



## CHEST RADIOGRAPHS OF COVID-19 PATIENTS AFFECTED IN FIRST AND SECOND COVID WAVE IN INDIA: A COMPARATIVE STUDY

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**ABSTRACT** **INTRODUCTION:** The COVID-19 pandemic in India is part of the global coronavirus disease pandemic of 2019 (COVID-19), which is caused by the coronavirus that causes severe acute respiratory syndrome (SARS-CoV-2). India was the first country to report over 400,000 new cases in a 24-hour period on April 30, 2021. The problems with the second wave were increasing manifolds as the symptoms of COVID-19 infections were strange and not common to the first wave. The majority of those infected in the first wave were the elderly with various comorbidities, but as the second wave began, the trend shifted, with younger people becoming infected. This study was conducted to evaluate the difference between chest X rays of the subjects affected in the first and the second wave of COVID19 in India. **MATERIAL AND METHODS:** This was a retrospective study in which chest X ray PA view of 40 COVID positive patients from first wave of pandemic and 40 such patients from second wave of pandemic were selected. The age and gender of the patient were also noted. Chest X rays were evaluated and classified according to BSTI(11) and Brixia scoring system(12). **RESULTS AND DISCUSSION:** Out of total 40 patients in the first wave 14 (35%) were female and 26 (65%) male, whereas in second wave subjects 22 (55%) were male and 18 (45%) female. BSTI classification revealed that classical features of COVID19 pneumonia were more common in the first wave. Chest X-rays were also classified according to Brixia scoring. The average Brixia score in wave 1 and wave 2 subjects was 6.925 and 8.825 respectively. **CONCLUSION:** Mutations occurring within the coronavirus and vaccination against it may play a possible role in the difference of radiological pattern and extent of the disease in the consecutive waves.

**KEYWORDS :** Chest X-ray, COVID-19, radiological features

**INTRODUCTION:**

The COVID-19 pandemic in India is part of the global coronavirus disease pandemic of 2019 (COVID-19), which is caused by the coronavirus that causes severe acute respiratory syndrome (SARS-CoV-2). India has by far the maximum number of confirmed cases in Asia at the present. (1) With 26.7 million recorded cases of COVID-19 infection and 307,231 deaths, India ranks just behind the United States in terms of number of confirmed cases and ranks third with respect to number of COVID-19 deaths (after the United States and Brazil) as on May 23, 2021(2)

On January 30, 2020, the first case of COVID-19 in India was recorded, which originated in China. (3) Daily infections peaked in mid-September at over 90,000 per day, before decreasing to fewer than 15,000 in January 2021. The second wave, which began in March 2021, was far bigger than the first (4). By late April, India had surpassed the United States in the number of new and active cases. It was the first country to report over 400,000 new cases in a 24-hour period on April 30, 2021.(5)(6)

The problems with the second wave were increasing manifolds as the symptoms of COVID-19 infections were strange and not common to the first wave. Most common symptom in second wave was Sore throat, which was uncommon in the first wave (7). The majority of those infected in the first wave were the elderly with various comorbidities, but as the second wave began, the trend shifted, with younger people becoming infected (8). This may be attributed to India's vaccination programme which started on 16 January 2021, first in healthcare workers followed by vaccination of people aged more than 60 years. By April, India was administering 3–4 million doses a day (9,10). This may also be attributed to emergence of new variants of coronavirus (ex. Delta variant) or callousness amongst the younger generation.(8)

This study was conducted to evaluate the difference between chest X rays of the subjects affected in the first and the second wave of COVID19 in India.

