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Severe acute respiratory illness surveillance for coronavirus disease 2019, India, 2020

Nivedita Gupta[1], Ira Praharaj[1], Tarun Bhatnagar[4], Jeromie Wesley Vivian Thangaraj[4], Sidhartha Giri[1], Himanshu Chauhan[3], Sanket Kulkarni[3], Manoj Murhekar[4], Sujeet Singh[3], Raman R. Gangakhedkar[1], Balram Bhargava[2] & ICMR COVID Team[#]

[1]Division of Epidemiology & Communicable Diseases, Indian Council of Medical Research, [2]Department of Health Research (ICMR), Ministry of Health & Family Welfare, New Delhi, [3]National Centre for Disease Control, Delhi & [4]ICMR-National Institute of Epidemiology, Chennai, Tamil Nadu, India

[#]ICMR COVID Team: *Harpreet Singh, Neeraj Aggarwal, Harmanmeet Kaur, Neetu Vijay, Arvind Bhushan, Salaj Rana, Swati Gupta, Indian Council of Medical Research; Jitendra Narayan, Department of Health Research (ICMR), Ministry of Health & Family Welfare, New Delhi; Naveen Yadav, ICMR-National Institute of Epidemiology, Chennai*

***Background & objectives*: Sentinel surveillance among severe acute respiratory illness (SARI) patients can help identify the spread and extent of transmission of coronavirus disease 2019 (COVID-19). SARI surveillance was initiated in the early phase of the COVID-19 outbreak in India. We describe here the positivity for COVID-19 among SARI patients and their characteristics.**

***Methods*: SARI patients admitted at 41 sentinel sites from February 15, 2020 onwards were tested for COVID-19 by real-time reverse transcription-polymerase chain reaction, targeting *E* and *RdRp* genes of SARS-CoV-2. Data were extracted from Virus Research and Diagnostic Laboratory Network for analysis.**

***Results*: A total of 104 (1.8%) of the 5,911 SARI patients tested were positive for COVID-19. These cases were reported from 52 districts in 20 States/Union Territories. The COVID-19 positivity was higher among males and patients aged above 50 years. In all, 40 (39.2%) COVID-19 cases did not report any history of contact with a known case or international travel.**

***Interpretation & conclusions*: COVID-19 containment activities need to be targeted in districts reporting COVID-19 cases among SARI patients. Intensifying sentinel surveillance for COVID-19 among SARI patients may be an efficient tool to effectively use resources towards containment and mitigation efforts.**

Key words Containment - COVID-19 - SARI - sentinel - surveillance

In December 2019, an outbreak of a novel coronavirus emerged in the city of Wuhan in Hubei province in Central China[1]. The virus has formally been named as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and the disease as coronavirus disease 2019 (COVID-19)[2]. On January

30, 2020, the WHO declared the outbreak as a public health emergency of international concern[3]. As on March 31, 2020, 750,890 laboratory-confirmed cases, including 36,405 deaths, have been reported from more than 200 countries/territories/areas[4]. In India, the first laboratory-confirmed case of COVID-19 was reported from Kerala on January 30, 2020. As of March 31, 2020, a total of 2,245 cases and 56 deaths were reported in India[5].

In India, the initial COVID-19 testing strategy included people who had international travel history with symptoms, symptomatic contacts of laboratory-confirmed COVID-19 patients and symptomatic healthcare workers managing respiratory distress/severe acute respiratory illness (SARI)[6]. In addition, to track the progression of the epidemic in the early phase, stored samples of SARI patients hospitalized since February 15, 2020 were also tested for COVID-19 under the Virus Research and Diagnostic Laboratory Network (VRDLN). The WHO recommends countries to leverage the existing hospital-based SARI sites to complement the COVID-19 surveillance activities. This will further assist to monitor the intensity of COVID-19 transmission over time and geographical spread and to assess the severity of the disease in the country[7]. Following the evolution of the COVID-19 epidemic, hospitalized SARI patients were included as part of the routine testing strategy[8]. We analysed the SARI surveillance data (February 15 - April 2, 2020) to calculate the weekly COVID-19 positivity, and described the distribution of COVID-19 positive SARI cases by place and individuals' characteristics.

