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Short Communication

Structural Immunology of Corona Virus

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Corona virus also called as Covid-19 or SARS-CoV-2 has been declared as pandemic by World Health Organization (WHO) in March 2020. It is an acute respiratory disease. This novel virus was basically emerged from Wuhan, a city in China, when cases of pneumonia began to rise and the cause was unknown. Later on, a virus was identified as the cause of pneumonia by the Chinese authorities and they named it as "Corona virus". The scientists named this virus as "Corona virus" because, if we see this virus through electron microscope, the viruses have club-shaped surface projections which give them a crown-like appearance. Corona virus is a large family of viruses which cause infection in nose, sinuses, or upper throat. Its symptoms include fever, cold, cough, bone pain and shortness of breath that eventually leads to pneumonia. Corona virus affects every individual differently [1]. The effects of corona virus on a particular individual basically depends upon the immunity system of the individual. The stronger the immunity system, the faster the recovery. According to studies, only 15% patients develop severe pneumonia whereas only 5% patients develop acute respiratory distress syndrome (ARDS), septic shock and/or multiple organ failure. According to World Health Organization (WHO), Corona virus has infected approximately about 60 million people world-wide and caused more than 1.4 million deaths. Today also, the corona virus is still prevalent in most of the countries of the world as no vaccine or prophylactic drugs have been invented which can fully destroy the virus from the body and prevent its spread. Although Remdesivir and Dexamethasone drug is now a days in use for curing the patients, these drugs only help to diminish the symptoms in acute cases. (National Institute of Allergy, and Infectious Diseases (NIAID), 2020; The Recovery Collaborative Group, 2020).

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Coronaviruses (CoVs) are the family members of Coronaviridae. The subfamily of Coronaviridae include Coronavirinae and Torovirinae. Corona virus contain a positive, single-stranded RNA genome which is the largest genome among RNA viruses with a size of approximately 30 kb. These viruses are encapsulated within a capsid. Generally, virus is not counted as living thing, it's just a strand of genetic material, whose main function is to replicate itself. Viruses are microscopic infectious particles that are basically nucleic acids enclosed in a protein coat and sometimes further enclosed in a membrane [2]. The genetic material or genome of viruses can be DNA (deoxyribonucleic acid) or RNA (Ribonucleic acid). These genetic material or genomes i.e., DNA or RNA is enveloped by a protein shell which is called as capsid. Nucleocapsid protein N is the main component of capsid which is again surrounded by a membrane containing three proteins - the membrane protein (M), the envelope protein (E) and the spike glycoprotein (S). The membrane protein and the envelope protein help in the virus budding process whereas the spike glycoprotein plays an important role in binding host receptor and mediating membrane fusion and also gives entry to the virus into host cells [3-4].

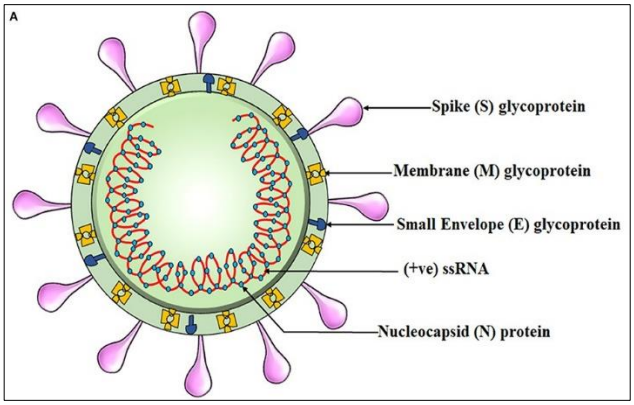

Fig 1 Structure of Corona Virus

Pathogeneses of Covid-19

Corona virus typically affects the respiratory system of the human being causing common cold or severe acute respiratory syndrome (SARS), or Middle East respiratory syndrome (MERS). SARS-CoV-2 follow the path of naso-oral cavity to reach the lungs. As soon as the virus is inhaled by the

individual, it attacks the epithelial cells of the nasal cavity by engagement of ACE2 receptor with the viral RBD and initiates its replication. The initial stage of the corona virus disease is asymptomatic and it lasts for about 1-2 days. During this period, the virus multiplies itself in the upper respiratory track. The symptoms of corona virus began to appear within 2-14 days of the virus encounter. The symptoms include fever, dry cough, pharyngitis, shortness of breath, joint pain and tiredness, which are much similar to SARS and MERS. Phases like nasocomial and fomite transmission of infection arises during this phase of disease which may result in increased chances of community spread [5]. After the initial period, the virus gradually make a move towards tracheobronchial tree or in simple words, towards the lower respiratory track which includes the major passages like windpipe (trachea) and within the lungs, the bronchi, bronchioles, and alveoli, resulting in activation of a strong innate immune response. Enhanced pro-inflammatory response is exposed by the patient at this stage which give rise to viral sepsis and along with it, other complications such as Acute Respiratory Distress Syndrome (ARDS), different organ failures, pulmonary edema, and death in extreme cases. The first and most precautionary step during this disease is to quarantine oneself to prevent the community spread. In moderate and mild cases, one can quarantine self at home only in an isolate room, whereas in severe cases, hospitalization is must. According to a report issued by health ministry, the maximum Covid-19 cases in both the covid waves were found in working population belonging to an age group of 21-50 years. 21.21% cases were from the age group of 21-30 in the first wave, whereas this ratio increased to 22.49% in the second wave for the same age group. 21.23% and 22.70% cases were found in people of age group 31-40 in first and second of Covid-19 wave respectively. In contrast, there was a minor drop of percentage in people belonging to age group of 41-50 from 17.30% to 17.26% in first and second wave respectively (The Indian Express). Children were the least infected subject during covid-19 as opposed to adults [6-7].

Covid-19 proved severe in cases where the immunity system of the individual was weak and the individuals who were already suffering from health issues like Diabetes, Asthma, obesity, hypertension, heart, kidney, or liver disorders, or HIV infection. People who died because of covid-19 were mainly due to multi-organ dysfunction with the highest viral titers in the lungs and immune cells in circulation, thus damaging the pulmonary and immune system.

SUMMARY

Severe Acute Respiratory Syndrome (SARS) was first identified in Viet Nam on February 28, 2003. SARS is a respiratory disease caused by a virus known as Corona virus which badly affects the respiratory system of the human being causing severe pneumonia. Corona virus got its name due to their crown-like projections. It is basically an air-borne virus which can spread with the help of saliva droplets which are released during cough and sneeze. It can spread through direct or indirect contact. In 2019, it again emerged and this time it was named as SARS-CoV-2 or Covid-19. It played a havoc with the human life as it is highly transmissible and pathogenic. WHO declared it as pandemic in March 2019.

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