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Emergence of a Post COVID-19 Community- An Overview

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ABSTRACT

COVID-19 pandemic has crumbled global economy and hindered our freedom to move around in our community. During this time, all of us are yearning to know the answer to the single illuminating question "When will this gripping COVID-19 end?" Relaxation of all the preventive measures before the immunity levels cross the HIT can lead to a second wave of COVID-19. This also is the reason why most countries including India are lifting restrictions in a gradual phased out manner rather than lifting all the preventive measures simultaneously. Selection of at-risk individuals who acquire infection and recover (some may die) and develop immunity results in slowing down the epidemic growth and facilitate induction of immunity in the community.

Keywords: SARS-CoV-2, Post COVID-19, Herd immunity, Susceptibility, Community

INTRODUCTION

There is documented evidence of epidemic right from the prehistoric era 3000BC, which wiped out the population of an entire village, of "Hamin Mangha"; coincidentally the village is in the present China. [1] The disease which has evidence to suggest reaching pandemic proportion is Plague, known as Black Death and has travelled from Asia to Europe. The disease which closely resembled the current covid-19 pandemic was Spanish flu with an estimated 500 million people (over a third of the world's population) falling victim from South Sea to North Pole. [2]

The disease had created havoc in the world and one-tenth of the population succumbed to the illness, with some indigenous communities pushed to the brink of extinction. The pre-runner for the current pandemic in this century was a severe form of acute respiratory infection known commonly as SARS caused by the virus SARS-CoV-1, infecting an estimated 8,000 people in 29 countries and had a mortality rate of around 10% in the year 2003. [3] COVID19, the current pandemic is caused by the virus in the Corona family which has ~85.5–92.4% genetic similarity to its predecessor and therefore named as SARS-CoV-2. The outbreak began in Wuhan City, China, in December 2019. [4]

As of July 7th 2020, the virus has resulted in 11,744,501 infections and 540,764 deaths and has now been reported on every continent except Antarctica. [5] COVID-19 pandemic has crumbled global economy and hindered our freedom to move around in our community. During this time, all of us our yearning to know the answer to the single illuminating question "When will this gripping COVID-19 end?" How will the post COVID-19 community emerge? As

human beings, we need a ray of hope during these testing times to see some light at the end of the dark tunnel which we are traversing!

The depth and breadth of the COVID-19 pandemic makes SARS a no match to it, despite the genetic similarity between the two. The mortality rate of the COVID-19 though varies from country to country is generally estimated to be around 3% and is much lower than the 10% mortality of the SARS outbreak. [6]

Though at one look this seems to be a better number, on deeper analysis we can understand that this too could act as a contributory factor for the spread of the outbreak across the world. This is because we are inclined to pay more attention to a disease that carries a high mortality. Diseases with high mortality rate are bound to develop a robust system for contact tracing and related containment measures like quarantine. Another factor is the relatively high R_0 (3 to 5) which is the basic reproduction number of the virus i.e. the average number of individuals to whom the virus gets transmitted from the source person. In short, the comparatively low mortality, high R_0 and the potential to transmit the virus from asymptomatic carriers and pre-symptomatic individuals has enabled the rapid spread of the disease in pandemic proportions across the world.

As the spread of the current COVID-19 draws comparison with Spanish flu of 1918, let's examine how the disease died out. The Spanish flu had a minimum of three waves from 1918 to 1920 affecting a third of the world's population. The unaffected areas got affected eventually with varying degrees of severity and the disease died out in a span of 3 years when the society developed a collective immunity to the virus. It is challenging to unravel when a disease will eventually stop to spread through a population. A pandemic end when the uncontrolled community transmission halts and cases reduce drastically. In order to attain the above goal in a sustained way large proportion of world's population has to develop immunity to COVID-19, called herd-immunity, so that the chain of transmission gets broken in need of susceptible individuals. This immunity can be developed either by a vaccine or by people catching the disease. As the level of immunity crosses a certain threshold, the outbreak will start to die out because there will not be enough new people to infect.

That means eventually number of susceptible numbers will become sufficiently low to curtail epidemic growth or, in other words, the herd immunity threshold (HIT) is attained. Herd immunity threshold (HIT) defines the percentage of the population that needs to be immune to reverse epidemic growth and prevent future waves. To calculate herd immunity threshold (HIT) we need to know the basic reproduction rate ($R_{0)}$ which means on an average how many people are infected by each infected individual. When $R_0 > 1$, it means that a disease will grow. [7] The formula used for calculating herd immunity threshold: $HIT = 1 - 1/R_0$. [8]

In case of SARSCoV-2 if we take R_0 as 2.5-3, the herd immunity threshold will be achieved when 60-70% of the population is immunized. This holds true in ideal situations where administration of vaccines and mixing of people happen at random. We can expect that once 60% of the population is infected, the number of COVID-19 cases start to drop. But it is possible that another 15-20% of the population that gets infected while the disease is starting to fade away.

However, one cannot overlook the fact that development of vaccines for COVID-19 are still in progress and that natural infection does not occur at random. Therefore, immunization by corona virus infection will not be in a random manner. Individuals with higher susceptibility and/or exposure will be more prone to be infected and become immune thereby lowering the threshold. [9,10]

In their study, Briton and his co-workers have shown that population heterogeneity impacts herd immunity. Using

a mathematical modeling that takes into account the rates of transmission in different age groups and among people with varying levels of social activity, the threshold for herd immunity was found to be as low as 43%. Varying susceptibility of individuals based on their ages also has been noted. Children are being least affected and the elderly and those with co-morbidities getting affected the most. Here, the concept of the reverse quarantine will benefit, in which we should selectively protect the most vulnerable group from contracting the disease.

Scientists across the world are putting their best efforts in developing a vaccine for the COVID-19 and this includes the Serum Institute of India. The corona virus is susceptible to the environmental pressures like climatic changes of weather condition and the humidity. So, this means that we can expect a resurgence of the COVID-19 in the later years. This hindsight should strongly motivate us to move with the vaccine development programs. Herd immunity is not a strategy rather a consequence. Relaxation of all the preventive measures before the immunity levels cross the HIT can lead to a second wave of COVID-19. This also is the reason why most countries including India are lifting restrictions in a gradual phased out manner rather than lifting all the preventive measures simultaneously. Selection of at-risk individuals who acquire infection and recover (some may die) and develop immunity results in slowing down the epidemic growth and facilitate induction of immunity in the community.

As highlighted in this paper, owing to population heterogeneity, there is certainly an element of uncertainty about the naturally acquired herd immunity threshold for COVID-19. This may prove more disastrous if there is any error in its calculation (depends upon R_0). In such a scenario, let's stick to the basics of the time tested strategy of hygiene and social distancing measures in order to prevent new cases. Though the strategy makes us feel uncomfortable we need to remember the history lessons the pandemics have taught us i.e. "the policies and measures implemented during the pandemics are often perceived as 'exaggerated' by the public, later on would be considered to be grossly insufficient". The authors believe that it is we as a society who have to be motivated enough to collectively hold on to the lifeboat of these preventive measures till the COVID-19 storm settles down and the rainbow adorns the future.

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