

Review Research Article Corona Virus, Covid-19, Pandemic Disease

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Abstract- *The disease caused by corona virus is come under the category of sudden/acute infectious disease which is caused by SARS-CoV-2. At time WHO stated that disease of COVID-19 is a worldwide contagious illness. According to WHO, this contagious disease is a 3rd acute contagious disease which is caused by infection due to corona virus in the current century after anticipated SARS. Till now the exact mechanism of COVID-19, how it produces its ill effects to the host body is still not clear.*

This disease of COVID-19 shows mild or negligible symptoms in most of the population, but usually it progresses with people of old aged groups or patient having low immunity. In the cases it started with dyspnea, progress towards pneumonia and might lead to multiple organ failure. Now a days most of the people or patients show no symptoms or otherwise are asymptomatic. Final diagnosis of the virus is confirmed by presence of virus in the secretions of respiratory tract with the help of molecular tests. First case of this pandemic was from city of wuhan, from china on 7th January, 2020.

I. INTRODUCTION

The pandemic namely corona virus is rapidly out breaking from its primary source i.e. from the city of Wuhan, situated in china to the entire world. This disease is a serious out break to the rest of the countries, resulting in damaging effect to the human body. This article give broad spectrum of view for the pandemic disease. Firstly in the month of December 2019, many patients of unspecified etiology of pneumonia which all had a history of visit to seafood whole sale market in Wuhan, China were come across.

The virus causing COVID-19 has been named by international committee on taxonomy of viruses as Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-COV-2) in month of February 11, 2020. The virus causing this pandemic disease is termed as COVID-19 by the world health

organization on 11th February 2020. Recently, Corona virus has become a critical condition of international concern of public health, WHO stated its danger to the extreme highest level. This virus has damaging effects over various human organs like lungs, can disrupt cardiac function by affecting the heart, may lead to renal problem by affecting the kidneys, hepatic dysfunction, and also affect genital organs of the human body.

Going through the literature the patients, who all were tested positive for COVID-19, ultimately lead towards acute respiratory distress syndrome(ARDS) in 67.3% of cases, acute kidney injury in 28.9% of cases, disrupted hepatic function in 28.9% of cases and cardiac injury in 23.1% of cases and on the 28th day mortality rate was 61.5%. The process of naming the novel coronavirus (2019-nCoV) which emerged in Wuhan, China, in December 2019, has created some controversies.

In this review, the WHO convention of referring to the disease condition as novel coronavirus disease (COVID-19) has been followed. The virus will be referred to as SARS-related CoV-2, or SARS-CoV-2. COVID-19 has been labeled as a public health emergency of international concern (PHEIC) , and the epidemic curves are still on the rise.

II. HISTORY

It is a RNA virus with diameter ranging from 60nm to 140 nm having projections similar to spike on the superficial surface which give its appearance of crown under an electron microscope. There have been two events in the past two decades wherein crossover of animal beta corona viruses to humans has resulted in severe disease. The very first occurrence of the virus was in 2002-2003, when a virus from genera with its prime origin from bats, crossed over to humans via mediator host of cats from Guangdong province of the country China.

This virus cause infection to 8422 people mostly in the country China along with Hong Kong and resulted in 916 deaths with a mortality rate of 11% before being contained and is designated as severe acute respiratory syndrome corona virus. Almost a decade later in 2012, the Middle East respiratory syndrome coronavirus (MERS-CoV), also of bat origin, emerged in Saudi Arabia with dromedary camels as the intermediate host and affected 2494 people and caused 858 deaths (fatality rate 34%).

Pathogen:-SARS-CoV-2 is an animal virus that belongs to the b- coronavirus genus. Current studies showed that bats, snakes, and pangolins may be the hosts for SARS-CoV. Result of genetic sequencing shows that bats are the primary host for corona virus as the homology between two coincides 96%¹⁶ but the intermediate host for the same virus is still unknown.

III. GENETIC STRUCTURE AND PATHOGENIC MECHANISM

Coronaviruses are single-stranded RNA viruses with a diameter of 60–140 nm. There are four types: -coronavirus, -coronavirus, -coronavirus and - coronavirus. Prior to SARS-CoV-2, six coronaviruses were known to cause disease in humans, including SARS-CoV and MERS-CoV. SARS-CoV-2, like SARS-CoV and MERS-CoV, is a -coronavirus. The genome sequence homology of SARS-CoV-2 and SARS is approximately 79%; SARS-CoV-2 is closer to the SARS-like bat coronaviruses (MG772933) than SARS-CoV, which descended from SARS-like bat coronaviruses.