Material & Methods

Forty one sentinel sites were selected to test throat/nasopharyngeal swabs from a sample of SARI patients admitted between February 15 and March 19, 2020. Aggregate data on the number of SARI patients tested and COVID-19 positivity were collected from each laboratory. Since March 20, 2020, testing strategy was revised to include all SARI patients. Line list reported in the VRDLN platform was used to segregate data on SARI patients. The SARS-CoV-2 laboratory test was based on the detection of unique sequences of virus RNA by nucleic acid amplification test such as real-time reverse transcription-polymerase chain reaction (RT-PCR) and targeted the SARS-CoV-2 *E* (envelope protein) and *RdRp* (RNA-dependent RNA polymerase) genes[9].

Results & Discussion

A total of 5,911 SARI patients were tested for COVID-19. Of these, 104 (1.8%) were tested positive for COVID-19. Among the 965 SARI patient samples that were tested retrospectively between February 15-29, 2020 and March 19, 2020, two (0.2%) were positive for COVID-19. When the COVID testing strategy was expanded to include all SARI patients, a total of 4946 samples yielded 102 (2.1%) cases. The positivity increased from zero during the initial weeks to 2.6 per cent in the 14th wk (Table I).

The median age of COVID-19 positive SARI patients was 54 yr (interquartile range: 44-63), and 85 (83.3%) were males; 83 (81.4%) of the affected patients were more than 40 yr of age. Positivity was higher in males (2.3%) and in 50-70 yr of age group (4.4%) (Table II).

COVID-19 cases among SARI patients were detected from 52 districts in 20 States. Majority of the SARI patients were tested from Gujarat (792), Tamil

Table I. Distribution of coronavirus disease 2019 (COVID-19) cases among severe acute respiratory illness (SARI) patients by week, India, 2020

Week	Number of laboratories testing SARI for COVID-19	Number of SARI patients tested	Number of COVID-19 positive (%)
8-9 (February 15 - 29)	16	217	0 (0.0)
10-11 (March 1 - 14)	41	642	0 (0.0)
12 (March 15 - 21)	27	106	2 (1.9)
13 (March 22 - 28)	119	2877	48 (1.7)
14 (March 29 - April 2)	104	2069	54 (2.6)
Total		5911	104 (1.8)

Table II. Distribution of coronavirus disease 2019 (COVID-19) cases among severe acute respiratory illness (SARI) patients by age, gender and per cent positivity, India, 2020

Characteristics	Number of COVID-19 cases (per cent of total)	Number of SARI patients (per cent of total)	Per cent positivity
Gender	n=102	n=5723	
Male	85 (83.3)	3676 (64.2)	2.3
Female	17 (16.7)	2047 (35.8)	0.8
Age groups (yr)	n=102	n=5682	
0-9	2 (2.0)	386 (6.8)	0.5
10-19	0	371 (6.5)	0
20-29	9 (8.8)	1419 (25.0)	0.6
30-39	8 (7.8)	971 (17.1)	0.8
40-49	16 (15.7)	634 (11.2)	2.5
50-59	31 (30.4)	637 (11.2)	4.9
60-69	26 (25.5)	672 (11.8)	3.9
70-79	8 (7.8)	405 (7.1)	2.0
≥80	2 (2.0)	187 (3.3)	1.1

Nadu (577), Maharashtra (553) and Kerala (502) with COVID-19 positivity of 1.6, 0.9, 3.8 and 0.2 per cent, respectively (Table III). COVID-19 positive SARI patients were detected from eight districts in Maharashtra, six in West Bengal and five each in Tamil Nadu and Delhi (Table III).

Of the 102 COVID-19 positive SARI patients, 40 (39.2%) did not report any history of contact or international travel, two (2.0%) reported contact with a confirmed case and one (1.0%) reported recent history of international travel. Data on exposure history were not available for 59 (57.8%) cases (Table IV).

COVID-19 positivity among SARI patients increased from 0 per cent before March 14, to 2.6 per cent by April 2, 2020. In 15 Indian States, more than one per cent of SARI patients were COVID-19 positive. About a third of COVID-19 positive SARI cases did not have any history of contact with laboratory-confirmed case or international travel, and such cases were reported from 36 Indian districts in 15 States. These districts need to be prioritized to target COVID-19 containment activities.