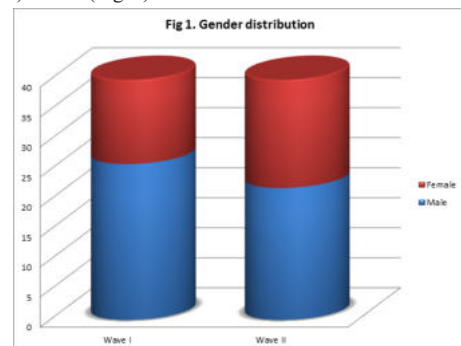
**MATERIAL AND METHODS:**

This was a retrospective study in which chest X ray PA view of 40 patients that were RTPCR or RAT positive during first wave of pandemic (July 2020 to December 2020) and 40 patients that were either RTPCR or RAT positive during second wave of pandemic (April 2021 to June 2021) were taken. All patients taken were of ages 18 and above. The age and gender of the patient was also noted. All chest X-rays that were done on day 5 of the symptom onset were considered.

Chest X rays were evaluated and classified according to BSTI(11) and Brixia scoring system(12).

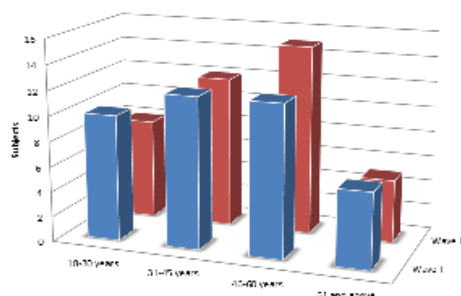
**RESULTS:**

Out of total 40 patients in the first wave 14 (35%) were female and 26 (65%) male, whereas in second wave subjects 22 (55%) were male and 18 (45%) female (Fig 1.)



The minimum and maximum age of the subjects were 18 years and 71 years in first wave group and 22 years and 72 years in second wave group respectively. Average age for first and second wave group was 43 and 45 years respectively. The age distribution graph is shown for both groups in Fig. 2.

Fig 2. Age distribution



	18-25 years	26-35 years	36-45 years	46 and above
Wave I	10	12	12	6
Wave II	8	17	15	5

All chest X-rays were classified according to the BSTI coding system for both the groups as detailed in Table 1.

BSTI Code	Inference	Wave I	Wave II	Total
CVCX0	Normal	7 (17.5%)	10 (25%)	17 (21.25%)
CVCX1	Classic	26 (65%)	16 (40%)	42 (52.5%)
CVCX2	Indeterminate	4 (10%)	8 (20%)	12 (15%)
CVCX3	Non COVID-19	3 (7.5%)	6 (15%)	9 (11.25%)
<b>Total:</b>		40	40	80

**Table 1. Comparison of BSTI coding of chest X-ray in wave I and wave II**

Chest X-rays were also classified according to Brixia scoring. The average Brixia score in wave 1 and wave 2 subjects was 6.925 and 8.825 respectively. Average Brixia score for all subjects combined was 7.875. Brixia score was also calculated with respect to each age group as shown in Table 2.

Age Groups	Brixia score of chest radiograph (Average)		
	Wave I	Wave II	Total
18-30 years	2.70	2.50	2.61
31-45 years	6.67	9.42	8.04
46-60 years	7.67	11.33	9.70
61 years and above	10.50	10.00	10.27
Total	6.925	8.825	7.875

**Table 2. Comparison of Brixia score amongst various age groups in both wave I and wave II subjects.**

## DISCUSSION:

As is evident from the results, classical features associated with COVID pneumonia, such as interstitial or alveolar infiltrates, peripheral distribution, and lower zone predominance were more common in the first wave than the second wave. Radiological features indeterminate for COVID19 and even atypical features such as pleural effusion, upper zone predominance, and central distribution were more common in the second wave. This may be due to emergence of new strains of the virus.

Brixia scoring, which denotes the radiological extent of involvement and is directly related to the severity of the disease and its prognosis, was more in the second wave affected individuals than those in the first wave. Compared to the first wave, average Brixia score was more in the age groups of 31-45 years and 46-60 years in the second wave. Age group of more than 60 years was affected slightly less in the second wave. This may be attributed to the vaccination drive in India where age group of more than 60 years were decided to be vaccinated earlier than other age groups.

