

Original Research Article

Assessment of health system preparedness to deal with the second wave of COVID-19 in a remote tribal district Surguja, Chhattisgarh, India-April 2021

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ABSTRACT

Background: Present study was conducted to assess the preparedness of the Surguja district to curtail COVID-19.

Methods: We conducted a cross-sectional observational study from May 2020 to March 2021 through records of 2 primary health centres areas selected by convenient sampling (farthest and nearest to district headquarters). Data on existing facilities and logistics was from district headquarters. Preparedness was assessed through checklist. Observations were presented as rates, ratios and proportions. Standard error of difference between two proportions was used as test of significance and $p \text{ value} \leq 0.05$ was considered significant.

Results: For Surguja district population of 925938 (65% rural), overall attack rate was 1.15%, case fatality rate was 0.96% (102/10636); there was 1 DCH, 9 DCHC, 6 CHCs, 25 PHCs, 3 upgraded PHCs, 197 subcentres, 12 CCC, 01 RT-PCR laboratory and 228 COVID vaccination centres. There were 1151 isolation beds; 300 with oxygen support (26%); ICU beds 134 (11.60%) with 34 ventilators. Cumulative 258229 tests; antigen 67.90%, test positivity rate 4.10% (urban 8.2%, rural 1.7%). This urban-rural difference in test positivity rate was statistically significant ($p < 0.001$). Health care workers, 94.81% (12722/13418) had received one dose of vaccine with 53.36% (6789/13418) both doses. Above 45 years eligible population; 66.68% (154254/231331) received one dose of vaccine.

Conclusions: Surveillance and management of COVID-19 were as per GOI guidelines issued. However, to enhance response we recommended strict implementation of appropriate behaviour in community, establishment of containment zones/facilities for high risk population in urban area blocks and increasing laboratories with RT-PCR testing in appropriate proportions.

Keywords: Tribal, COVID-19, Surguja, District hospital, Quarantine, Vaccine

INTRODUCTION

In December 2019, the first case of Coronavirus disease (COVID-19) was identified in Wuhan city of China.¹ On 30th January 2020 the WHO declared the COVID-19 as a Public health emergency of international concern.^{2,3} On 11th March 2020, the WHO characterized COVID-19 as a pandemic.^{2,4} There were 2.6 million new cases of COVID-

19 reported in the world between 22nd February to 28th February, 2021.

This was an increase of 7 percent as compared to the previous week, following six consecutive weeks of declining numbers. Possible reasons for increase in new cases was continued spread of more transmissible variants of concern (VOCs), relaxation of public health and social

measures (PHSM) and fatigue around adhering to PHSM measures.⁵

On 30th April 2021, India reported 408332 new COVID-19 cases and became the first country in the world to report more than 4 lakh COVID-19 cases in a single day. Average daily new cases were reported maximum from Maharashtra (62919) followed by Karnataka (48296) and Kerala (37199) states.⁶ In India during the second wave, it was observed that almost all states were showing increase in reporting of new cases of COVID-19. Case fatality rate was highest in few states including Maharashtra, Punjab, Delhi and Chhattisgarh.^{6,7}

In response to the increase in the number of new COVID-19 cases and deaths in the month of March 2021, Government of India formed multidisciplinary teams of minimum three members: a public health specialist, a microbiologist and an internal medicine specialist/ anaesthetist to be deployed at district level for supportive supervision and guidance to district health administration. This special team was sent to the districts which had reported highest number of cases and/or deaths due to COVID-19.

Out of more than 50 such special teams one team was deployed to Surguja district. Surguja is a remote tribal district in Chhattisgarh state of India. The special team deployed to Surguja district supported the district administration and conducted a study with the following objectives.

Objectives

The objectives of this study were (a) to assess the health infrastructure and response mechanism for surveillance and management of COVID-19 cases in Surguja district of Chhattisgarh; (b) to study the case detection rate and distribution of COVID-19 cases in Surguja district of Chhattisgarh; (c) to study the trend and distribution of test positivity rate in Surguja district of Chhattisgarh; and (d) to study the vaccination rate and distribution of COVID-19 vaccination centers in Surguja district of Chhattisgarh.

METHODS

Study type

We conducted a cross-sectional observational study in Surguja district of Chhattisgarh to assess the preparedness of district health system to deal with the second wave of COVID-19.