Interestingly, several analyses have shown that SARS-CoV-2 uses angiotension- converting enzyme 2 (ACE2) as its receptor, in common with SARS- CoV19. This virus has the tendency to perceive their analogous receptor over the target cells, due to presence of S proteins on their outer surface and entry inside the cell finally leads to infection. A structure model analysis shows that SARS-CoV-2 binds to ACE2 with more than 10-fold higher affinity than SARS-CoV, at a level above the threshold required for virus infection.

The comprehensive implementation through which severe acute respiratory syndrome- corona virus infects humans through binding of protein- S to ACE 2 , the brawn of interaction for danger of human communication and how SARS-COV-2 results in organs injury is still remain unknown and for this more studies required to come across. These outcome describe the speedy imparting potentiality of the virus in humans and the more number of authenticate cases of COVID-19 contrast with SARS-COV disease. Contemplate

the higher empathy of SARS-COV-2 binding to ACE 2 might be likely candidate for the therapy of COVID-1921.

Origin and Spread of COVID-19:

In December 2019, adults in Wuhan, capital city of Hubei province and a major transportation hub of China started presenting to local hospitals with severe pneumonia of unknown cause. Many of the initial cases had a common exposure to the Human wholesale seafood market that also traded live animals. The surveillance system (put into place after the SARS outbreak) was activated and respiratory samples of patients were sent to reference labs for etiologic investigations.

On December 31st 2019, China notified the outbreak to the World Health Organization and on 1st January the Huanan sea food market was closed. On 7th January the virus was identified as a coronavirus that had >95% homology with the bat coronavirus and > 70% similarity with the SARS CoV. Environmental samples from the Huanan sea food market also tested positive, signifying that the virus originated from there. The number of cases started increasing exponentially, some of which did not have exposure to the live animal market, suggestive of the fact that human-to-human transmission was occurring.

The first fatal case was reported on 11th Jan 2020. The massive migration of Chinese during the Chinese New Year fuelled the epidemic. Cases in other provinces of China, other countries (Thailand, Japan and South Korea in quick succession) were reported in people who were returning from Wuhan. Transmission to healthcare workers caring for patients was described on 20th Jan, 2020. By 23rd January, the 11 million population of Wuhan was placed under lock down with restrictions of entry and exit from the region. Soon this lock down was extended to other cities of Hubei province. Cases of COVID-19 in countries outside China were reported in those with no history of travel to China suggesting that local human-to-human transmission was occurring in these countries. Airports in different countries including India put in screening mechanisms to detect symptomatic people returning from China and placed them in isolation and testing them for COVID-19. Soon it was apparent that the infection could be transmitted from asymptomatic people and also before onset of symptoms.

Therefore, countries including India who evacuated their citizens from Wuhan through special flights or had travellers returning from China, placed all people symptomatic or otherwise in isolation for 14 days and tested them for the virus. Cases continued to increase exponentially and modeling

studies reported an epidemic doubling time of 1 days²⁵. In fact on the 12th of February, China changed its definition of confirmed cases to include patients with negative/ pending molecular tests but with clinical, radiologic and epidemiologic features of COVID-19 leading to an increase in cases by 15,000 in a single day.

It is important to note that while the number of new cases has reduced in China lately, they have increased exponentially in other countries including South Korea, Italy and Iran. Of those infected, 20% are in critical condition, 25% have recovered, and 3310 (3013 in China and 297 in other countries) have died²⁶. Till 2nd of March 2020 only 3 cases of corona virus were reported in India. After than there was an unexpected erupt in viral cases by 5th of March 2020. Viral cases start reporting mostly in the region of New Delhi, Agra, Jaipur, because of contact of Italian tourist persons².

Source of Infection and Transmission Routes:-

Currently, the major source of infection is patients which are already affected with COVID-19 and some patients who are asymptomatic could become carrier of infection, close approximate contact and respiratory droplets are the major spreading route & specific awareness should be given to family members and asymptomatic carriers. Recently SARS-COV-2 has been recognized in the air in ICU, so a long term vulnerability in comparatively sealed ICU surroundings may result in aerosol communication.

IV. DIAGNOSIS

Diagnosis of corona virus and acquiescence with any of the underlying, could be diagnosed as critical COVID-19 patients.