The results of SARI surveillance need to be interpreted against the following limitations. First, the weekly number of SARI patients tested at each laboratory varied between 4 and 24 (13 on an average). Moreover, the proportion of all hospitalized SARI patients tested for COVID-19 by each laboratory was not known. This proportion is expected to be lower during initial weeks of surveillance. However, with the expansion of the testing criteria to include all SARI patients, it is assumed that majority of SARI patients hospitalized in these facilities would have been tested for COVID-19. Second, the data presented pertained to patients seeking care from selected sentinel hospitals that were predominantly in public sector in urban areas and hence might not be representative of the entire district, State or country. However, the trend of COVID-19 positivity among SARI patients could provide reliable information about its spread in the area. Third, diagnosis of COVID-19 positive SARI patients could have been missed due to false negative results of laboratory test based on RT-PCR[10]. Antibody-based testing among RT-PCR negative SARI patients could have increased the yield of COVID-19 cases in this group.

Tracking the spread of COVID-19 is critical to inform response activities including testing, containment and mitigation measures. The current SARI testing strategy will complement and strengthen the routine COVID-19 surveillance activities. Information from hospital-based SARI surveillance would help in setting triggers for escalation/de-escalation of mitigation measures, identify risk

Table III. Distribution of coronavirus disease 2019 (COVID-19) cases among severe acute respiratory illness (SARI) patients by State/Union Territory, India, 2020

State/UT	Number of laboratories testing SARI patients	Number of SARI patients	Number of COVID-19 positive (%)	Number of districts with COVID-19 cases
Gujarat	7	792	13 (1.6)	4
Tamil Nadu	14	577	5 (0.9)	5
Maharashtra	14	553	21 (3.8)	8
Kerala	5	502	1 (0.2)	1
Karnataka	8	320	2 (0.6)	2
Uttar Pradesh	7	295	4 (1.4)	2
Delhi	11	277	14 (5.1)	5
Assam	5	276	1 (0.4)	1
Bihar	2	263	3 (1.1)	2
West Bengal	5	256	9 (3.5)	6
Madhya Pradesh	4	249	5 (2.0)	2
Telangana	4	190	8 (4.2)	2
Rajasthan	4	179	0 (0.0)	0
Haryana	3	161	4 (2.5)	3
Punjab	2	158	1 (0.6)	1
Andhra Pradesh	4	129	4 (3.1)	2
Himachal Pradesh	2	110	0 (0.0)	0
Jharkhand	1	110	1 (0.9)	1
Odisha	3	107	2 (1.9)	1
Jammu and Kashmir	4	79	1 (1.3)	1
Chhattisgarh	1	74	0 (0.0)	0
Puducherry	1	41	0 (0.0)	0
Arunachal Pradesh	0	28	0 (0.0)	0
Chandigarh	2	24	1 (4.2)	1
Meghalaya	1	21	0 (0.0)	0
Manipur	2	20	0 (0.0)	0
Tripura	1	18	2 (11.1)	1
Nagaland	0	18	0 (0.0)	0
Andaman and Nicobar Islands	1	17	0 (0.0)	0
Mizoram	0	11	0 (0.0)	0
Uttarakhand	1	6	0 (0.0)	0
Sikkim	0	3	0 (0.0)	0
Goa	1	2	0 (0.0)	0
Dadra and Nagar Haveli	0	1	0 (0.0)	0

groups for severe disease and measure impact of the response activities. Continued sentinel surveillance for COVID-19 among SARI patients would guide the health departments to prioritize, plan and mobilize their resources in terms of where, when and how to respond.

Table IV. Coronavirus disease 2019 (COVID-19) cases among severe acute respiratory illness (SARI) patients by source of exposure, India, 2020 (n=102)

Source of exposure	Number of cases (per cent of total)
No foreign travel/contact with known laboratory confirmed COVID-19 case	40 (39.2)
Contact with a known laboratory confirmed COVID-19 case	2 (2.0)
History of foreign travel	1 (1.0)
Data not available	59 (57.8)

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For correspondence: Dr Manoj Murhekar, Director, ICMR-National Institute of Epidemiology, Chennai 600 077, Tamil Nadu, India
e-mail: mmurhekar@nieicmr.org.in