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Correspondence

SARS-CoV-2 seropositivity among non-medical frontline workers in Pune, Maharashtra, India

Sir,

Given the possibility of asymptomatic or pre-symptomatic transmission of SARS-CoV-2, especially given the emergence of newer variants, frontline workers (FLWs) are at a higher risk of contracting the infection as well as transmitting it to others. A survey conducted in the containment zones in Pune city, India, by the Indian Council of Medical Research (ICMR)-National Institute of Virology (NIV), during the last week of May and the first week of June 2020, showed the seroprevalence of SARS-CoV-2 infection to be 15-30 per cent in containment zones (ICMR-NIV unpublished data). In this preliminary study, we present SARS-CoV-2 seroprevalence among non-medical FLWs in urban western India during August 2020-January 2021.

For the ICMR study in containment zones in Pune city conducted in May-June 2020, five containment zones were selected randomly out of total 69 zones at that time. FLWs rendering services in and around these zones were included in the present study. FLWs, *i.e*. (*i*) grocery store operators and medical store operators, (*ii*) police, (*iii*) Pune municipal corporation (PMC) employees, and (*iv*) vegetable/ fruit vendors and *swachh* workers (domestic waste collectors employed by PMC), were considered for inclusion.

Sample size was calculated according to the primary objective of understanding seropositivity among FLWs. Assuming a seroprevalence of 30 per cent, average seroprevalence in the city[1], with a five per cent margin of error and a design effect of two, the total sample size was calculated to be 646 (Epi Info v7.2, CDC, Atlanta, USA). The design effect of two was considered because of the possible heterogeneity among different sections of FLWs. It was planned to enrol equal number of participants each from four groups mentioned, though the targeted number of PMC workers did not show willingness to participate in the study.

For the organized sector workers, the officials were approached with requests for approvals. Willing workers were enrolled in the study. For the unorganized sectors, small organizations in the selected areas were approached. Participants willing to offer blood samples were included in the study; giving nasal swab and throat swab (NS/TS) samples was optional. The study was approved by the Institutional Ethics Committee (NIV/IEC/June/2020/D-12), ICMR-NIV, Pune. After obtaining written informed consent from the participants, 2-5 ml of blood was collected once from each participant. NS and TS samples were collected in viral transport medium vials. All the samples were transported to ICMR-NIV laboratories in cold chain. A questionnaire addressing possible risk factors was administered to the participants. Information regarding frequency of hand sanitization, social distancing (working within six feet of customer or more) and proper use of mask was collected. Those residing within approximately 100 m of a known confirmed case were considered to be in 'Zone-1', between 100-200 m were in 'Zone-2' and >200 m were in 'Zone-3'. Being from lower socio-economic status (SES), vegetable/fruit vendors and *swachh* workers were combined in a single category for analysis.

IgG ELISA was performed on the serum samples (COVID Kawach ELISA, J. Mitra & Co. Pvt. Ltd., India) as per the manufacturer's instructions. NS and TS samples were tested by multiplex one-tube real-time reverse transcriptase polymerase chain reaction (RT-PCR) at the National Influenza Center (NIC) at ICMR-NIV[2].

Table. Seropositivity for SARS-CoV-2 among non-healthcare frontline workers in Pune city, India (August 2020-January 2021)

Category	Seropositivity (%)	95% CI
FLWs (n=635)	35.43	(31.71-39.29)
Proper use of mask (at all times while at work):	Yes=34.24	OR=2.19 (0.78-6.13)
Yes (n=620); no (n=15)	No=53.34	
Housing: Hutments (n=49) *vs*. permanent (n=586)	Hutments: 59.18	OR=2.87 (1.58-5.21)
	Permanent: 33.50	
Hand sanitization: After every interaction with	After every interaction: 29.9	OR=1.88 (1.31-2.70)
clients (n=194) *vs*. less frequent (n=441)	Less frequent: 44.5	
Residence zone: 'Zone-1' (n=143) *vs*. others	Red: 48.2	OR=2.00 (1.37-2.92)
(n=492) (492 includes 101 'don't know' responders)	Others: 31.7	

'Zone-1', households where a confirmed SARS-CoV-2 case was recorded within 100 m. FLWs, frontline workers; CI, confidence interval; OR, odds ratio

Simple proportional analyses were performed with the help of Epi Info V7.2 (CDC, Atlanta, USA) and SPSS V.20 (IBM Corp., Armonk, NY, USA).

