia, shortness of breath, and acute respiratory distress syndrome, resulting in higher mortality (He etal,2021).

1.3 effects of COVID-19 on organs

Coronavirus is a Highly Functional Virus, SARS-CoV-2 was initially thought to be a respiratory virus, but now available evidence suggests that it may be independently associated with severe inflammatory reactions on various organs(e.g.؛heart,liver, kidney, Gastrointestinal tract ،nervous system ،immune system). Oxygen deprivation, multiple organ failure, or metabolic and electrolyte disturbances may occur. In addition, Several mechanisms may cause heart damage in COVID-19. Cardiac arrhythmia, cardiomyopathy and myocardial injury, heart failure, decreased output have been observed in patients who were severely ill or died of COVID-19. A 78% prevalence of cardiovascular involvement and myocardial infarction without left ventricular dysfunction in cardiac imaging in COVID-19 patients improved without cardiac symptoms has been reported after hospital discharge. Evidence from the autopsy shows endothelial damage and vascular involvement and a high prevalence of deep vein thrombosis as well as pulmonary arterial thrombosis in COVID-19 (Tang etal,2021; Biswas etal,2022) .

Intravenous Thromboembolism (VTE) with a incidence of 25% and pulmonary embolism with an incidence of 20% in hospitalized patients is another

reason for the deterioration of patients .Like other pneumonias requiring hospitalization, acute renal impairment in hospitalized patients with Covid-19 is up to 43%, and with proteinuria and hematuria, AKI is a risk factor for mortality versus mortality in Covid-19 is less common in patients without acute kidney damage. About 15% of ICU patients develop acute kidney damage. In patients with chronic kidney disease, kidney function may deteriorate (Meyerowitz etal,2021) .

Covid-19 often affects the liver and causes varying degrees of liver dysfunction. In a study, 20.4% of patients with onset of the disease developed skin manifestations that included a wide range of clinical manifestations including macular, papular, maculopapular eruptions, mouth ulcers and blisters and herpetiform   lesions.
Because skin examinations are often not performed in patients with coronavirus, the prevalence of adverse skin outcomes in COVID-19 patients may be less reported. At the time of admission, most patients have at least one underlying disease (diabetes, chronic kidney disease, chronic heart disease, etc) (Rathore & Ghosh,2020).

1.3.1 Heart

Some of the familiar Coronavirus symptoms include: Palpitations, , Fatigue   and Chest pain This is because COVID-19 also impacts the heart, and a lasting impact on the heart of the COVID-19 patient is widespread. The grouping of blood clots in the heart also poses risks of heart attacks or strokes. It can also cause problematic blockages in the heart in the long run. Therefore, patients of COVID-19 should consult a heart specialist, especially if they have any associated problems like cholesterol, diabetes, etc (. Letko etal,2020).

1.3.2 Liver

COVID-19 frequently affects the liver of those who are infected with it. After individuals have recovered from COVID-19, there have been reports of increasing enzyme levels. It can potentially cause liver dysfunction. The most visible and widespread ailment resulting from this is digestive troubles. Not only can the coronavirus harm the liver, but so can the high doses of medication given to the patient throughout their treatment. This is why, if there are any underlying conditions, it is also a good idea to be cautious with medications and visit a doctor (Li etal,2020) .

1.3.4 kidney and pancreas

According to observations, people with Covid 19 can be exposed to damage to the pancreas (caused by a virus) as a result of diabetes. Long-term observations are needed to determine if the injury will be permanent or if the hyperglycemia is temporary and will resolve over time. In a review of 61 improvements in SARS, Liu et al found that 39.3% had hypocortisolism and 83.3% had central adrenal insufficiency (Baig etal,2020) .