Place of study

Present study was conducted in Surguja, a remote tribal district in Chhattisgarh. Surguja district consists of tribal population Pando, Orao, Pahari korba etc. and is surrounded by five other districts Korba, Raigarh, Jashpur, Balarampur and Surajpur. The district Surguja is well

connected with other nearby states of Uttar Pradesh, Bihar, Jharkhand and Odisha. The headquarter of Surguja district is in Ambikapur which is located nearly 400 km away from the state capital Raipur.

Sample size and sampling technique

Data on observation of facilities was collected from two different PHC areas. Selection of PHCs was done by using a convenient sampling technique. We selected one PHC near to district headquarter and second PHC farthest from the headquarter and COVID care centre, vaccination centre, ICU under them.

Study and reference period

Study was conducted from 9th April to 13th April, 2021. Data was collected for the period May 2020 to March 2021.

Data collection

Data was collected by using a facility assessment checklist, direct observation of the services and informal interview of key informants. Data was collected from COVID care centres, Covid vaccination centres, COVID ICU in district hospital. Preparedness assessment of district health system to deal with COVID-19 was done by using a checklist and observation of following pillars against COVID-19- (a) containment and surveillance; (b) laboratory infrastructure and testing; (c) hospital infrastructure, logistics and case management; (d) COVID-19 vaccination; and (e) citizen communication.

Secondary data on existing health care facilities, human resource and logistics was collected from district surveillance officer. Key informants interviewed were District Magistrate, Chief Medical officer of Health, District Surveillance Officer, District Programme Manager, Dean of the medical college, Head of the RT-PCR Laboratory and Medical Officer PHC.

Data analysis

Data analysis was done in line with the study objectives. Observations were presented in the form of rates, ratios and proportions. Standard error of difference between two proportions (SEP) was used as test of significance and p value ≤ 0.05 was considered as significant.

RESULTS

A remote district of Chhattisgarh, Surguja had 925938 population with more than 65 percent staying in rural areas. It has 7 blocks and 593 villages. There was one district hospital and one medical college in Surguja district, 6 Community health centres (CHCs), 25 Primary health centres (PHCs), 3 upgraded PHCs, 197 Subcentres (SCs) and 16 ambulances (Table 1). The medical college was designated as a dedicated COVID hospital (DCH). There

were 09 private hospitals designated as Dedicated COVID Health Centres (DCHC), 12 COVID care centre (CCC) and 27 quarantine centres. There was one RT-PCR testing centre located in the Medical College. There were 1151 isolation beds of which 300 have oxygen support.

Total ICU beds and working ventilators are 134 and 34 respectively. There were 228 COVID-19 vaccination centres (Table 2). During the reporting period May 2020 to March 2021, a total of 10636 COVID-19 cases were reported from Surguja district. Out of these, 73.75 percent were from urban areas (Table 3). A total of 258229 tests (RT-PCR, antigen and true NAAT) were done in Surguja district. Out of total 258229 tests, 94922 (36.75%) were done in urban areas. Distribution of tests done in urban and rural areas were in proportion to the population residing in respective areas. Over all testing rate in Surguja district was 27888 tests per lakh population. The rate of testing in urban and rural area was 30798 and 26436 per lakh

population (Table 3). Out of total tests done, 23.0 percent was by using RT-PCR test, 67.9 percent was by using antigen test and 9.1 percent was by using true NAAT test. The difference in rate of testing in urban and rural area was statistically insignificant at $p > 0.05$.

Overall test positivity rate was 4.1 percent. The test positivity rate in urban area was 8.2 percent while in rural area it was 1.7 percent. This difference in test positivity rate in urban and rural area was statistically significant at $p < 0.001$ (Table 4). Average test positivity rate over last 6 months was 3.74 percent. The test positivity rate was highest (5.27 %) in the month of October 2020 and lowest (1.53%) in the month of February 2021 (Figure 1). Block wise test positivity rate varies from 1.25 percent to 8.26 percent. Test positivity rate was maximum (8.26%) in Ambikapur urban block while it was minimum in Mainpat block (Figure 2).

