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Epidemiological trends of COVID-19 pandemic during first and second waves: A comparative study in east Godavari district, Andhra Pradesh, India

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ABSTRACT

Introduction: From Wuhan, China, the novel severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) infection that caused the coronavirus disease 2019 (COVID-19) spread quickly to other countries. India experienced its first wave of COVID-19 infection between March 2020 to February 2021 with the peak in August 2020.The second wave started in March 2021 and continued for few months till November 2021.

Aim: This study has been conducted to describe the epidemiological trends based on laboratory data at East Godavari district, Andhra Pradesh, India.

Materials and Methods: The study was performed between March 2020 to November 2021at a tertiary care centre in East Godavari Dist., AP. Samples (Throat/ Nasal/ Nasopharyngeal swabs) were received from the Government hospitals in East Godavari district for Covid-19 Real time PCR.

Results: A total number of 5,00,869 and 8,75,808 samples were tested using rRT-PCR, and 39,626 (7.9%) and 98,656 (11.2%) were positive during first and second waves respectively. In the first wave the highest positivity rate was observed in the month of August (26.8%) whereas in Second Wave it was observed in the month of May (36.6%). In the both the waves highest positivity was observed in the age group 70-79 years (first wave 11.1% and second wave 16.3%). In both the waves the positivity rate of males was higher than females. Among symptomatic cases, the positivity rate was in the first wave 8.6% whereas in second 19.1% was observed.

Conclusion: The overall, higher positivity rate was observed in the second wave when compared to first wave. Also we observed a noticeable difference between the 1^{st} and 2^{nd} waves in terms of positivity percentage among symptomatic cases.

1. Introduction

The novel virus responsible for severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) that was labelled as COVID-19 was first reported from Wuhan, mainland China, and later identified in several parts of the world.[1] In India, first case was reported when one of the medical students returning from Wuhan University to Kerala was tested positive on 3^{rd} January, 2020.[2] Since then, SARS-CoV-2 infection has spread across all states in India. The first case of the COVID-19 pandemic in Andhra Pradesh was reported in Nellore on 12 March 2020. The virus has spread in 13 districts of the state, of which East Godavari being the largest populated district reported the highest number of cases.[3]

The Virus Research and Diagnostic Laboratory (VRDL), situated in Department of Microbiology, Rangaraya Medical College, Kakinada was the first diagnostic laboratory set up for COVID-19 testing in East Godavari district. This laboratory-initiated testing on March 18, 2020, with

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a responsibility to cater to the entire district of East Godavari and also nearby districts like West Godavari, Visakhapatnam, Vizianagaram, Srikakulam and Yanam of Pondicherry. The first positive case was documented from our center on March 31, 2020, and confirmed by the reference labs at NIV (National Institute of Virology), Pune.

In Andhra Pradesh as of November 2021, the total number of samples tested were 3,10,98,568. Out of these 20,73,317 were found to be positive for Covid-19 with 14,486 deaths reported.[3] Even though the virus caused mild disease in many, it caused severe disease leading to more deaths in elderly and in patients with comorbidities.[4]

India experienced its first wave of COVID-19 infection between March 2020 to February 2021 with the peak in August 2020. The second wave started in March 2021 and continued for few months till November 2021.

Many of the epidemiological features vary from country to country and are not known completely. In India the published epidemiological studies are quite small to date and similarities and differences between two waves remain largely unknown therefore, there is need to generate evidence on this aspect. This study has been conducted to describe the epidemiological trends across time period, age groups, gender and symptom based on laboratory data at East Godavari district, Andhra Pradesh, India.

2. Materials and Methods

2.1. Study design and data sources

The study was performed at the Virus Research and Diagnostic Laboratory (VRDL), Department of Microbiology, Rangaraya Medical College, Kakinada, Andhra Pradesh from March 2020 to November 2021. Samples (Throat/Nasal swabs/ Nasopharyngeal swabs) were received from the Government hospitals in East Godavari district, based on the criteria defined by the Ministry of Health and Family Welfare, Government of India.[5] Samples were collected from suspected symptomatic cases and asymptomatic high-risk contacts or healthcare workers who were at high risk following ICMR guidelines from time to time, after duly obtaining consent.[6]

All the samples were subjected to Nucleic acid extraction, subsequently real time-reverse-transcriptase polymerase chain reaction (rRT-PCR) using ICMR approved kits for Covid-19. (Automated Nucleic acid extraction- Genes2me, Himedia and Real-time PCR - VIRALDTECT II Multiplex real time RT-PCR kit). Results were entered in to the State Government Portal-Mata Sisu Samrakhshana (MSS) portal which is integrated and synchronize with ICMR Portal.

Data Collection: The records that were stored from the online database were retrieved and for the period from March 2020 to November 2021.

2.2. Statistical analysis

The data presented were analyzed using the chi-square test for proportion and linear trend using the GraphPad Prism 9.3.1 program. P- Values of < 0.05 were considered as significant.

