About COVID-19

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In late December last year, the Chinese city of Wuhan in Hubei province reported an outbreak of 'unusual' pneumonia cases in a large section of its population caused by a virus of 'previously unknown' origin. The epidemiological link of the initial reported (index) cases was traced to Huanan Seafood Wholesale Market in Wuhan where live animals were sold and also wild animals were served at restaurants. [1] Zoonotic transmission was obvious which later culminated into human to human transmission resulting in the epidemic. Subsequently WHO put the whole world on alert and the disease was declared as a pandemic in middle of March 2020 due to its widespread effects and increasing number of cases in several parts of the world.

Rigorous search for the causative virus led to the discovery of a novel coronavirus (designated as SARS-CoV-2 by International Committee on Taxonomy of Viruses) which was considerably similar to the ones responsible for the SARS (Severe Acute Respiratory Syndrome) and MERS (Middle East Respiratory Syndrome) epidemics previously. WHO later came up with an appellation for the respiratory illness caused by 2019-nCoV or SARS-CoV-2 as COVID-19 (Coronavirus Disease in 2019).

The name coronavirus comes from the Latin word 'corona' meaning crown or halo, characteristic of the crown like appearance (because of the protein spikes) of this family of viruses when viewed under a Transmission Electron Microscope. Coronavirus particles are enveloped with projecting glycoproteins. The core has the matrix protein enclosed within which is the single stranded positive sense RNA. The surface glycoproteins are responsible for attachment to host cell receptors. [2]

Lu et al., were the ones to obtain the complete genome of SARS-CoV-2 by performing next generation sequencing (NGS) from bronchoalveolar lavage fluid and cultured isolates from nine patients who had visited Huanan sea food market. The genome of SARS-CoV-2 was genetically distant from SARS-CoV (about 79%) and MERS-CoV (about 50%). Phylogenetic analysis revealed that 2019-nCoV belonged to the subgenus Sarbecovirus of the genus Betacoronavirus. Notably of the nine patients enrolled in the study, the genomes showed 99.98% similarity. Since this level of similarity in different humans is unusual for RNA viruses, it suggests a recent spill-over event from an animal source into humans. Though this study indicated bats to be original host of the virus, a particular wild

animal sold at Huanan market might be the intermediate host transmitting the virus to humans since bats were hibernating during the time and no bats were sold at the time. [3]

The viral spikes (residue 394, glutamine in the SARS-CoV-2 receptor binding domain) [4] recognise and bind to the lysine 31 residue protein called ACE2 (Angiotensin Converting Enzyme 2) [5] found on cell surface. Also, the SARS-CoV-2 has come to evolve such that the exact contours on its surface bind more tightly and exactly to ACE2, requiring less virus to start the infection. SARS-CoV-2 also can infect both the upper and lower respiratory tracts which accounts for its severity. One of the unusual features of this virus is that it utilizes the ubiquitous furin enzyme in our cells to activate its spikes by cleavage of the two connected halves. Though very little is known about the pathogenesis of COVID-19, from the preliminary studies it has been suggested that 2019-nCoV attacks the ACE2 in the airways causing cells to die and filling the airways with sloughed off dying cells which carries the virus to the lungs. The shortness of breath typically associated with progression of infection is attributed to the clogging of lungs with dead cells and fluid. Inflammation and fever ensues when the immune system starts to respond to the virus. In severe cases, the immune system triggers a cytokine storm causing haywire in homeostasis, affecting other organs and making the body more susceptible to secondary infections. [6]

No specific and robust medications or vaccine are available yet for treating COVID-19. Unprecedented scientific collaboration and vigorous studies are underway to find a cure. For now, a few drugs are showing effectiveness selectively. Among these, remdesivir and chloroquine are shown to be promising. Remdesivir is a nucleotide analog which gets incorporated into viral DNA and halts viral replication by inhibiting RNA-dependent RNA polymerase whereas chloroquine is an anti-malarial compound which acts on lysosomal membranes interfering with the viral-host cell fusion. [7] Clinical trials with various other potential compounds and modes of treatment are underway worldwide. On March 20th 2020, WHO announced a global trial named SOLIDARITY to test the efficacy of the four most promising drugs for COVID-19. The study will include thousands of patients worldwide. The four drugs are: Remdesivir, Chloroquine and hydroxycholoroquine, ritonavir/lopinavir (anti-HIV drug inhibiting HIV protease) and ritonavir/lopinavir and interferon-β. [8] Moderna Therapeutics recently announced a potential mRNA vaccine, mRNA-1273, for SARS-CoV-2 and will soon launch human clinical trials. This mRNA, on administration, will guide the immune cells to produce the spike protein found in SARS-CoV-2 against which antibodies will be made subsequently in the body of an individual.

The COVID-19 pandemic has already caused widespread damage in terms of health, medical facilities and economies of the countries. It has claimed innumerable lives worldwide. Wuhan, the epicentre of the pandemic, is coming to normalcy with number of new cases having declined hugely after several months of lockdown. Currently the disease is ravaging Italy, Spain and USA in addition to other countries. The death toll of Italy and Spain has surpassed that of China and USA is leading with respect to the number of coronavirus cases right now. The only measures right now are lockdown, social distancing and isolation, frequent handwashing to contain the wildfire like spread of the disease.

The first reported coronavirus case in India was on 30th January, 2020 in Kerala. The three students had returned from Wuhan, China. The number of cases has since been escalating, mostly in individuals having a travel history. Evidences of community transmission have started coming up in a few states. India is on the verge of the most crucial stage of an epidemic, stage 3, wherein widespread community transmission occurs and the virus is passed on from asymptomatic individuals making it difficult to control epidemic. As of 29th March 2020, the total number of cases stands at 1127 with 90 recoveries and 27 deaths. RT-PCR followed by NGS is considered to be the gold standard for testing but India is supposedly lagging behind in terms of testing capacity accounting for a huge number of underreported cases. Recently an indigenous COVID-19 kit has been designed by Mylabs in India with a large number of testing capacity. Multiple labs have also been permitted to carry out the tests now to expedite the process. This may improve the scenario because large scale testing and isolation of the positive cases are the only solutions to efficiently combat the disease. The government has been proactive in its efforts to limit the spread of COVID-19 with imposing a 21 day country wide lockdown, setting up of multiple isolation wards and quarantine centres across the country. But at the end of the day, it is only us who can thwart COVID-19 from the face of the planet by complying to norms set by the government, practising social distancing, washing hands frequently with soap, avoiding touching eyes, nose or mouth, covering our mouth with flexed elbow or tissue paper while coughing or sneezing, completely isolating oneself at home for people with a travel history and staying at home peacefully abiding by the rules of lockdown.

References

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