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An Analytical Overview of Covid 2019- A Scientific Discussion

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ABSTRACT

Corona virus pandemic has swept a major section of the world population. In terms of infectivity it's higher than any pandemic in the recent past. Corona virus, a member of the family Coronaviridae, spread from bat to human through an intermediate host pangolin. It has lower mortality rate than the previous pandemics in last 100 years such as Spanish Flu(1918-20),Asian Flu (1957-58), SARS Corona virus (SARS-Cov) (2003), H1N1 Swine Flu Pandemic(2009-10), Middle East Respiratory Syndrome (MERS) (2012), West African Ebola (2014-16) etc. Research shows Covid spike attaches ACE2 receptor; it leads to a release of cytokine into the blood capillaries near the alveoli and may ultimately turn into pneumonia. The alveoli get collapsed leading ARDF. The pulmonary inflammation proceeds to systemic inflammation that causes multiple organ failure. Drug like Chloroquine, Lopinavir/ritonavir, and Remdesivir may halt the spread of the virus in the body. Antipyretic is prescribed to reduce the temperature. This article comprises of detail mechanism of the dreadful disease along with its diagnosis and proposed treatment. This exploratory study mainly designed to generate awareness and provide information to the individuals who want to know the A to Z of Covid in nutshell. This article may create a pathway to number of upcoming scientific researches and may attract them to work on this field to enhance the probability of inventing appropriate vaccine and medicine to fight against this contagious disease and to win the battle against this Global Pandemic.

Key Words: Corona Virus, Pandemic Disease, Covid 19, RNA

INTRODUCTION:

Corona Virus Disease 2019 (COVID-19) comprise of 4 human viruses affecting all age groups looks like it has a crown validating its name. Since its first detection novel strain of coronavirus SARS-CoV-2 in Wuhan, a city in China's Hubei province with a population of 11 million in December 2019, the virus has now spread to over 200 countries and territories across the globe, and was characterized as a pandemic by the World Health Organization (WHO) on 11 March 2020 as the fifth pandemic after the 1918 flu pandemic. It was termed as 'Wuhan Virus' based on its origin, although World Health Organisation (WHO) coined the name as Novel Corona Virus (2019-nCoV) and then officially named as COVID-19. Later, the International Committee on Taxonomy of Viruses (ICTV) officially designated the virus as SARS-CoV-2 after detailed analysis of phylogeny and taxonomy.

According to the latest COVID-19 data of the top 20 nations worst-affected by, India has accelerated its growth being the only one where daily cases registered continue to break new records. India's three-day average of fresh cases as of September 3 stood at 77,397 – around 92% of the largest single-day caseload of 83,883. Using the same metric, no other country in the top 20 had caseloads in excess of 80 % of their own daily peaks. As per the most up-to-date figures published by the Union Health Ministry, the nation currently has 8,31,124 active cases – 21.11 % of its total confirmed COVID-19 tally now well over 39 lakhs. Around 54% of India's cases had come during the month of August alone – an indication that India is still some way away from reaching its COVID-19 peak. To understand how the quickly the crisis is escalating in the nation, it is noticeable that it took six months to breach the 1 million mark, but just an additional three weeks to reach two million cases. 16 days later, India had crossed 3 million cases. According to health ministry's data (HT Report) India's Covid-19 caseload as on 21st September stands at 5,400,619. Following Wuhan Model lockdown was imposed in countries where COVID had made through, though densely populated regions faced the real challenge.

No drug or vaccine has been made against the rapidly mutating RNA virus yet, hence repurposing of an existing drug would be a better alternative. COVID-19 is a Zoonotic virus which is spread from bats to humans via an intermediate suspected to be a pangolin which is a common culprit during epidemics. Corona virus differs from SARS outbreak and H1N1 in R0 value (2-3). The three of them originated from bats and invaded human lungs only differing in intermediate host animal. Research shows R0 value of influenza is 1.3 whereas in case of Covid 19, its 2 to 3. However in mass gatherings its spreadability (R0) reaches up to 1200.

MECHANISM:

Corona virus contain positive-sense RNA genome of 5' cap structure along with a 3' poly (A) tail, permitting it to act as an mRNA for translation of the Replicase Polyproteins. The gene that encodes the non-structural proteins occupies two-thirds of the genome whereas accessory and structural proteins occupy the rest. The 5' end of the genome has a leader sequence and untranslated region (UTR) that contains loop structures required for RNA replication and transcription. Furthermore at the beginning of each gene are sequences required for expression of each of these genes. The 3' UTR contains RNA structures for replication and synthesis of viral RNA.

