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An Overview of Novel Corona Virus 2019-nCoV and their Clinical and Immune Responses

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Abstract

The novel virus such as corona virus 2019 is the main cause of the disease that is declared by the WHO (World Health Origination). Some other virus similar to this virus were also discovered in initial year of 21th century such as SARS-CoV in 2003, HCoV NL63 in 2004, HKU1 in 2005, MERS-CoV in 2012, and SARS-CoV-2 in 2019. The first few cases of covid-19 were detected from direct contact to the infected animal to human which is also called as animal to human transmission. Due to direct exposure of this virus to infected animals the human to human transmission of the virus is as well possible, which is also likely to be consider and measured as core form of transmission. According to the reports of WHO by 26 February 2020, patients suffering from COVID-19 reduced gradually in China but rapidly increased in countries like Italy, Iran and South Korea. The infection caused by the COVID 19 is detected by looking at the symptoms and it ultimately confirmed by the reverse transcription polymerase chain reaction (rRT-PCR) of infected secretions with 71% sensitivity and computed tomography scan with 98%. Pharmacological demonstrating dependent on observed drug absorptions and in vitro drug testing propose that prophylaxis with hydroxychloroquine at affirmed portions could anticipate SARS-CoV-2 contamination and improve viral shedding. Clinical preliminaries of hydroxychloroquine treatment for COVID-19 pneumonia are in progress in China (NCT04261517 and NCT04307693).

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INTRODUCTION

Corona virus is a single stranded RNA virus and it is composed by wide family of positive sense. The corona virus family is basically substituted into two sub families which are Torovirinae and Coronavirinae (Fehr and Perlman, 2015). Alpha corona virus, beta corona virus, gamma corona virus and delta corona virus are the further classification of corona virus. Some amount of Phylogenetic clustering present in these viruses (Lu *et al.*, 2020; Chen *et al.*, 2020). The viral RNA genome measured 26 to 32 kilo base in length. There are mostly found in

various species of animals such as birds, bats, mice, dogs, camels, cats.

COVID-19 is acute respiratory syndrome corona virus-2. It is also called as novel corona virus 2019 (Chen *et al.*, 2020). It originated from Wuhan city of republic of china at the end of 2019 and gradually spread all over the world in the initial month of 2020 (Cascella *et al.*, 2020; Hassan *et al.*, 2020). The novel virus such as corona virus 2019 is the main cause of the disease that is declared by the WHO (World Health Origination). This shows the chances corona virus in human to human and also human to animal transmission (Cascella *et al.*, 2020).

Discovery and Origin

In late 1960s, the first human corona virus was discovered (Kahn and McIntosh, 2005). An infections bronchitis virus in the chicken were discovered and two in human patient suffering from common cold were initially discovered and later they were called human corona virus 229E and human corona virus OC43. Some other virus similar to this virus were also discovered in initial year of 21th century such as SARS-CoV in 2003,HCoV NL63 in 2004, HKU1 in 2005, MERS-CoV in 2012, and SARS-CoV-2 in 2019 Geller *et al.* (2012). These all are related to the respiratory infectious disease. Due to sever acute respiratory syndrome corona virus-2 has become an uncontrolled ongoing pandemic disease in 2019-2020 (Cyranoski, 2020). WHO (World Health Origination) announced SARS-CoV-2 as pandemic on 11 March 2020.

According to the reports collected till March 30, 2020. More than 751854 cases of COVID-19 have been reported in more than 190 countries, resulting that 158722^{+} recoveries and 36230^{+} death (Curetis Group Company Ares Genetics, 2020; Worldometer, 2020).

Diffusion and Transmission of COVID-19

The first few cases of COVID-19 were detected from direct contact to the infected animal to human which is also called as animal to human transmission. Due to direct exposure of this virus to infected animals the human to human transmission of the virus is as well possible, which is also likely to be consider and measured as core form of transmission. Symptomatic people are considered as the main source for spreading the infection (Cascella *et al.*, 2020; Ghinai *et al.*, 2020). The infection spread through respiratory droplets by coughing and sneezing. Studies shows that closed contact between individuals and closed space helps in transmission due to elevated aerosol consecration.

The viability of SARS-CoV-2 is up to three hour (van Doremalen *et al.*, 2020; Pyankov *et al.*, 2012). According to the recent research which is same as to the viability of SARS-CoV in air and MERS-CoV in air. This time is considered for exposure, inhalation and infection occur in the surrounding (Pyankov *et al.*, 2018; van Doremalen *et al.*, 2013).

The classification of the COVID-19 depends upon the severity of the disease. This disease has been classified into four different stages:

1. Mild disease
2. Moderate disease
3. Severe disease
4. Critical disease

Mild disease

This is an initial stage of the COVID-19; the symptoms include viral infection in the upper respiratory tract. This stage also include symptoms like dry cough, mild fever, nasal congestion, sore throat, headache, muscles pain, malaises, along with all these symptoms it is also characterizes by shortness of breath which the patient suffers (Cascella *et al.*, 2020). Most of the COVID-19 cases are at the mild stage in severity and therefore radiography features are not present in such cases. If not controlled at mild stage, then the patient will not take much time to reach severe and critical stage (Wang *et al.*, 2020).

