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SARS-CoV-2 Serological Prevalence among General Population in India: A Short Summary from A Nationwide Sero-Epidemiological Study

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Introduction

Antibody prevalence against SARS-CoV-2 remains one of the most important evidence to assess the extent of infection, portion of susceptible population, fraction of symptomatic-asymptomatic infection especially in young age group [1]. Till now several study had been conducted in different part of India. As per the nationwide seroprevalence study done in May-June, 2020 among 28,000 individual reported a prevalence of 0.73% [2]. The second seroprevalence study conducted from Aug 18 and Sept 20, 2020, among 29082 individuals from 15613 households reported 6.6% prevalence [3]. These study were during and after the first wave in India.

Methodology

We conducted this multi-centric population based sero-epidemiolgical study from March to August of 2021 during the ongoing second wave. The study was conducted among all age group above one year age in five study sites across India. The sites were Delhi, Gorakhpur in Uttar Pradesh, Bhubaneswar in Odisha, Pondicherry and Agartala in Tripura. In each study site both urban and rural population were included except in Agartala where tribal and rural population was part of the study. In each of rural and urban/ tribal area the sample size was 1000 from 25 conveniently selected clusters (40 samples/cluster). In rural/tribal area, individual village and in urban area, municipality ward were considered as cluster. In each cluster, consecutive households from a centre position of the cluster were approached to collect ≥ 40 samples. We collected venous blood with serum separation within 2 hours followed by transport and storage in 2-8 degree Celsius which were analysed by standard qualitative ELISA (WANTAI SARS-CoV-2 total antibody) kit within seven days. Data of basic sociodemographic variables, exposure history, symptoms, and vaccination status were collected.

Result

Total 10110 subjects were recruited and samples collected from total five sites. The proportion of female (55.2%) were little more than male (Table 1).

Whereas according to the different age group, two third of the participants were between 20 years to 60 years (Table 2).

Out of the total 10110 participants, 7474 (73.9%) participants were positive for SARS-CoV-2 antibody. The maximum prevalence were found in urban area of Gorakhpur whereas the lowest prevalence was in rural area of Bhubaneswar (Table 3).

Among the participants aged <18 years the total prevalence was 70.4%

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with a maximum being in urban area of Gorakhpur (87.7%). Whereas among the participants aged 18 years or more, the total prevalence was 75.1% with a maximum being 95.6% in urban area of Gorakhpur (Table 4).

The participants gave history of any symptoms faced in last three months. Out of the total seropositive participants, 26.5% had history of any symptoms whereas the 73.4% participants didn't experience any symptom (Table 5).

Among the participants received at least one dose of COVID vaccine had seropositivity of 79.8% whereas this prevalence was 68.1% among the participants without vaccination (Table 6).

	Delhi (n= 2060)		Tripura (n= 2000)		Odisha (n=2000)		Gorakhpur (n=2010)		Pondicherry (n=2040)		Total (n=10110)
	Urban (n=1001)	Rural (n=1059)	Tribal (n=1339)	Rural (n=661)	Urban (n=1000)	Rural (n=1000)	Urban (n=1002)	Rural (n=1008)	Urban (n=1020)	Rural (n=1020)	
Male	419 (41.9)	511 (48.2)	554 (41.3)	249 (37.6)	511 (51.1)	415 (41.5)	565 (56.4)	471 (46.7)	417 (40.8)	417 (40.8)	4529 (44.8)
Female	582 (58.1)	548 (51.7)	785 (58.6)	412 (62.3)	489 (48.9)	585 (58.5)	437 (43.6)	537 (53.3)	603 (59.1)	603 (59.1)	5581 (55.2)

Table 1: Number of participants recruited in each of rural and urban of all five study sites.

	Delhi (n= 2060)		Tripura (n= 2000)		Odisha (n=2000)		Gorakhpur (n=2010)		Pondicherry (n=2040)		Total (n=10110)
Age Group	Urban (n=1001)	Rural (n=1059)	Tribal (n=1339)	Rural (n=661)	Urban (n=1000)	Rural (n=1000)	Urban (n=1002)	Rural (n=1008)	Urban (n=1020)	Rural (n=1020)	
1-4 years	3	10	0	4	3	16	3	2	1	3	**45**
5-9 years	18	44	13	26	35	49	25	30	52	30	**322**
10-14 years	49	84	50	50	73	76	58	102	103	74	**719**
15-19 years	37	97	80	59	65	56	89	137	94	80	**794**
20-29 years	125	209	242	101	118	116	185	168	153	153	**1570**
30-39 years	166	176	290	125	155	145	157	155	159	194	**1722**
40-49 years	202	176	261	117	175	164	205	174	166	154	**1794**
50-59 years	163	107	188	96	181	148	142	111	136	154	**1426**
60-69 years	168	104	129	54	133	132	103	83	88	102	**1096**
70+ years	70	52	86	29	62	98	35	46	68	76	**622**

Table 2: Number of participants recruited in each age group in rural and urban of all five study sites.

