

# COVID-19 Lockdown Release – Cytokine Storm & Herd Immunity

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## 1.0 Abstract:

Socio economic factors are leading many countries to lift lock-downs with stringent precautions. However clinical challenges in managing Cytokine Storms and functional challenges on obtaining Herd immunity to be recognized in circumventing emotional impact due to elevated mortality risks.

## 2.0 Background:

The best approach formulated by most of the governing bodies around the world is to stop the transmission of SARS-COV-2 through social distancing by locking down important jurisdiction or the whole country, as vaccine is still within the laboratory boundary. A perfect lift of lockdown would happen when there is reliable data on the infection spread, dynamic control, increased testing, contact tracing, permitting to commute based on immune status, successful clinical therapy and vaccinating the population. However, developing countries even find it challenging to test SARS-COV-2 viral samples. The test strategy governs specific criteria including potential symptoms. Currently India has tested 0.07% of its entire population for SARS-CoV-2 infection.

As SARS-COV-2 infection statistical data remain uncertain, recovery rate is rapidly improving, ratio of mortality to number of cases is getting stabilized. On the date of writing this article, the confirmed cases around the globe was close to 3.5 million, Recovered cases were 32% of the total cases and the death percentage was around 0.7%. The death rate was higher in the elderly age group. Most of the critically ill and the deceased patients did not exhibit severe clinical indicators in the early week of their admissions. However, sudden leap towards Acute Respiratory Distress Syndrome followed by multiple organ collapse worsened the process of recovery and leading to rapid decease of the patients. The reason for such Acute Respiratory Distress Syndrome followed by multiple organ collapse is ostensible due to 'Cytokine Storm'.

With the above clinical therapy uncertainty and non-availability of vaccination, exposing a large group of population to potential infectious viral load have to be

carefully considered and communicated for implementing the controls.

## 3.0 Cytokine Storm:

SARS-COV-2 when it binds and infuse with ACE 2 protein on the epithelial alveolar region, our body triggers an immune response and immune cells move to the particular area to bout the virus causing a local inflammation. Potentially in most of the elderly patients with high comorbidity, uncontrolled level of cytokine, a protein that normally helps fight off infection gets released which activates extra numerous release of immune cells counter attacking healthy cells leading to uncontrollable hyper inflammation. This hyper inflammation causes severe damage to the lower respiratory area and possibly collapsing multiple organs. Various drugs are been used to regulate Cytokine Storm through immunomodulatory therapy to give more time to provide supportive treatment for COVID-19 patients, but still not proven to be effective.

Research papers published on Cytokine Storms pertaining to COVID-19 suggest that low number of T cells (A type of white blood cells that work to fight against virus as part of immune response) were found in the sample of COVID-19 patients. On the same sample, high level of Cytokine protein were found. The study suggested that SARS-COV-2 did not attack the T cells directly, but rather triggers the cytokine release, which deprives T cells and depletes it off. Common Cytokines are interleukins (IL 1 $\beta$ , IL 18, IL33 etc.), Tumor Necrosis Factors (TNF). Various studies are in progress to arrive at a clinical treatment strategy with the inflammatory cytokine storm, example such as Chloroquine to inhibit production and release of TNF and IL-6 to suppress cytokine storm in COVID-19 patients. Various other treatment methods are researched including Stem Cell Therapy, Blood purification treatment etc., Results awaited.

## 4.0 Herd Immunity:

The underlying line of control for Herd Immunity is that large percentage of population develops immune to a disease and there by spread of disease slows down and

eventually stops. Vaccination is one method to catalyze herd immunity. Another method is to expose large proportion of the population to viral load non-voluntarily and there by building self-immune system. Mandatory follow-up of social distancing, hand / respiratory etiquettes, wearing face cloth becomes mandatory to limit spread of viral infection. It is required to ascertain the minimum percentage of the population to get immune to have a herd protection.

Two key factors are required to determine the level of population to get immune to obtain a satisfactory rating on Herd Immunity. Basic Reproductive Number  $R_0$  has been determined as 2 and the Real Time Effective Reproductive number  $R_t$  is for a given population set.  $R_t$  for this article has been presumed a value of 3. Based on the empirical formula  $P_{crit} = 1 - (1/R_t)$  calculation, at least two-third of the population need to be immune to declare Herd Immunity. Even though SARS-COV-2 is a new virus, common seasonal human coronavirus circulated decades before such as OC43, 229E, NL63, HKU1 may have caused possible antibody cross reactivity and partial immunity in human population. This antibody cross reactivity and partial immunity has been evident during SARS-COV-1 outbreak. Some of the current population group may have such partial immunity leading to milder or asymptomatic infection for SARS-COV-2.

Current lock down may not be possible to continue considering various socio-economic factors. It is essential to release lockdown at a particular stage. Global statistics for COVID-19 states that 80% of infections are mild or asymptomatic, 15% require treatment, 5% could be in critical and mortality rate would be less than between 3 to 4%. In India, above 60 years of age are 10% and children below age of 10 are around 17% of the total population. This group to be considered as highly vulnerable to COVID-19 and need to be protected from potential Cytokine Storm situations.

To obtain Herd Immunity, two-third of the population needs to be continue with their 'NEW LIFE'. 'NEW LIFE' pertains with but not limited to mandatory social distancing, frequent sanitization hand, disinfection on high contact surfaces as frequent as possible and wearing face cover in public places.

High number of infection cases can get reported after release of lock down. Large amount of make shift hospitals could be installed to treat such infected cases. Further lockdowns may be imposed based on epidemiological data. Children below age group of 10, elderly age group and people with high comorbid should compulsorily stay self-quarantined to avoid Acute Respiratory Distress Syndrome followed with multiple organ failure leading to death through Cytokine Storm until a vaccine is available or on obtaining herd immunity.

Given the mortality rate for COVID-19 between 0.25% to 4% of the reported cases (global statistics), and with an exposure to herd immunity  $P_{crit}$  level of two-third country population, the mortality number may still be hurtful to admit. Need to accept and manage the risk. Strict adherence with guidelines issued by 'law of land' is the key to overcome the situational risk.

## 5.0 Reference:

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