Corona virions are pleomorphic enveloped particles studded with protruding glycoproteins, surrounding a core of matrix protein which encloses single strand of positive-sense RNA associated with nucleoprotein. The glycoproteins carry the main antigenic epitopes and are responsible for attachment to the host cell .OC43 possesses a haemagglutinin.

Virologists have found that the virus attaches to the ACE-2 receptors in lungs, and kidneys and releases its positive sense single stranded RNA which undergoes translation via ribosomes in type 2 pneumocyte to form capsid and spike proteins. Some RNA undergo replication to form multiple RNA. The RNAs get enclosed in the capsids and are ejected out of the cell. The damaged cells release chemicals which stimulate macrophages to release cytokines like interleukin 2 and 6. These inflammatory chemicals are released in viral and bacterial infections and also in autoimmune disorders. The cytokines cause vasodilatation and increase permeability of the blood vessels. Plasma gushes into the post alveolar gap and into the alveoli causing pneumonia and oedema.

It renders the gas exchange mechanism inefficient. As a result of which it necessitates to pump in and out the same amount of gas; thus heart rate is elevated by the sympathetic nervous system. Hypothalamus is stimulated by the interleukins to release prostaglandins responsible for raising body temperature leading to fever. The oxygen deficit shows its symptoms in the form of dizziness, nausea but on a more serious stage it causes organ failure of brain, heart and other organs due to hypoxia and ultimately septic shock. Furthermore, Kidney and Liver failure are also common occurrence in recovered patients.

The pulmonary immune response when turns systemic, coagulation proteins are used up leading to Disseminated intravascular Coagulation, a condition in which small blood clots form throughout the bloodstream, which clog small blood vessels depleting the platelets and clotting factors needed to control bleeding, causing incessant bleeding.

Medical report reveals loss of taste and smell as the primary sites of action of the virus i.e. virus affects olfactory, gustatory cells and pharynx at a time.

In case of Acute Respiratory Distress Syndrome (ARDS), widespread inflammation in the lungs is manifested in higher breathing rate and bluish skin color. It's life threatening and patients need to be put on ventilators immediately with fluids. Patients with ARDS collapse alveoli therefore mechanical ventilation has to be chosen to be Low tidal volume ventilation (LTVV) to reduce the damaging, distension of lung and alveolar tissue.

The condition may progress to a condition called Systemic Inflammatory Response Syndrome (SIRS) which is an exaggerated response against stressors, characterized by tachycardia, tachypnea, hyperthermia and leucocytosis; the four criteria for SIRS. This is the penultimate stage of multiple organ failure. The virus can either attack the organs indirectly via systemic inflammation pathway or directly via ACE-2 receptors. Studies have shown that most comorbidities in Covid patients are not pre-occurring but have taken place during the course of action of the virus.

DISCUSSION:

DIAGNOSIS

RT-PCR technique-reverse transcriptase enzyme is used to first convert viral RNA to single stranded DNA then annealed to double stranded DNA. This is amplified to produce billions of copies. This is a time consuming process with not a high accuracy but still considered a golden standard.

Physical diagnosis includes checking wheezing or crackling sounds in the lungs although this method is of low reliability. Serology tests are done to check for antibodies in blood serum. In recovered patients Immunoglobulin G (IgG), is found to be abundant whereas Immunoglobulin M (IgM), is established in infected individuals. Rapid antibody testing kits check for these antibodies.

Moreover, Enzyme Linked Immunosorbent Assay (ELISA) is applied on a Microtiter Plate. The fluorogenic material shows color on binding with the enzyme linked antibody, inferring Covid positivity. A Complete Blood Count Test (CBC test) carried out on bone marrow demonstrates low platelet and lymphocyte count. X Ray images of lungs show bilateral/unilateral capacities. CT scan depicts ground glass capacities and consolidation. CT Angiogram results reveals clots in systemic circulation. Ultrasound makes visible the blue lines and other pleural lines.

