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## Journal of KIST Medical College

### COVID-19 and Herd Immunity: A Dilemma to Understand

Rano Mal Piryani <sup>1</sup>, Suneel Piryani <sup>2</sup>, Rupesh Mukhia<sup>3</sup>

<sup>1</sup>Department of Internal Medicine, Universal College of Medical Sciences, Bhairahawa, Nepal.

<sup>2</sup>Public Health Consultant, Karachi Pakistan.

<sup>3</sup>Department of Surgery, KIST Medical College, Lalitpur, Nepal

What are the possible modes to develop widespread immunity against SARS-CoV-2 (COVID-19) within population? According to Haley E. Randolph and Luis B. Barreiro, two possible modes to build widespread SARS-CoV-2 immunity in populations are: 1) natural immunization of populations with the virus over certain time period and 2) a mass vaccination with an effective, efficacious and safe vaccine.<sup>1</sup>

The consequences for natural immunization of populations to achieve are grave and far-reaching as large proportion of population would need to become infected with SARS-CoV-2 and millions would succumb to it, however, effective and efficacious vaccine unlikely to be available for mass vaccination in near future. Hence, overconfidently thinking and striving for attaining herd immunity without mass vaccination must not be the aim of any country.<sup>1,2</sup>

Herd immunity is defined as the indirect protection from infection conferred to susceptible persons when a sufficiently large proportion of immune persons

exists in a population through vaccination and/or prior illness<sup>1, 2</sup> The herd immunity threshold refers to the point in epidemic at which the proportion of susceptible persons in a population falls below the threshold needed for transmission of infection.<sup>1</sup> The herd immunity threshold may vary between populations to populations in infectious diseases transmissions including COVID-19. In COVID-19 besides symptomatic patient, asymptomatic person or carrier can be highly infectious and contribute to the spread of infection. The effectiveness of herd immunity mainly depends on the strength and duration of immunity acquired. It is yet not known whether any immunity induced by COVID-19 is protective; protects lifelong or short lived or fades over time or infection confers no immunity or person may develop severe disease if re-infected. If herd immunity acquired naturally will be less effective than periodic outbreaks of infection may occur and if immunity will be unevenly distributed within a population, then possibility of transmission will also be there.<sup>1, 2, 3</sup>

**Citation:** Piryani RM, Piryani S, Mukhia R. COVID-19 and herd immunity: a dilemma to understand. JKISTMC 2020;2(2)4: I-II

#### Correspondence

Dr. Rano Mal Piryani,

Professor of Internal Medicine and Head of Department of Internal Medicine

Chief Coordinator-Health Professions Training Committee  
Universal College of Medical Sciences, Bhairahawa, Nepal

Email: rano.piryani@gmail.com, r\_piryani@hotmail.com

Mobile: 00977-9841269522

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Vaccines for COVID-19 are in the process of development. It is not known whether vaccine trials will produce an effective and efficacious vaccine/s which confer lifelong immunity or immunity will be short-lived and when vaccine will be available for mass vaccination or search for vaccine may continue like vaccine for HIV.<sup>1</sup>

Many drugs have been repurposed and tried in various combinations for critically ill COVID-19 patient and observational studies have been published but no specific promising drug or combinations of drugs available for treatment and prophylaxis which may cure the disease and impede progression of infection. Various drug trials are undergoing. The time will tell the outcome of the drugs.<sup>1,4</sup>

Haley E. Randolph and Luis B. Barreiro estimated figures for herd immunity based on reproductive number ( $R_0$ ). As per their estimates at  $R_0$  estimate of 3 for SARS-CoV-2, the herd immunity threshold is approximately 67%. This means that the incidence of infection will start to decline once the proportion of individuals with acquired immunity to SARS-CoV-2 in the population exceeds 0.67.<sup>1</sup>  $R_0$  refers to the average number of secondary infections caused by a single infectious individual introduced into a completely susceptible population. Various studies have estimated  $R_0$  varying from 2.2 to 5.7.<sup>5</sup> <sup>6</sup> Kwo KO et al esteemed that at least two third of population need to be immune.<sup>7</sup> Assuming a uniform herd immunity threshold of 67% ( $R_0 = 3$ ) and an infection fatality rate(IFR) of 0.6%, the absolute number of expected deaths across the globe would exceed 30 million people.<sup>1</sup> The IFR is defined as the proportion of deaths caused by a certain disease among all infected individuals.<sup>1</sup> Attaining herd immunity without effective mass vaccination will drain public healthcare resources especially of developing and under developed countries resulting in significant mortality, economic and social implications.<sup>2</sup>

Yet lot of information regarding COVID-19 unfolds. It looks that we have to learn to live with COVID-19 for long. To minimize the spread of COVID-19, the option at this point-in-time is to continue practice of effective non-pharmacological interventions like physical distancing, hand-washing, covering face with mask, droplet and contact precautions, testing, isolating PCR positive patients and treating them, tracing contact and quarantine them and make populations aware of the facts.

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