They concluded that adrenal insufficiency could be a late complication of SARS, which could be a secondary consequence of pituitary or direct hypothalamic injury. In a cohort study conducted in March 2020 on the effect of viral load on Acute Renal Impairment (AKI) at the time of hospitalization among patients (1049 patients) with sars cov2 in New York City, viral load using instantaneous RT-PCR method was measured and information was extracted by (EHRs). The viral load was associated with an increased risk of AKI.(aHR = 1.04, 95% CI: 1.01–1.08, p = 0.02) People at the top 50 percent of the viral load were

1.27   times   more
likely to be infected with AKI than those at the bottom 50 percent. In patients with
AKI, C-reactive protein, procalcitonin, D-dimer, and ferritin levels were
significantly higher than the control group and lymphocyte levels were
significantly lower than the control group. High levels of viral load at admission
may indicate greater disease severity, and strong proinflammatory status, but even
after setting inflammatory markers, viral load still showed a strong association
with an increased risk of AkI. Lead to the development of AkI, but viral load has a
separate and independent role in the development of AKI through other
mechanisms (Yavarpour-Bali etal,2020) .

1.3.4 Nervous system

There is compelling evidence that SARS-CoV 2 can affect the nervous system
through nerve damage and changes. The olfactory pathway and cranial nerves are
the most logical explanation for an attack on the CNS. SARS-CoV-2. It can also
damage the spinal   cord and lead to acute myelitis. The neurological symptoms
in acute disease are far greater (Almamlouk etal,2022) .

Preliminary reports indicate that neurological disorders are associated with the
severity of SARS-CoV-2 infection, which includes loss of mind (cognitive
impairment and impaired consciousness), olfactory and visual impairment,
headache, dizziness, delirium, and pain. Nervousness, encephalopathy, ataxia and
seizures, acute and ischemic stroke, cerebral venous thrombosis, paresthesia,
neuropathy, movement disorders and intracranial infection Epilepsy and paralysis
and impaired consciousness are the symptoms that It is associated with many
intracranial lesions and has been reported in COVID-19 patients (Zheng
etal,2020).

1.3.5 Respiratory system

COVID-19 is primarily a respiratory disease; therefore, it's no surprise that it affects the lungs . This is due to the coronavirus's damage to the lungs and other tissues, which puts respiratory health at risk. This is why it's crucial to get sufficient rest while you're sick with COVID-19 and after that so that your respiratory system can repair adequately (Turner etal, 2004)

3. Immune system

The body contains the organs of the immune system, which protects against diseases. It plays a key role to maintain health and pathogenesis. It also protects the body from harmful substances, germs, and cell changes (neoplasm). The key player in the immune system is the white blood cells, which can travel throughout the body through the blood vessels. To monitor for invading microbes, the body exchanges cells and fluids between blood and lymphatic vessels and enables the lymphatic system. The lymphatic vessels carry lymph. Each lymph node contains specialized compartments where they can encounter antigens. Through the incoming lymphatic vessels, the immune cells and foreign particles enter the lymph nodes. When they are in the bloodstream, they are transported to tissues throughout the body. They continue the cycle all over by patrolling for foreign antigens everywhere and then gradually drift back into the lymphatic system. The immune cells gather, work, and serve to confront antigens in lymph nodes and the spleen's compartments (Kubánková etal,2021) .

When the cells of the immune system become educated, they complete their jobs by recirculating between central and peripheral lymphoid organs and migrating it and from sites of injury via blood. Blood carries naïve and educated

immune cells from one site to another, as it flows throughout the body, and acts as a pipeline for the immune system. The cells again enter into the bloodstream to be transported to tissues throughout the body after exciting these nodes through outgoing lymphatic vessels. After being affected by virus immune responses to mediate antibody. The B cells are assisted by T cells to differentiate into plasma cells, which then produce antibodies specific to a viral antigen. A neutralizing nature antibody is efficient in fully blocking the virus from entering into host cells to limit the infection and plays a very intense protective role at the later stage of infection and prevents relapse of infection. By contrast, a cellular immunity response can be observed inside the infected cells, which is mediated by T-lymphocytes. The overall adaptive immune response is directed by helper T cells, and cytotoxic T cells play a vital role in the clearance and cleaning of viral-infected cells (Gupta etal,2020) .