PROGNOSIS

Research has shown the relation between the following disease and fatality:-

- Cardiovascular disease increases risk by 10.6%; this is the most contributing factor to Covid deaths.
- Pulmonary diseases increase risk by 7.3%
- Pancreatic disease like diabetes mellitus increase fatality by 6.3%
- Immune compromised diseases like Cancer contribute a 5.6% of additional risk.

The probability of deaths is low till the age of 50-60 but increases after 60s. Reliable prognostic markers include excess D-Dimer, ferritin, CK-NB, troponin, etc.

RECOMMENDATION:

PROPOSED TREATMENT

- Fluids should not be provided in excess to prevent worsening of pulmonary edema
- Antipyretic drugs like Tylenol may reduce fever.
- Drugs like Chloroquine may prevent attachment of virus to ACE 2 receptors.
- Remdesivir blocks the replication of RNA by inhibiting RNA polymerase enzyme.
- Ritonavir is used as a protease inhibitor.
- Corticosteroids are used to inhibit flow of interleukins from macrophages to the blood.
- To reduce carbon dioxide levels in the body of an ARDS patient, the respiratory rate is the only factor which can be increased, as attempts to increase tidal volume will make the alveoli collapse.
- Positive End-Expiratory Pressure (**PEEP**) is used to improve oxygenation and prevent alveolar collapse in mechanically ventilated patients with the ARDS.

PRECAUTIONS:

- Avoiding large crowds as the R0 value can reach as high as 1200.
- Any physical contact with a person must be avoided.
- No foreign body should be exposed to the mucous membranes.
- Items of daily use must be sanitised.
- Travel should be reduced or avoided.
- N91 masks should be worn by patients with no infections while surgical masks should be worn by infected ones to prevent spreading.

CONCLUSION AND FUTURE SCOPE:

In conclusion it can be stated that Corona virus, in terms of infectivity is higher than any pandemic in the recent past. Corona virus, a member of the family Coronaviridae, spread from bat to human through an intermediate host pangolin. It has lower mortality rate than the previous pandemics in last 100 years such as Spanish Flu(1918-20), Asian Flu (1957-58), SARS Corona virus (SARS-Cov) (2003), H1N1 Swine Flu Pandemic(2009-10), Middle East Respiratory Syndrome (MERS) (2012), West African Ebola (2014-16) etc. Research shows Covid spike attaches ACE 2 receptor; it leads to a release of cytokine into the blood capillaries near the alveoli and may ultimately turn into pneumonia. The alveoli get collapsed leading ARDF. The pulmonary inflammation proceeds to systemic inflammation that causes multiple organ failure. People with under cardio vascular disease have the highest probability of mortality and people with other health problem such as diabetes, cancer and other immune compromised condition may also have highest chance of death. Though the doctor said that co morbidity is another main cause of death in this pandemic, but that's not the real fact. It's happening because of the virus only. The

physical diagnosis includes checking for unusual sounds like wheezing and crackling sounds from the lung which implies edema. RT-PCR and Rapid antibody test clinically diagnoses the disease within a very short period of time. City scan and chest x-ray show the damaged area of lungs. Drug like chloroquine ritonavir, remdesivir holt the spread of the virus in the body. Antipyretic may be prescribed to reduce the temperature. ARDS patients require proper mechanical ventilation to avoid alveolar distention. Excess fluid should not be given to the patient.

This article encompasses a detail mechanism of this deadly disease along with its diagnosis and proposed treatment. This scientific study mainly designed to generate awareness and provide information to the individuals who want to know the A to Z of Covid in nutshell. This article may create a pathway to number of upcoming scientific researches and may attract them to work on this field to enhance the probability of inventing appropriate vaccine and medicine to fight against this contagious disease and to win the battle against this Global Pandemic.

REFERENCES:

1. How flu spreads. (2018). [cdc.gov/flu/about/disease/spread.htm](https://www.cdc.gov/flu/about/disease/spread.htm)
2. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *N Engl J Med.* 2020;382:1199–207. [DOI External Link PubMed External Link](#)
3. Sanche S, et al. (2020). High contagiousness and rapid spread of severe acute respiratory syndrome coronavirus 2. DOI: [10.3201/eid2607.200282](https://doi.org/10.3201/eid2607.200282)
4. WHO. Pneumonia of unknown cause—China [cited 2020 Jan 30]. <https://www.who.int/csr/don/05-january-2020-pneumonia-of-unkown-cause-china> [External Link](#)
5. <https://www.hindustantimes.com/india-news/covid-19>