## CONCLUSION:

The second wave of the pandemic in India not only had different clinical features but also had more proportion of chest radiographs with atypical presentation. Radiological extent of disease has also decreased in some age groups, probably due to vaccination. Mutations within the virus itself as well as the vaccination against the SARS-COV2 will play an important role in the radiological appearance and severity in consecutive waves in the future. Studies with a larger sample size are required to further research in the radiological difference amongst different waves of the COVID19 pandemic.

## REFERENCES

- Hindustan Times. "India most infected by Covid-19 among Asian countries, leaves Turkey behind." <https://www.hindustantimes.com/india-news/india-most-infected-by-covid-19-among-asian-countries-leaves-turkey-behind/story-Jjd0AqIsuL3yjMWg29uJ3I.html> [Internet]. 2020 [cited 2021 Jun 6];(29 May). Available from: <https://www.hindustantimes.com/india-news/india-most-infected-by-covid-19-among-asian-countries-leaves-turkey-behind/story-Jjd0AqIsuL3yjMWg29uJ3I.html>
- Times of India. India's Covid toll tops 3 lakh, 50,000 deaths in 12 days | India News [Internet]. [cited 2021 Jun 6]. Available from: <https://timesofindia.com/india/indias-covid-toll-tops-3-lakh-50000-deaths-in-12-days/articleshow/82892432.cms>
- Perappadan BS. India's first coronavirus infection confirmed in Kerala - The Hindu. The Hindu [Internet]. 2020 [cited 2021 Jun 6]; Available from: <https://www.thehindu.com/news/national/indias-first-coronavirus-infection-confirmed-in-kerala/article30691004.ece>
- The Guardian. India's shocking surge in Covid cases follows baffling decline [Internet]. [cited 2021 Jun 6]. Available from: <https://www.theguardian.com/world/2021/apr/21/india-shocking-surge-in-covid-cases-follows-baffling-decline>
- The Hindu. Coronavirus | India becomes first country in the world to report over 4 lakh new cases on April 30, 2021. 2021 [cited 2021 Jun 6]; Available from: <https://www.thehindu.com/news/national/coronavirus-india-becomes-first-country-in-the-world-to-report-over-400000-new-cases-on-april-30-2021/article34453081.ece>
- BBC. India coronavirus: New record deaths as virus engulfs India - BBC News [Internet]. 2020 [cited 2021 Jun 6]. Available from: <https://www.bbc.com/news/world-asia-india-56961940>
- Zee News. COVID-19 second wave brings new symptoms, see if you have them [Internet]. 2021 [cited 2021 Jun 6]. Available from: <https://zeenews.india.com/health/covid-19-second-wave-brings-new-symptoms-see-if-you-have-them-2355682>

- The Indian Express. COVID-19: Doctors explain why young people are getting more affected in second wave [Internet]. 2021 [cited 2021 Jun 6]. Available from: <https://indianexpress.com/article/lifestyle/health/covid-19-doctors-explain-why-young-people-are-getting-more-affected-in-second-wave-7312303/>
- Government of India. #IndiaFightsCorona COVID-19 in India, Vaccination, Dashboard Corona Virus Tracker | mygov.in [Internet]. Government of India. [cited 2021 Jun 6]. Available from: <https://www.mygov.in/covid-19/>
- Daily COVID-19 vaccine doses administered, Apr 11, 2021 [Internet]. [cited 2021 Jun 6]. Available from: <https://ourworldindata.org/grapher/daily-covid-19-vaccination-doses?tab=chart&country=IND>
- Imaging BS of T. BSTI COVID-19 CXR Report Proforma. Bsti [Internet]. 2020;19. Available from: <https://www.bsti.org.uk/standards-clinical-guidelines/clinical-guidelines/bsti-covid-19-guidance-for-the-reporting-radiologist/>
- Borghesi A, Maroldi R. COVID-19 outbreak in Italy: experimental chest X-ray scoring system for quantifying and monitoring disease progression. Radiol Med [Internet]. 2020;125(5):509-13. Available from: <https://doi.org/10.1007/s11547-020-01200-3>