Moderate disease

At moderate stage, patient suffers from breathing problems such as shortness of breath, cough, and tachypnea (Cascella *et al.*, 2020). But, these cannot be considered as symptoms of sever disease.

Severe disease

Acute respiratory distress syndrome (ARDS), sepsis, or septic shock and pneumonia symptoms are present in the severe disease patient. Severe disease is diagnosis clinically and the complications can be avoided by radiography. After reaching the severe stage of COVID-19 the respiratory rate of the patient will be greater than 30 per minute. Other signs include PaO2/FiO2 lesser than 300, $SpO2 \leq 93\%$, respiratory distress, greater than 50% lung infiltrates within 24 to 48 hours, moderate stage symptoms are not present in the severe stage disease (Geller *et al.*, 2012).

Critical disease

Respiratory failure is the main cause of the critical disease. Only 5% patient can suffer from the critical disease due to complete respiratory damage, cardiac damage, septic stock as well as malfunctioning of multiple organ of the body. According to the data comes from the Chinese center for disease control

and prevention the approx. 49% patient are suffering from the critical stage of the COVID-19 (Wang *et al.*, 2020).

Sign and symptom of covid-19

The time period taken for the incubation or the time between infection and symptoms is found to be approximately in 1 to 14 days. However in one or two cases it took over 27 days for incubation (Hopkins and Kumar, 2020). Signs and symptoms which includes fever 87.9%, Dry cough 67.7% fatigue 38.1%, uncommon symptoms are sputum production 33.4%, loss of smell 30-66%, muscle pain 14.8%, shortness of breath 18.6%, headache 13.6%, sore throat 13.9% vomiting 5.0%, chills 11.4%, nasal congestion 4.8%, diarrhea 3.7% hemoptysis 0.9%, conjunctival congestion 0.8%. Most common symptom is fever, dry cough, and fatigue. In sever disease the symptoms are high fever, coughing up blood, decrease white blood cells and kidney failure (Hopkins and Kumar, 2020).

Diagnosis

The infection caused by the COVID 19 is detected by looking at the symptoms and it ultimately confirmed by the reverse transcription polymerase chain reaction (rRT-PCR) of infected secretions with 71% sensitivity and computed tomography scan with 98%.

Viral testing

The World Health Organization has drawn numerous RNA testing rules for SARS-CoV-2, of which the first one was issued on 17^{th} of January. Testing uses real-time reverse transcription polymerase chain reaction (rRT-PCR). Here Respiratory or blood samples are taken for test. The results can be obtained within few hours or a day or two (Brueck, 2020). If an individual has travelled to an area which has an ongoing community transmission within a fortnight or have had close contact with an infected person, then individual is at risk. Common signs or symptoms are fever, coughing or shortness of breath, fatigue, anorexia, sputum production and sore throat can also be considered as possible indicators.

Epidemiology

On 31 December 2019 several pneumonia cases of unknown cause were reported in Wuhan city of China by the Health authorities.

According to the report on 14 March 2020, from the South China Morning Post said that the first individual who contracted the disease on 17 November was 55 years old and belonged to Hubei province (Sun *et al.*, 2020). According to the reports of WHO by 26 February 2020, patients suffering from COVID-19 reduced gradually in China but rapidly increased in countries like Italy, Iran and South Korea (Al, 2020). In fact the patients suffering from COVID-19 were more outside China than the patients in China. Cases which showed mild symptoms are still under reported. But by 26 February 2020, 2.4% of cases were reported of patients of age around 19 years old from around the world. According to the Government sources of UK and Germany, more than half of their population will need to become infected before effective herd community can be attained. On 9 January 2020, first death was reported in Wuhan, China. And on 1 February 2020 first death outside China was reported in Philippines and also the first death outside Asia was confirmed on 14 February. By 28February many deaths were reported outside China, in countries like Iran, South Korea, and Italy (Li *et al.*, 2020b).

Except Antarctica, all other continents were affected and more than forty countries as well as territories reported deaths. According to the estimation of WHO which believed that crude mortality rate is 3 to 4% as on 6 March 2020. Infection mortality rate states that the numbers of death reported upon number of infection. Than the infection mortality rate will be lower (Li *et al.*, 2020a).

In India the first case of COVID-19 pandemic was reported on 30 January 2020, which originated from Republic of China. On 25 March 2020 the Indian Council of Medical Research and Ministry of Health and Family Welfare reported approximately 562 cases of which 40 recoveries, 1 migration and 9 deaths took place in India. The initial three patients who suffered from COVID-19 were the students who returned from Wuhan city of China and who belonged to Kerala. According to the recent reports 1590 plus case confirmed and 150 plus recoveries and 52 deaths. Maximum cases were found in the Kerala and Maharashtra.

