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COVID-19 serosurveys for public health decision making

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During the first year of the COVID-19 pandemic, more than 90 million cases were reported globally, with nearly 2 million deaths. Case reporting depends on several factors, including testing capacity, type of tests used, testing strategies, and health-seeking behaviour of the population. Most SARS-CoV-2 infections are mild or asymptomatic in nature and are less likely to be detected by the surveillance system. Therefore, population-based serosurveys are considered as a valuable tool in estimating the proportion of the population previously infected with SARS-CoV-2.[1]

A number of serosurveys have been done in different countries at different timepoints in the pandemic, investigating different population groups (eg, general population, health-care workers, contacts), and using different types of laboratory assays. Xinhua Chen and colleagues,[2] in *The Lancet Global Health*, have synthesised data from serological studies published between Dec 1, 2019, and Dec 22, 2020. On the basis of the data from 82 high-quality studies, they estimated an overall seroprevalence of 8·0% (95% CI 6·8–9·2) in the general population, ranging from 1·7% in the Western Pacific region to 19·6% in the South-East Asia region. The seroprevalence was higher among close contacts of COVID-19 cases (18·0%, 95% CI 15·7–20·3) and health-care workers (17·1%, 9·9–24·4%) than in low-risk health-care workers (4·2%, 1·5–6·9) and the general population.

The seroprevalence studies provide information about the extent of transmission in the past and help to understand the future course of the pandemic.[1] With less than 10% of the general population exposed to SARS-CoV-2, Chen and colleagues[2] infer that antibody-mediated herd immunity has not been reached in most regions. SARS-CoV-2 transmission is expected to continue, along with the need to continue public health measures to control transmission, including testing, contact tracing, isolation of people testing positive, and quarantine of high-risk contacts as well as non-pharmaceutical interventions. Continued transmission of infection in many countries corroborates well with low overall seroprevalence. However, the declining trend of cases observed in some countries in South-East Asia and the Eastern Mediterranean regions[3] could partly be on account of naturally acquired population immunity. Serosurveys in different settings, combined with information on control measures, will be vital in understanding the extent of population immunity and trajectories of future transmission.

Another important use of serosurveys is to understand who is at higher risk of infection in different population groups, including by age and sex.[1] Chen and colleagues observed that the risk of infection was significantly higher among Black (relative risk [RR] 2·70, 95% CI 2·30–3·18) and Asian (RR 1·91, 1·82–2·03) individuals compared with White individuals. In these studies, the risk of infection was also higher among working-age adults (20–64 years) than in young (<20 years) and older (≥65 years) adults.[2] The infection fatality ratios estimated using seroprevalence estimates and reported that number of COVID-19 deaths could help to identify population groups at higher risk of severe outcomes given infection.[4] This knowledge is key to target prevention and control measures to reduce transmission and severe outcomes. As Chen and colleagues emphasise, few high-quality studies were available among high-risk populations such as health-care workers and close contacts,[2] and such studies are warranted to better inform the public health response against COVID-19.

Infection-to-case ratio is helpful in identifying regions or areas with insufficient levels of testing. Chen and colleagues estimated that surveillance systems missed about ten infections for every virologically confirmed case. The infection-to-case ratio was similar in the Americas (6·9, 95% CI 2·7–17·3) and European regions (8·8, 7·3–10·6), but higher in the South-East Asia region (56·5, 28·5–112·0), suggesting the need to strengthen the surveillance and improve testing. Although the higher infection-to-case ratio could also partly be due to the different demographics in different countries, and therefore variation in the proportion of cases being milder, it can also be attributed to different surveillance strategies.

Although serological studies are important in estimating the burden of SARS-CoV-2 infection in the population, their findings—especially the inference about antibody-mediated population immunity—need to be interpreted with caution. Immunoglobulin G antibodies against SARS-CoV-2 decline over time,[5,6] with faster waning of anti-nucleocapsid antibodies than

anti-spike antibodies.[7] Hence, seroprevalence data could underestimate the true number of individuals who have been infected. Moreover, the seroprevalence data do not reflect the long-term immunity, as the durability of SARS-CoV-2 adaptive immunity is still uncertain.[8,9] Additionally, serosurveys do not measure T-cell-mediated immunity, and immune escape viral variants can cause resurgence despite high seroprevalence.[10]

Seroepidemiological studies provide meaningful information to guide the public health response. Unfortunately, most serological studies done globally were of low quality, with nearly two thirds of studies included in the review using convenience sampling.[2] Large-scale population-based serosurveys are resource-intensive, and allocating scarce public health resources could be challenging for many developing nations. Therefore, well designed, population-based studies with probability sampling, use of laboratory assays with high sensitivity and specificity, and appropriate data analysis (including adjustment for assay characteristics as well as for population demographics) are very important.

COVID-19 vaccination is being rolled out in many countries. Serosurveys will continue to be of great use for understanding population immunity on account of natural infection as well as vaccination and ongoing transmission.

We declare no competing interests.

*Manoj V Murhekar, Hannah Clapham
mmurhekar@nieicmr.org.in

Indian Councial of Medical Research, National Institute of Epidemiology, Chennai 600 070, India (MVM); Saw Swee Hock School of Public Health, National University of Singapore, Singapore (HC)

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