3. Results

In our study, a total number of 5,00,869 and 8,75,808 samples were tested using rRT-PCR, during first and second waves respectively and were included in the analysis. A total of 39,626 (7.9%) and 98,656 (11.2%) were positive in the first wave and second wave respectively (Table 1).

In Andhra Pradesh First wave of COVID-19 infection was observed between March 2020 to February 2021, and the second wave, started from March 2021. During the first wave, the highest positivity rate was observed in the month of August (26.8%), followed by September (22.5%) and July (17.7%). During the 2^{nd} wave, the highest positivity rate was observed in the month of May2021 (36.6%) followed by June'21(19.4%) and April'21 (15.9%). During the peak time of the second wave 11.8% increase in the positivity rate (monthly average) was observed when compared with first wave (Figure 1). The peak of first wave was observed in East Godavari district on mid - August (30.5%) and the peak of second wave observed in mid-May (44.1%), denoting a significant increase in the positivity (13.6%) during the second wave, showing increase in parallel with the monthly average as shown in Figure 1.

In the present study, the age group of individuals ranges between 1-95 years with the mean age of 36.7 years. There was an increase in Covid 19 positive cases across all age groups in the second wave. (Table 1). In the first wave the highest positivity was observed in the age group 70-79 years (11.1%), followed by 30-39 years (9%) whereas in the second wave, the highest positivity was observed in the age group 70-79 years (16.3%) followed by 60-69 (14.1%).

In both the waves the positivity rate of males (first wave, 8.5% and second wave, 12.3%) was higher than females (first wave, 7.1% and second wave, 10.1 %) ($p<0.05$) (Table 1).

The overall RTPCR positivity as well as the positivity among the symptomatic and asymptomatic cases were significantly higher in the second wave as compared to the first wave (Table 1). There was a significant difference between the two waves in terms of positivity rate among symptomatic cases (8.6% in the first and 19.1% in the second wave). In symptomatic cases, most common symptoms were fever, cough, Nasal Discharge, Nasal congestion, sore throat, Shortness of breath, headache, loss of taste, vomiting and diarrhoea.

Table 1: 1 : Demographic characteristics of Covid-19 positivity (first and second waves) in East Godavari district, Andhra Pradesh, March 2020- Nooupvember2021 (n = 13,88,801)

Characteristic	First wave		Second wave		
	Total No.	COVID-19 Positive, n (%)	Total No.	COVID-19 Positive, n (%)	P value
No of sample tasted					
Total No. of positive	500869	39626(7.9)	875808	98656(11.2)	<0.001
Gender					
Male	285182	24312(8.5)	446982	55141(12.3)	<0.001
Female	215498	15314(7.1)	428802	43513(10.1)	<0.001
Others	09	0	24	02(8.3)	
Age group					
≤9	15927	1260(7.9)	38122	4105(10.7)	
10-19	50995	3012(5.9)	134906	12765(9.4)	
20-29	129061	8787(6.8)	122713	21328(10)	
30-39	103417	9350(9.0)	184605	21516(11.6)	
40-49	93631	7519(8.0)	143450	17283(12)	<0.001
50-59	60485	5339(8.8)	92652	11560(12.4)	
60-69	33436	2957(8.8)	47329	6700(14.1)	
70-79	10954	1224(11.1)	18849	3077(16.3)	
≥80	2783	178(6.3)	3181	322(10.1)	
Symptomatic					
Yes	53502	4623(8.6)	82698	15832(19.1)	<0.001
No.	477367	35003(7.3)	793110	82824(10.4)	<0.001