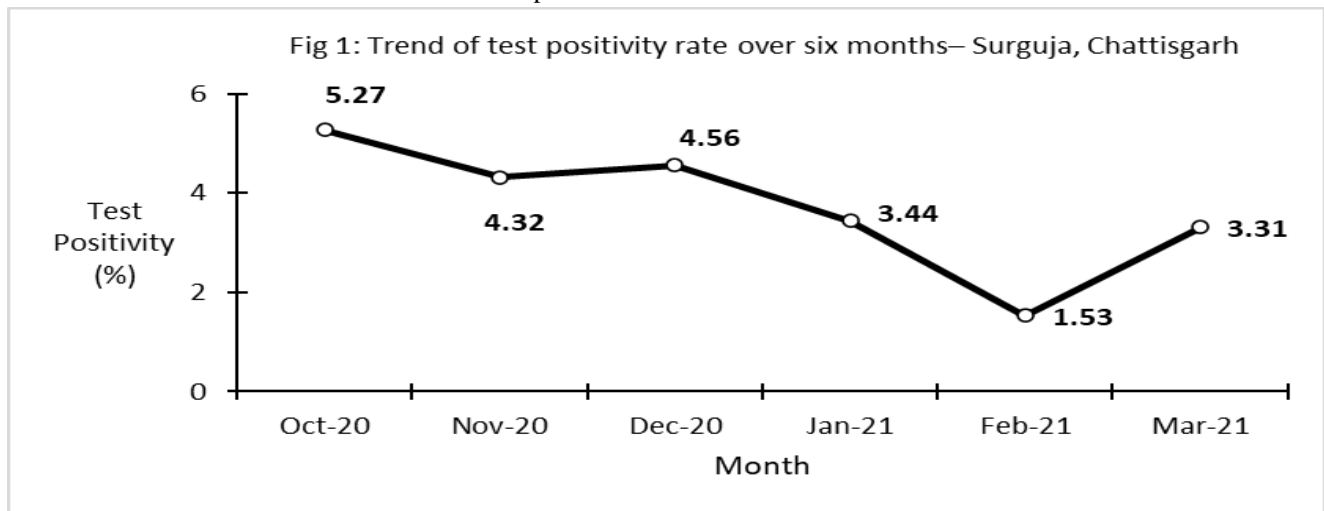


Figure 1: Trend of test positivity rate over six months- Surguja, Chattisgarh.

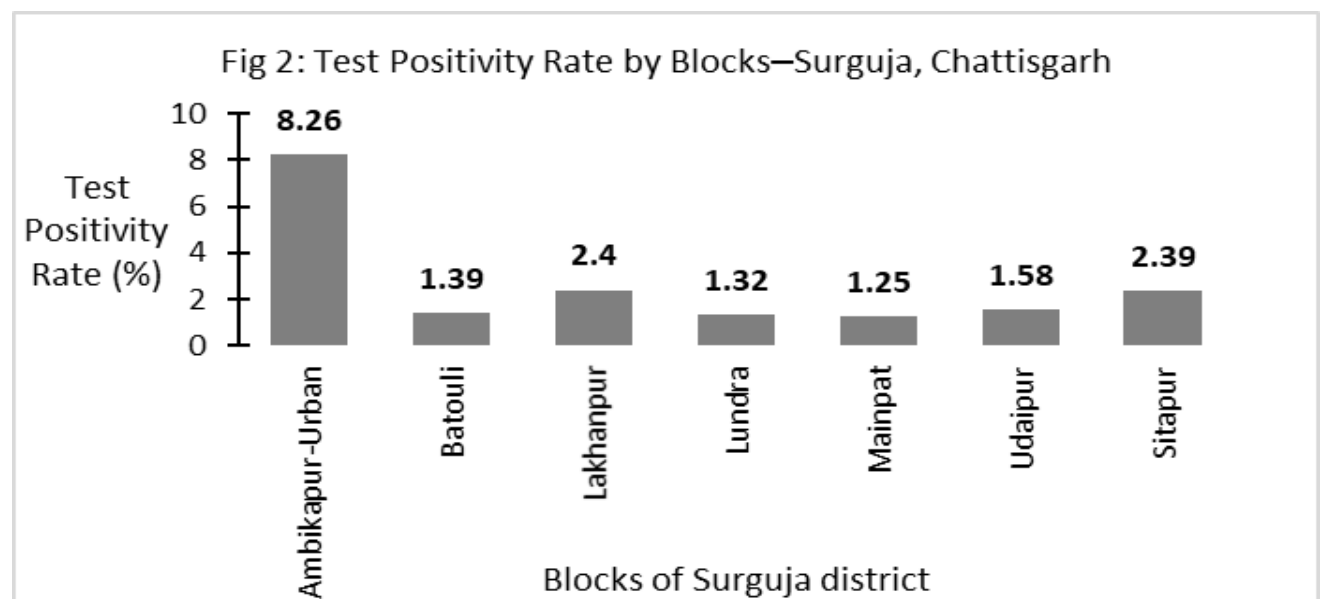


Figure 2: Test positivity rate by blocks- Surguja, Chattisgarh.