1. Respiratory anguish:- in which the rate of respiration is equal or more than 30 breathes per minute.
2. Pulse oximetry oxygen saturation at rest:-should be equal to or less than 93%.
3. Oxygenation index (Pao₂/Fio₂):- should be equal to or less than 300mm/Hg
4. If imaging test of lungs were done and shows significant progression i.e. more than 50% in lesion that too with in 24 – 48 hours.
5. If patient had undergone respiratory failure and there is need for mechanical ventilation.
6. If patient has underwent shock, along with above discussed features along with failures of other organs.

Susceptible population:-

An epidemiological investigation report reported that elderly people are most susceptible to SARS-CoV-2 (median age at death 75 years), and most of the patients who died had comorbidities or a history of surgery before admission^{21, 31}. Zhong et al. found that, based on the clinical features of 1099 patients with COVID-19, the median incubation period was 3 days (range 0–24 days), and the median time from symptom onset to death was 14 days.

For SARS-CoV infection, the median latency was 4 days, the average interval from symptom onset to hospital admission was 3.8 days, and the average interval from hospital admission to death was 17.4 days. The median latency of MERS-CoV infection was 7 days. The median incubation period for COVID-19 is shorter than that for SARS and MERS.

However, the maximum latency of SARS-CoV-2 currently observed is as high as 24 days, which may increase the risk of virus transmission. Moreover, people aged 70 years had a shorter median interval (11.5 days) from symptom onset to death compared with patients aged <70 years (20 days), demonstrating that disease progression is more rapid in elderly people compared with younger people. As such, our focus should be on elderly people who might be more vulnerable to SARS-Cov.

Clinical Presentation and Auxiliary Tests:-

Ground on some other studies, patient diagnosed with COVID-19 usually manifests Dyspnea after 1 week of virus onset in the body and out of some more serious cases, could rapidly proceeds towards “Acute Respiratory Distress Syndrome”, show some coagulation disorders, can underwent shock (septic shock), can underwent refractory metabolic acidosis. In addition to above patient diagnosed with corona virus and comorbid encephalitis should not be missed, as chances of development of cerebral congestion, edema and neuropathy is more in patients diagnosed with covid-19.

Some of the early neurological features shown by patient affected with covid-19 are; headache, dizziness, anosmia, myalgia, impaired level of consciousness . Some of the markers that are helpful in diagnosing covid-19 are; (1)decreased in count of peripheral blood lymphocyte(2) progressive elevation in peripheral blood inflammatory factors such as IL-6 and the C-reactive protein; (3) progressive elevation in lactic acid level; (4) and imaging results showing bilateral or multilobar infiltration, pleural effusion, or short term increase in lesions³³. Study revealed that ratio value of neutrophil to lymphocyte (NLR) is one of the determining factor which can be used for early detection of covid-19.

Study revealed that patient aged more than 50 years along with NLR equal to or more than 3.13 might have the tendency to develop covid-19 and the patient should be admitted internal care unit (34). Chest CT plays a major role in diagnosis of COVID-19. Chest CT has high diagnostic value in patients who have negative Reverse Transcription-Polymerase Chain Reaction (RT-PCR) results but whose clinical symptoms, auxiliary test results, and epidemiological history make them highly suspected patients.

Treatment:

Antiviral Drugs

Till date, there is no as such specific antiviral drugs for covid-19. But a study revealed that some antiviral drugs like remdesivir, lopinavir and ritonavir could be an effective agent in the treatment of covid. But their safety and efficacy in the treatment of covid-19 still requires large sample size or clinical validation. They also stated that interferon- α – nebulization, ribavirin, chloroquine and umifenovir could also be used in SARS-COV-2 treatment.

Immunoenhancement therapy :- One of the pathogenesis of SARS-CoV is caused by a disproportionate immune response. Boosting the body's immunity is a potential candidate protocol for treating SARS patients. Interferons can inhibit viral infection by inducing both innate and adaptive immune response.

Synthetic recombinant interferon has been shown to be effective for the treatment of patients with SARS in clinical trials, the interferon alfacon- plus corticosteroids treatment had a shorter time to 50% resolution of lung radiographic abnormalities compared with corticosteroids treatment alone and was associated with reduced disease-associated impaired oxygen saturation.

Interferon was also found to be an effective inhibitor of MERS-CoV replication. These findings suggest that interferon could be used in the treatment of COVID-19. Intravenous immunoglobulin might be the safest immunomodulator for long- term use in all age groups, and could help to inhibit the production of pro-inflammatory cytokines and increase the production of anti-inflammatory mediators.