A total of 635 FLWs participated in the study. Overall, 223 FLWs were seropositive for SARS-CoV-2 [35.12 %; 95% confidence interval (CI)=31.50-38.91]. Among the 635 NS/TS swabs, six tested positive (0.95%; 95% CI=0.45-1.71). Among different categories, FLWs from lower SES (vegetable vendors and *swachh* workers) had higher seropositivity than other higher SES categories put together.

Several studies have reported seroprevalence of SARS-CoV-2 in India, and in the world, in different populations[3-7]. There are reports on medical FLWs at different points in time[8-10]. Surveys conducted in high and low SES populations in Pune city during May-June 2020 reported seroprevalence to be between 15 and 45 per cent in different populations[1].

Mask usage was well accepted among FLWs; 97.63 per cent reported strict use of masks at work places. A total of 316 participants reported 'always working within six feet' of their customers/clients or colleagues; they had higher seropositivity (41.14%) than those who did not (29.97%); the difference was significant (odds ratio=1.63; 95% CI=1.17-2.27). Regarding frequency of soap hand wash/sanitization, 30.55 per cent reported sanitization after every interaction with client/customer, 22.83 per cent reported every hour, 33.07 per cent every two hours, 11.65 per cent at beginning and end of working hours and 0.2 per cent rarely. Those who sanitized their hands after every interaction had lower seropositivity compared to all other categories put together (Table).

When compared based on type of housing (as a proxy for SES), 49 of those residing in hutments or temporary housing had higher seropositivity (57.14%; 95% CI=42.21-71.18) than 586 of those residing in permanent houses (40.00%; 95% CI=33.47-46.80). Those residing in Zone-1 (n=143; confirmed case within 100 m from home) had higher seropositivity (48.61%; 95% CI=25.18-37.78) than those from Zone-3 [n=492; confirmed case beyond 200 m from home (31.22%; 95% CI=25.18-37.78)].

It was observed that the seropositivity among the Pune FLWs was comparable with the general population in the Pune city but lower than that in other parts of the country[1,3,5]. The seropositivity was lower than that reported in slums or among lower SES general population in Pune city or other cities in India based on surveys conducted before and during the study period[1] Almost all the FLWs (97.67%) followed strict use of masks at work places. Those who sanitized their hands after every interaction with their customer had lower seropositivity than those who sanitized hands less frequently. It was evident that seropositivity was associated with strict hand-washing, observing social distancing at all times and also the SES of the FLWs. Recently reported COVID-19 transmission modelling efforts imply that individual COVID-19 appropriate behaviour can be a major factor in deciding the quantum of spread of the virus in future[4] and our findings were in agreement. Studies conducted in Pune city, other parts of India and other countries have shown higher seroprevalence among low SES populations compared with higher SES populations[11,13-15].

It needs to be reiterated that this study was conducted before the FLWs were vaccinated against

SARS-CoV-2. It was observed that six of the 635 NS/TS samples tested positive for the presence of SARS-CoV-2 RNA by RT-PCR. All the RT-PCR-positive individuals were found to be IgG antibody negative. The overall seroprevalence among FLWs was higher than that reported in the general population in other parts of the country during the same period[1]. The systems need to be sensitive to these higher risks to the FLWs including the psychological impact similar to that on the frontline healthcare workers[16].

Unavailability of a well-characterized sampling frame was a limitation of the study. Only willing individuals were included; whether their willingness to participate had any confounding factor with their sero-status could not be commented upon. Although it was presumed that the FLWs answered the questions correctly, yet a recall bias regarding some parameters might have occurred.

In conclusion, the FLWs had similar seropositivity as general population in the Pune city. Frequent hand sanitization, maintaining social distancing and strict use of masks were effective in prevention of SARS-CoV-2 infection.

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