Containment zone and surveillance

At the time of assessment there were no containment zone in Surguja district. The cases were scattered throughout different wards of the urban area. More than 70 percent of the cases were from urban area of Ambikapur. COVID-19 appropriate behaviour limited mask adherence and crowd control in urban blocks.

Lab infrastructure and testing

There was only one virology laboratory at district hospital doing RT-PCR and true NAAT test. The laboratory has a capacity of doing 900 RT-PCR tests per day however the actual number of tests done was 1500 per day as the RT-PCR laboratory of neighbouring district was in the process of establishment.

Hospital infrastructure and treatment

In Surguja district, 16 ambulances were there for COVID. Drugs and logistics were available and were adequate for next 15 days. Over all Case fatality rate (CFR) for COVID-19 was 0.96 percent. CFR for co-morbid patients and for patients with age more than 60 years was 0.88 percent and 0.52 percent respectively. Death audit was performed for all deaths. Number of suspected/confirmed COVID-19 cases brought dead to the hospital was zero.

Isolation and quarantine

During reporting period, total 80.48 percent of active cases were under home isolation.

The home isolation was as per guidelines issued by Ministry of Health and Family Welfare (MoH and FW), Government of India. All cases under home isolation were very mild/asymptomatic case and meets the requirement of individual isolation room for the patient and separate rooms for all high-risk contacts, daily monitoring of temperature and SpO₂ and at-least one physical examination of the house by supervisory team.

There were total 228 vaccination centres. Maximum number of vaccination centres (35) were in Lakhanpur and Lundra blocks while Mainpat block had minimum (22) vaccination centres.

In urban area of Ambikapur total 29 vaccination centres were there. Out of 29 vaccination centres 10 vaccination centres were in private hospital setting. All other vaccination centres were in government facility and were free of charge (Table 5).

Out of total 13418 health care workers, 12722 (94.81%) had received at least one dose of COVID-19 vaccine while 6789 (53.36%) had received full vaccination. And of 7695 front line workers, 6362 (82.68%) and 3250 (51.08%) had received 1st and 2nd doses of vaccine respectively. In Surguja district there was 231331 population more than 45 years eligible for COVID-19 vaccination.

Out of 231331 eligible population, 154254 (66.68%) and 5834 (3.78%) had received 1st and 2nd dose respectively (Table 6).

Overall vaccine wastage was 6.69 percent. During the reporting period, total 21 Adverse event following immunisation (AEFI) were reported. Out of total 21 reported AEFIs, 2 were major and 19 were minor. The reported AEFIs were investigated and followed up by the district authorities. The availability of COVID-19 vaccine was not adequate for next 15 days.

Table 1: Health infrastructure in Surguja district of Chhattisgarh.

Available infrastructure	Number
Medical college	01
District hospital	01
Community health centres (CHC)	06
Primary health centres (PHCs)	25
Upgraded PHCs	03
Subcentres (SCs)	197
Ambulances	16

Table 2: COVID infrastructure in Surguja district of Chhattisgarh.

Available infrastructure	Number
Dedicated COVID hospital (DCH)	01
Dedicated COVID health centres (DCHC)	09
COVID care centre (CCC)	12
Quarantine centres	27
RT-PCR testing laboratory	01
Isolation beds without oxygen support	705
Isolation beds with oxygen support	300
ICU beds	134
Ventilators	34
COVID vaccination centres (CVC)	228

Table 3: Place distribution of COVID-19 cases in Surguja district.

Area	Population	Cumulative cases		Attack rate in %	Cumulative tests		Testing (per lakh population)
		Number	%		Number	%	
Urban	308202	7845	73.75	2.55	94922	36.76	30798
Rural	617736	2791	26.25	0.45	163307	63.24	26436
Total	925938	10636		1.15	258229		27888

Table 4: Test positivity rate in Surguja district.