Moreover, thymosin alpha-1 (Ta1) can be an immune booster for patients with SARS, effectively controlling the spread of disease. Intravenous immunoglobulin and Ta1 may also be considered for treatment of COVID-1921

Convalescent plasma therapy:-

When there are no sufficient vaccines or specific drugs, convalescent plasma therapy could be an effective way to alleviate the course of disease for severely infected patients in a retrospective survey, it was stated that convalescent plasma therapy is very much considered helpful in treating patient with SARS, which results in reducing hospital stays.

A different study done by HUNG et al revealed that patient with pandemic disease H1N1 influenza virus in the year of 2009, patient shows high recovery rate those treated with convalescent plasma21

Moreover, from the perspective of immunology, most patients who recover from COVID-19 will produce specific antibodies against the SARS-CoV-2, and their serum could be used to prevent re-infection. At the same time, antibodies can limit viral reproduction in the acute phase of infection and help clear the virus, which is conducive to rapid recovery from the disease.

Theoretically, viraemia peaks during the first week of most viral infections, and it should be more effective to give convalescent plasma early in the disease course. Therefore, the plasma of patients who have recovered from COVID-19 could be collected to prepare plasma globulin specific to SARS-CoV-2. However, the safety of plasma globulin products specific to SARS-CoV-2 deserves further consideration.

Auxiliary blood purification treatment:- At present, extracorporeal blood purification technology is used in the treatment of patients with severe NCP. According to the latest study, ACE2, the key receptor of SARS-CoV-2, is highly expressed in human kidney (nearly 100 times higher than in lung). Kidney might be the main target of attack for SARS-CoV.

Early continuous blood purification treatment could reduce renal work- load and help to promote the recovery of renal function. The most severe cases of COVID-19 may suffer from a cytokine storm. The imbalance of pro-inflammatory factors and anti-inflammatory factors may cause immune damage.

Therefore, blood purification technology could be used to remove inflammatory factors, eliminate cytokine storms, correct electrolyte imbalances and maintain acid-base balance to control patients' capacity load in an effective manner. In this way, patient symptoms could be improved and blood oxygen saturation could be increased

Prevention:-

SARS-CoV-2 spreads via respiratory droplets and physical contact. It is essential to practice precautionary measures to prevent transmission. Standard precautions consist of hand hygiene, use of personal protective equipment (PPE) and respiratory and cough etiquettes. Hand hygiene should be done with alcohol-based hand rubs (ABHRs) containing 60-80 per cent ethanol. Hand washing following the correct steps with soap and water should suffice.

Cloth towels should be avoided for drying hands and disposable tissue papers should be preferred. PPE consists of the medical masks or particulate respirators, face shields or goggles, gowns, gloves and shoe covers⁴⁰. For droplet and contact-based transmission, medical masks or procedure masks with head straps should suffice. This should be worn before entering the patient area and should be taken off only after leaving the same. It is mandatory for persons in the community settings who are symptomatic, the patients who are in home care setups and suspected cases of COVID-19 with mild respiratory symptoms and healthcare workers (due to their elevated risk of exposure) need to wear medical masks at all times followed by hand hygiene and correct disposal⁶¹. Particulate respirators (NIOSH-certified N95, EU standard FFP2 or equivalent) should be used by HCWs involved in aerosol-generating procedures (AGPs). Face shields/goggles are to be used by all HCWs while performing AGP.

Long-sleeved, sterile, waterproof gowns, made of non-absorbable materials are to be worn. When gowns are not available, waterproof aprons should be used. Powder-free, latex gloves should be worn while handling infected patient's material

V. SUMMARY

There have been several lessons to glean from the global response to the SARS-COV-2 threat. Most responses have been reactive, with little preparedness investment in health systems and through community engagement and empowerment. However, the emphasis on data sharing, the rapid development and distribution of interim guidance documents by WHO and open-access pre-print sharing of rapidly emerging evidence reflect a paradigmatic shift in providing a data driven global-epidemic response. This unprecedented effort at providing information to global practitioners has led to a more concerted response, helping to mount international, multi-country, migratory actions.

The original source of the outbreak, the intermediate host, an effective treatment regimen, tools for early diagnosis

in asymptomatic patients and tools to predict emergence of novel pathogens all remain elusive. Clinical trials have begun to identify vaccines and effective and safe treatment regimens, but efforts to identify drugs that can be repurposed and used, off-label, remain limited.

Further, epidemiologic determinants and reservoirs which are likely responsible for the recent explosive case counts in Italy and Iran are yet to be identified. The infectious disease threats of our times are far from over, and if these are to be contained with lower magnitudes of loss to human life and economy, we need to invest in building up people-centric health systems, which pre-empt and prevent, rather than work in reactive, feedback loops driven by the burden of human misery.

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