Antiviral Drugs Used For The Management And Reduce The Transmission Of The COVID-19

The current COVID-19 crisis warrants the pressing advancement of potential techniques to secure individuals at high danger of contamination (Bi *et al.*, 2020). Pre-exposure prophylaxis and post-exposure prophylaxis (PEP) with antimicrobial medications are successful in anticipating sickness after recorded presentation to a collection of microbial pathogens, and in decreasing the danger of auxiliary spread of disease. On the basis of PEP for different diseases, we suggest beginning PEP at the earliest opportunity after an ongoing conceivable introduction to SARS-CoV-2 (Welliver, 2001).

For instance, PEP with rifampicin is given to individuals presented to list instances of obtrusive

meningococcal contamination, and oseltamivir has been prescribed by WHO for individuals at high danger of disease previously or after presentation to pandemic flu (Yao *et al.*, 2020).

Antiviral medications regulated soon after manifestation beginning can lessen irresistibleness to others by diminishing viral shedding in the respiratory emissions of patients (SARS-CoV-2 viral burden in sputum tops at around 5–6 days after indication beginning and keeps going as long as 14 days), and focused on prophylactic treatment of contacts could decrease their danger of getting contaminated.

The execution of antiviral treatment and prophylaxis has a few necessities. The store of medications must be sufficient, the security of treatment must be high, and expenses should to preferably be low. The anti-malarial medicate, hydroxychloroquine, is authorized for the chemoprophylaxis and treatment of intestinal sickness and as a disease changing anti-rheumatic drugs (Tett *et al.*, 1989). It has a past filled with being protected and very much endured at regular portions. Quite, the medication shows antiviral movement in vitro against corona viruses, and explicitly, SARS-CoV-2.4 Pharmacological demonstrating dependent on observed drug absorptions and in vitro drug testing propose that prophylaxis with hydroxychloroquine at affirmed portions could anticipate SARS-CoV-2 contamination and improve viral shedding. Clinical preliminaries of hydroxychloroquine treatment for COVID-19 pneumonia are in progress in China (NCT04261517 and NCT04307693). We are looking into the outcomes from China as they develop. The primary examination (NCT04261517) has demonstrated positive fundamental results (though not indisputable in light of the little example size) as far as clinical administration, with distributed information expected soon (Henao-Restrepo *et al.*, 2017).

Multicenter randomized controlled preliminary (NCT04304053) to assess the viability of antiviral treatment in anybody saw as contaminated, and the adequacy of prophylactic hydroxychloroquine in anticipating optional SARS-CoV-2 diseases and illness side effects among all contacts. Our goal is to assess the decrease in transmissibility of SARS-CoV-2 and in illness movement among the contacts of a record case (Henao-Restrepo *et al.*, 2017).

Immune responses of corona viruses (CoV) infection during an infection

A, CoV infects macrophages, and afterward macrophages present CoV antigens to T cells. This procedure prompts T cell initiation and separation, including the production of cytokines related with the distinctive T cell subsets (i.e., Th17), and trailed by an enormous arrival of cytokines for resistant response amplification. The proceeded with creation of these middle people because of viral constancy negatively affects NK, and CD8 T cell initiation. However, CD8 T cells produce extremely successful arbiters to clear CoV. B, Attachment of CoV to DPP4R on the host cell through S protein prompts the appearance of genomic RNA in the cytoplasm. A safe reaction to dsRNA can be halfway created during CoV replication. TLR-3sensitizedbydsRNA and falls of flagging pathways (IRFs and NF-κB initiation, separately) are actuated to create type I IFNs and pro inflammatory cytokines. The creation of type I IFNs is critical to improve the arrival of antiviral proteins for the security of uninfected cells. Sometimes, accessory proteins of CoV can meddle with TLR-3 flagging and tie the ds-RNA of CoV during replication to forestall TLR-3 actuation and sidestep the immune reaction. TLR-4 may perceive S protein and lead to the initiation of pro inflammatory cytokines through the MyD88-dependent signaling pathway. Virus-cell connections lead to the solid creation of safe goes between. The discharge of enormous amounts of chemokine's and cytokines(IL-1, IL-6, IL-8, IL-21, TNF-β,andMCP-1) is advanced in tainted cells in light of CoV contamination. These chemokine's and cytokines, thus, recruit lymphocytes and leukocytes to the site of disease. Red lines allude to inhibitory impacts. Green lines indicate to initiating impacts (Li *et al.*, 2020b; Shereen *et al.*, 2020; Kahn and McIntosh, 2005).

CONCLUSIONS

COVID-19 is acute respiratory syndrome corona virus-2. Respiratory failure is the main cause of the disease. The infection spread through animal to human transmission and human to human transmission. Studies shows that closed contact between individuals and closed space helps in transmission due to elevated aerosol consecration. The antimalarial medicate, hydroxychloroquine, is authorized for the chemoprophylaxis and treatment of intestinal sickness and as a disease changing antirheumatic drugs. The medication shows antiviral movement in vitro against corona viruses.

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