Area	Cumulative tests	Cumulative tests positive	Test positivity rate in percentage
Urban	94922	7845	8.2
Rural	163307	2791	1.7
Total	258229	10636	4.1

Table 5: Distribution of COVID-19 vaccination centre in different blocks of Surguja district.

Name of block	COVID-19 vaccination centres
Ambikapur urban	29
Bhafauli	30
Batauli	22
Lakhanpur	35
Lundra	35
Mainpat	24
Sitapur	31
Udaipur	22
Total	228

Table 6: Vaccination coverage in Surguja district.

Category	Total eligible population	Received 1 st dose of vaccine, N (%)	Received two doses of vaccine, N (%)
Health care worker	13418	12722 (94.81)	6789 (53.36)
Front line worker	7695	6362 (82.68)	3250 (51.08)
Persons >45 years	231331	154254 (66.68)	5834 (3.78)

DISCUSSION

Surguja district has population of 925938 with more than 65 percent staying in rural areas. The health infrastructure including 1 district hospital, 1 medical college, 6 CHCs, 25 PHCs, 3 upgraded PHCs, 197 SCs and 16 ambulances were adequate to deal with the current pandemic of COVID-19. COVID infrastructure including DCH, DCHC, CCC, number of isolation beds, beds with oxygen facility, ICU beds, COVID testing (RT-PCR, antigen and true NAAT) facilities were in accordance with the guidelines issued by the Ministry of Health and Family Welfare, Government of India.⁸

In Surguja district around 35 percent of population resides in urban area where as number of COVID-19 cases reported from urban area was more than 73 percent of total cases. The population density in rural and urban areas of Surguja district is 390 and 3200 per square kilometre respectively.^{9,10} In urban area of Surguja district the population density is very high as compared to the rural area and the chances of gathering and overcrowding is

more in urban areas. These could be the possible reasons for increased cases in urban area of Surguja district. Gupta et al reported similar trend in other districts of Chhattisgarh and also from other states in India.¹¹ The number of tests (RT-PCR, Antigen and true NAAT) done to detect COVID-19 was satisfactory. Out of total tests around 36.75 percent were done in urban areas.

Distribution of tests done in urban and rural areas were in proportion to the population residing in respective areas. Number of tests done per lakh population was slightly higher in urban area as compared to the rural area. However, the difference was statistically insignificant. The test positivity rate in urban area was significantly higher than that in rural areas. The ratio of RT-PCR to antigen test was 23:68 which is not complying with the guideline issued by the National Task Force on COVID-19, Government of India.¹³ The trend of test positivity rate same over a period of six months. The test positivity rate was highest in Ambikapur block as this is the urban area and district head quarter with highest population density as compare to other blocks.¹⁰

At the time of assessment there were no containment zone in Surguja district. The cases were scattered throughout different wards of the urban area. There was only one virology laboratory at district hospital doing RT-PCR and true NAAT test and the test load was optimum. Over all CFR for COVID-19 was less than <1 percent. CFR for co-morbid patients and for patients with age more than 60 years was more as compare to the other groups. Similar observations were reported from other states and researchers.^{13,14}

As per the guideline issued by MoH and FW, Government of India maximum number of active cases of COVID-19 were kept under home isolation. These cases included very mild/ asymptomatic case. In Surguja district there was no facility quarantine facility for high-risk population living in limited space and in high population density.

In Surguja district there were total 228 vaccination centres. Maximum number of vaccination centres were in Lakhanpur and Lundra blocks. In urban area of Ambikapur total 29 vaccination centres were there. Out of 29 vaccination centres 10 vaccination centres were in private hospital setting. All other vaccination centres were in government facility and were free of charge. Overall vaccine wastage was 6.69 percent. Cases of AEFI were reported, investigated and managed as per the guideline. Drug supply, supply of diagnostic kits and other logistics were adequate for next 15 days however the supply of vaccine was not adequate.

CONCLUSION

Surveillance and management of COVID-19 were as per the guideline issued by Government of India.

Recommendations

To enhance the capacity of district health we recommended- (a) strict implementation of the COVID-19 appropriate behaviour in the community; (b) establishment of containment zones with perimeter control especially in urban area blocks/facilities for quarantine for high risk populations; and (c) to procure an additional RT-PCR machine or to start the RT-PCR test in the adjacent districts immediately. This will enhance the percentage of RT-PCR test to 70% of the total test done in a day. Further involvement of private RT-PCR labs could increase capacity.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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