4. Demographic characteristics of survey study

Table (1) Demographic characteristics of the study participants N% 189

		The ratio	the number
sex	male	28.9%	55
	female	71.1%	135
the age	10 – 20	13.2%	25
	21 – 30	66.3%	126
	31 - 40	6.8%	13
	40 – 50	6.8%	13
	Older than 50 years old	6.8%	13
How many times have you been infected with Corona virus?	1	71.1%	135
	2	20%	38
	3	4.7%	9
	3 more than	4.2%	8

What is the average time period between each injury?	I was not injured again.	68.4%	130
	less than six months	14.2%	27
	more than six months	17.4%	33
The severity of the symptoms of injuries after the first infection.	Same severity as the first injury	41%	48
	Less than the severity of the first injury	41.9%	49
	Less than the severity of the first injury	17.1%	20
Are you a smoker?	Yes.	8.9%	17
	No	91.1%	173
chronic diseases.	nothing	86.3%	164
	.Hypertension	5.3%	10
	High blood sugar	1.6%	3
	.other	6.8%	13
Did you receive the vaccine?	Not	15.8%	30
	Yes	84.2%	160
Did you become infected after receiving the vaccine?	Not	68.4%	121
	Yes	31.6%	56
The severity of the infection after receiving the vaccine?	No. I have not been infected after receiving the vaccine	66.7%	114
	The same severity of the injury	8.8%	15
	. less.	17%	29
	more	7.6%	13
Chances of infection with other diseases after infection with the Corona virus.	more susceptible to disease	24.7%	47
	Less susceptible to disease	11.1%	21
	.no effect	64.2%	122
Did the Corona virus affect your respiratory system?	Yes	40.5%	77
	No	59.5%	113
If you answered yes, what diseases did your respiratory system suffer from?	Colds.	32.4%	55
	Pneumonia	4.1%	7
	.shortness of breath	21.2%	36
	A persistent cough.	24.1%	41

	No, I do not suffer	50.6%	86
After recovering from Corona, did you suffer from one or more of the following complications?	Constant tiredness	41.1%	78
	.pain in chest	9.5%	18
	Muscle pain.	21.6%	41
	abdominal pain	2.6%	5
	Diarrhea.	2.6%	5
	Frequent high temperatures.	8.4%	16
	Headaches.	24.2%	46
	Hypertension	6.3%	12
	.Forgetting.	26.3%	50
	depression.	20%	38
	Loss of sense of smell and taste.	17.4%	33
	No, I do not suffer	35.8%	68

Table (2) **Several symptoms variables of the male and female subjects were measured.**

	Ages between 20 and 40 years	Ages over 40 years old	Smokers	Non-vaccinated recipients
injury more than once	27.3%	38.5%	47%	20%
More severe after the first infection	8.6%	19%	17.6%	10%
injury after receiving the vaccine	29.5%	30%	41%	--
Increasing severity of infection after receiving the vaccine	5.8%	15.4%	11.7%	--
More susceptible to disease after injury	25%	27%	29%	40%
Effect on the respiratory system	41%	42%	29%	50%
Colds	13%	30%	17.6%	33%
Pneumonia	3.5%	3.8%	--	3%
shortness of breath	15.8%	11.5%	53%	20%
persistent cough	21%	19%	59%	23%
Constant tiredness	38%	42%	17.6%	47%
muscle pain;	21%	27%	11.7%	23%
Frequent high temperatures	7%	15.4%	5.8%	6%
Headaches	26%	15.4%	23.5%	16. 6%
Hypertension	5%	15.4%	--	6%
Forgetting	27%	--	29%	30%
brood	23%	19%	17.6%	20%
loss of sense of smell	17%	--	23.5%	23%
No, I did not suffer	21%	27%	35.2%	20%