	Delhi		Tripura		Odisha		Gorakhpur		Pondicherry		Total
Sex	Urban	Rural	Tribal	Rural	Urban	Rural	Urban	Rural	Urban	Rural	
Male	301/419 (71.8)	287/511 (56.2)	379/554 (68.4)	129/249 (51.8)	380/511 (74.4)	216/415 (52)	534/565 (94.5)	421/471 (89.4)	350/417 (83.9)	347/417 (83.2)	**3344/4529 (73.8)**
Female	448/582 (77.0)	337/548 (61.5)	514/785 (65.5)	232/412 (56.3)	352/489 (72.0)	335/585 (57.3)	414/437 (94.7)	476/537 (88.6)	499/603 (82.8)	523/603 (86.7)	**4130/5581 (74.0)**

Table 3: Sero-prevalence of participants as per sex in rural and urban of all five study sites.

	Delhi		Tripura		Odisha		Gorakhpur		Pondicherry		Total Sero+: 7474
Age Group	Urban	Rural	Rural	Tribal	Urban	Rural	Urban	Rural	Urban	Rural	
<18 years	68 (73.9)	115 (60.8)	39 (32.2)	69 (63.3)	98 (64.1)	77 (46.1)	114 (87.7)	168 (80.4)	161 (77.4)	124 (75.6)	**1033 (70.4%)**
≥ 18 years	681 (74.9)	509 (58.5)	322 (59.6)	824 (66.9)	634 (74.8)	474 (56.9)	834 (95.6)	729 (91.2)	688 (84.7)	746 (87.2)	**6441 (75.1%)**

Table 4: Sero-prevalence among <18 years and ≥ 18 years in rural and urban of all five study sites.

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	Delhi		Tripura		Odisha		Gorakhpur		Pondicherry		Total Sero+: 7474
Symptoms Status	Urban (sero+: 749)	Rural (sero+: 624)	Rural (sero+: 361)	Tribal (sero+: 893)	Urban (sero+: 732)	Rural (sero+: 551)	Urban (sero+: 948)	Rural (sero+: 897)	Urban (sero+: 849)	Rural (sero+: 870)	
Symptomatic	250 (33.4)	193 (30.1)	103 (28.5)	236 (26.4)	186 (25.4)	198 (35.9)	301 (32.3)	263 (91.9)	28 (3.3)	219 (24.2)	**1977 (26.5)**
Asymptomatic	499 (66.6)	431 (69.1)	258 (78.5)	657 (73.6)	546 (74.6)	353 (64.1)	642 (67.7)	634 (70.7)	821 (96.7)	651 (74.8)	**5492 (73.4)**

Table 5: Symptomatic and asymptomatic proportion among the seropositive participants in rural and urban of all five study sites.

	Delhi		Tripura		Odisha		Gorakhpur		Pondicherry		Total
Vaccination Status	Urban	Rural	Rural	Tribal	Urban	Rural	Urban	Rural	Urban	Rural	
Vaccinated	46 (79.3)	102 (65.4)	187 (86.9)	434 (55.6)	450 (73.9)	132 (78.1)	505 (97.8)	201 (95.3)	258 (92.8)	442 (96.1)	**2757 (79.8)**
Unvaccinated	702 (74.6)	522 (57.8)	174 (39.0)	459 (55.6)	282 (72.1)	419 (50.4)	441 (91.2)	691 (87.4)	591 (79.6)	427 (76.4)	**4708 (68.1)**

Table 6: Sero-prevalence among the participants in rural and urban of all five study sites according to the vaccination status.

Discussion and Conclusion

The evidence showed that a major portion of the population was infected across all age throughout the nation. According to a meta-analysis, the pooled prevalence after the second wave in India was 69.2% which was similar to our evidence whereas another large study among 2433 participants reported 71.5% sero-prevalence [4,5]. The prevalence was relatively more among population of the urban area due to its inherited pattern of transmission in urbanized area. On the other side this prevalence was similar in both sex, both the age group (<18 years and ≥ 18 years). The evidence was similar to the two community based study in South India showing the similar prevalence in both sex and age group [6,7]. The majority of the seropositive population was asymptomatic according to our study which is similar to the study by Dayanand et al. [5]. Among the participants having history of COVID vaccination the pooled prevalence was relatively higher than those without history of vaccination though this difference were not seen among the participants of urban areas.

Conflicts of Interest

Nil.

Declaration

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