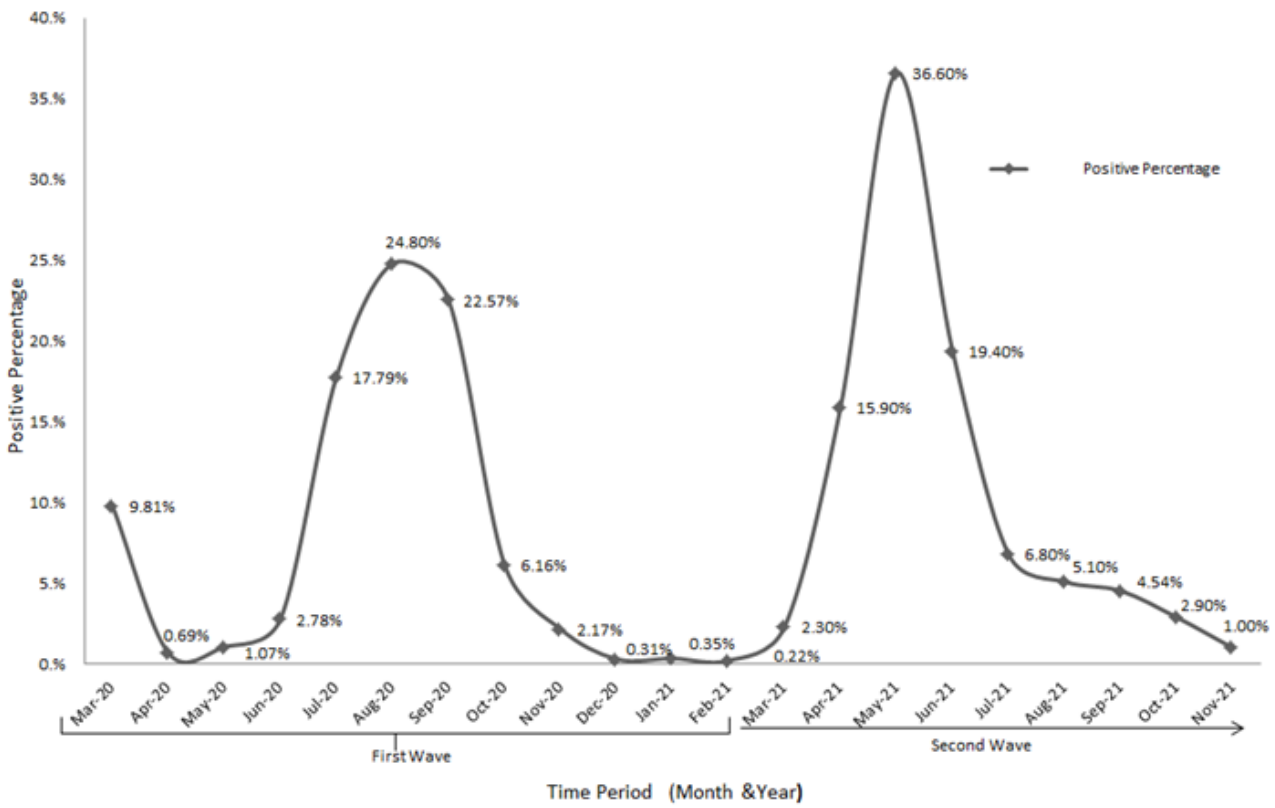

Fig. 1: Month wise frequency of positivity rate (%) for SARS-CoV-2, during the study period

4. Discussion

This is a laboratory-based study presenting the epidemiological characteristics of COVID-19 among the positive patients. This is the first study comparing the epidemiological trends of COVID-19 during the first and the second waves in Andhra Pradesh. Our study found that 28% increase in the number of tests conducted during second wave and during the peak time of the second wave 11.8% increase in the positivity rate was observed when compared with first wave. When compared to other studies in India and other countries, Uttar Pradesh showed an increase of 8.4% and Nigeria[7] showed 14.3% in second wave.[8] There could be several causes responsible for the increased number of cases in the second wave. It is observed that the mutant virus has more effective transmission capability and also lesser incubation period, increase the number of test cases and the individuals that were tested were mostly symptomatic.[9,10] In the first wave, the population tested were mostly asymptomatic contacts and those who returned after lockdown. Whereas during second wave, the population tested were mostly symptomatic and contacts developing symptoms. This might also have caused raise in the positivity rate.

Rise in positivity noted in all age groups in the second wave with a marked increase in elderly (60-79 years) (about 5.3% higher than the first wave). Many studies suggest that the population aged above 50 years is more prone to infection than the lower age groups, due to compromised immunity and prevalent health ailments or comorbid conditions.[11] In Uttar Pradesh, India, a study found that highest positivity rate was observed in older age group and positivity rate was four times higher than the first wave, in older age groups.[12]

Males showed higher positivity than females in both the waves and the finding is comparabale with other studies from India.[12] It could be due to immunological processes, dietary choices like smoking, self-care practices related to health, or other elements that could alter how the epidemic affects different genders and also Men exhibit higher expression of the coronavirus receptors (ACE 2) than women do, which may explain why women are more resistant to infections than men are.[13–15]

The predominant symptoms of infection (fever, cough, Nasal Discharge, Nasal congestion, sore throat, Shortness of breath, headache, loss of taste, vomiting and diarrhea) were similar in both waves, but in symptomatic cases positivity rate was increased to 10.1% in second wave when compared with first wave. Other study from Uttar Pradesh, India showed that positivity rate was increased to 9.9% in symptomatic cases.[12]

The limitation of the present study is lack of data from the patients regarding hospitalizations, immunization status (as the first dose of immunization was already underway when the second wave started) and the severity of the disease. If such data was also available, the analysis could have been more comprehensive to reflect the dynamics of the disease during the first and second waves.

5. Conclusion

This study revealed, higher positivity rate was observed in the second wave.In the first wave highest positivity rate was observed in the month of August 2020, whereas in second wave in month of May 2021. During the peak time of the second wave 11.8% increase in the positivity rate was observed. Higher positivity noted in the second wave, in symptomatic cases and in elderly.

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7. Conflict of Interests

The authors have no competing interests to declare that are relevant to the content of this article.

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