5. Discussion

COVID-19 is a serious and dangerous infectious disease with symptoms similar to SARS in the form of fever, cough and fatigue. The disease is mostly transmitted through respiratory droplets and close contact. This disease is a major threat to world health and safety. All ages are susceptible. Infection is transmitted through large droplets generated during coughing and sneezing by symptomatic patients but can also occur from asymptomatic people and before onset of symptoms (Rothe etal,2020). Studies have shown higher viral loads in the nasal cavity as compared to the throat with no difference in viral burden between symptomatic and asymptomatic people [Zou etal,2020]. Patients can be infectious for as long as the symptoms last and even on clinical recovery. These infected droplets can spread 1–2 m and deposit on surfaces. The virus can remain viable on surfaces for days in favourable atmospheric conditions but are destroyed in less than a minute by common disinfectants like sodium hypochlorite, hydrogen peroxide etc. [Kampf etal2020]. Infection is acquired either by inhalation of these droplets or touching surfaces contaminated by them and then touching the nose, mouth and eyes. The virus is also present in the stool and contamination of the water supply and subsequent transmission via aerosolization/ feco oral route is also hypothesized [WHO,2020]

The clinical features of COVID-19 are varied, ranging from asymptomatic state to acute respiratory distress syndrome and multi organ dysfunction. The common clinical features include fever (not in all), cough, sore throat, headache, fatigue, headache, myalgia and breathlessness. Conjunctivitis has also been described. Thus, they are indistinguishable from other respiratory infections. In a subset of patients, by the end of the first week the disease can progress to pneumonia, respiratory failure and death. This progression is associated with extreme rise in inflammatory cytokines including IL2, IL7, IL10, GCSF, IP10,

MCP1, MIP1A, and TNFα [Chen et al,2020]. Complications witnessed included acute lung injury, ARDS, shock and acute kidney injury. Recovery started in the 2nd or 3rd wk. Fatality rate in hospitalized adult patients ranged from 4 to 11%. The overall case fatality rate is estimated to range between 2 and 3% [Xinhua etal,2020].

A suspect case is defined as one with fever, sore throat and cough who has history of travel to China or other areas of persistent local transmission or contact with patients with similar travel history or those with confirmed COVID-19 infection. However cases may be asymptomatic or even without fever. A confirmed case is a suspect case with a positive molecular test. Specific diagnosis is by specific molecular tests on respiratory samples (throat swab/ nasopharyngeal swab/ sputum/ endotracheal aspirates and Broncho alveolar

lavage). Virus may also be detected in the stool and in severe cases, the blood. It must be remembered that the multiplex PCR panels currently available do not include the COVID-19. Commercial tests are also not available at present. In a suspect case in India, the appropriate sample has to be sent to designated reference labs in India or the National Institute of Virology in Pune. As the epidemic progresses, commercial tests will become available ([Zou etal,2020]

Finally This new virus outbreak has challenged the economic, medical and public health infrastructure of China and to some extent, of other countries especially,. More so, future outbreaks of viruses and pathogens of zoonotic origin are likely to continue. Therefore, apart from curbing this outbreak, efforts should be made to devise comprehensive measures to prevent future outbreaks of zoonotic origin.

7. Conclusion

The current COVID-19 pandemic is clearly an international public health problem. There have been rapid advances in what we know about the pathogen, how it infects cells and causes disease, and clinical characteristics of disease. Due to rapid transmission, countries around the world should increase attention into disease surveillance systems and scale up country readiness and response operations including establishing rapid response teams and improving the capacity of the national laboratory system.

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الخلاصة

يعد فيروس كورونا من الفايروسات التي تصيب الجهاز التنفسي وتسبب اعراض مرضية حادة (-SARS
CoV-2) هو فيروس شديد العدوى وممرض ظهر في أواخر عام ٢٠١٩ وتسبب في جائحة كبيرة ، هددت
حياة الناس في مختلف دول العالم.. في هذا الاستطلاع ،سوف نسلط الضوءعلى التصنيف الاساسي لـ
SARS-CoV-2 ، بما في ذلك الخصائص الجينية واستخدام المستقبلات ، مع تسليط الضوء على اختلافه
الرئيسي عن فيروسات كورونا المعروفة سابقًا. في هذا الاستطلاع نحاول ان نلخص بعض الصفات
السريرية والوبائية والمرضية لـ COVID-19. ، نناقش أيضًا المضيفات المحتملة للحياة البرية والأصل
الحيواني لهذا الفيروس الناشئ بالتفصيل.

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