

A Comparative Analysis of Clinical, Demographic and Mortality Indicators Between First, Second and Third Covid Wave in A COVID Dedicated Tertiary Care Hospital at Jaipur, Rajasthan, India

Kriti Goyal¹, Gaurav Dalela², Anupma³, Nilofar Khayyam⁴, Jitendra Panda⁵

¹Third Year Resident, Department of Microbiology, RUHS College of Medical Sciences, Jaipur

²Senior Professor and HOD, Department of Microbiology, RUHS College of Medical Sciences, Jaipur

³3rd Year Resident, Department of Microbiology, RUHS College of Medical Sciences, Jaipur

⁴Associate Professor, Department of Microbiology, RUHS College of Medical Sciences, Jaipur

⁵Assistant Professor, Department of Microbiology, RUHS College of Medical Sciences, Jaipur

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Corresponding author: Dr. Kriti Goyal

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Abstract

Background: SARS-COV-2 virus causing Covid-19 disease has caused disruptive pandemic. A comparative analysis of first wave, second wave and third wave would suggest policymakers about better management of Covid-19 recurrence or its severity for future.

Aim & Objective: The aim of this study was to compare clinical characteristics, age distribution, gender and mortality indicators between first, second and third wave of Covid-19 in a COVID dedicated tertiary care hospital at Jaipur, Rajasthan

Methodology: This was a retrospective study done in Rajasthan University of Health Sciences College of Medical Sciences and hospital (RUHS CMS & HMS), a covid dedicated tertiary care hospital at Jaipur, Rajasthan. Comparison of relevant data was done between the first wave (August – December 2020), second wave (April – June 2021) and third wave (Dec 2021- Feb 2022) at Jaipur, Rajasthan.

Results And Discussion: Out of 5838 RT-qPCR Covid positive patients admitted in 1st wave, 4333 were males and 1505 were females, in 2nd wave out of 5841 positive patients, 3946 were males and 1895 were females, and in 3rd wave also 3002 were males and 1253 were females out of 4255 positive patients, indicating male preponderance. Most affected age in first wave was 51-70 years (35.02%) followed by 31–50 years (32.6%), in 2nd wave most affected age group was 31-50 years (39.7%) followed by 18-30 years (28.9%) while in 3rd wave 18-30 years age group were most affected one (42.5%). Symptoms were mild in first and third wave while second wave had serious complications. Mortality was significantly higher in 2nd wave (5.5%) as compared to other waves (1.1% in 1st & 1.0% in 3rd).

Conclusion: There was a shift of positivity towards the younger age in second and third wave as compared to first wave, most probably related with vaccination status in India. Males are more affected due to more mobility and carelessness. Severity was higher in second wave

therefore, it is necessary to remain vigilant for newer variants and to study age, gender and severity in order to prevent morbidity and mortality.

Keywords: SARS-CoV-2, Wave, Covid Positive, Severity, Gender.

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Introduction

Coronavirus disease 2019 (COVID-19) is defined as disease caused by novel coronavirus called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2; formerly called 2019-nCoV). Initially cases of the novel coronavirus (2019-nCoV) occurred in Wuhan, Hubei Province, China, in December 2019 and January 2020 [1]. In December 2019, a cluster of patients with lung disease and pneumonia of unknown cause were linked to a seafood wholesale market in Wuhan city of China [1, 2]. Globally, the number of new weekly cases decreased by 17% during the week of 24 to 30 October 2022 as compared to the previous week, with over 2.3 million new cases reported, As of 30 October 2022, over 627 million confirmed cases and over 6.5 million deaths have been reported globally [3,4].

The COVID-19 virus transmitted primarily through droplets of saliva or discharge from the nose of an infected person when he coughs or sneezes, so respiratory etiquette practice is important [5]. Most people infected with the COVID-19 virus had experienced mild-to-moderate respiratory illness and recovered without special treatment [6], while people with underlying medical problems such as cardiovascular disease, diabetes, chronic respiratory disease, and cancer had developed serious illnesses [6]. Many countries have experienced multiple waves of coronavirus outbreaks. Consequently, many government and health authorities, including the WHO, have been actively educating people to take preventive measures which are necessary to reduce the spread of the virus, including lockdown measures and social distancing.

The empirical data collected show differences in viral infection behaviour between the different periods of waves in the population diagnosed with COVID-19, in age range, symptoms, and disease severity, in different countries and locations[7,8]. The 2nd wave was at a phenomenal speed as compared to the 1st wave. There could be several reasons responsible for the increased number of cases in the second wave. It is also observed that the mutant virus had more effective transmission capability and its incubation period was also lesser. This study compared various characteristics of different waves during the COVID-19 pandemic in Rajasthan, India.

Method

Data collection and study design

We conducted a retrospective cohort study at RUHS College of Medical Sciences & Hospital, a covid dedicated tertiary care hospital in Jaipur, Rajasthan. RUHS CMS & HMS was the first and only Covid dedicated hospital during the initial phase of COVID pandemic in Western Rajasthan, India. This study was conducted in three phases in order to compare the clinical characteristics, gender distribution, and mortality differences in different demographic groups in the three waves of COVID-19 pandemic in Rajasthan.

The first phase of study was from August 2020 to December 2020 coinciding with the first wave with peak in September 2020. The second phase of study was from April 2021 to June 2021 coinciding 2nd wave with its peak in April 2021. The third phase of study was from December 2021

to Feb 2022 having peak of 3rd wave in January 2022.

Study population

The COVID-19 infection database was queried to identify all recorded ages, gender, and susceptible population. Cases in which such information was missing were excluded. We classified the population based on age (0-17 years, 18-30 years, 31-50 years, 51-70 and >70 years) and gender (males and females) to compare the covid positivity rates among them in first, second and third wave of COVID-19. A comparative analysis of mortality patterns was also done in each phase of study along with gender and age-group difference. Real-time quantitative PCR (RT-qPCR) tests were performed of all susceptible individuals testing for

COVID-19 disease and results were recorded according to the reading of graphs obtained.

Results

During first wave (from August 2020 to December 2020), total 27023 susceptible individuals were tested for COVID-19 in RUHS and 5838 were RT-qPCR positive i.e., 21.6% positivity. Out of which 4333 were males and 1505 were females. In second wave (from April 2021 to June 2021), total 21011 were tested, among which 5841 were covid positive i.e., 27.7% positivity. Out of 5841 positive patients, 3946 were males and 1895 were females. While in third wave, positivity was 37.2% as 4255 were tested positive out of 11426 susceptible persons, having 3002 males and 1253 females.

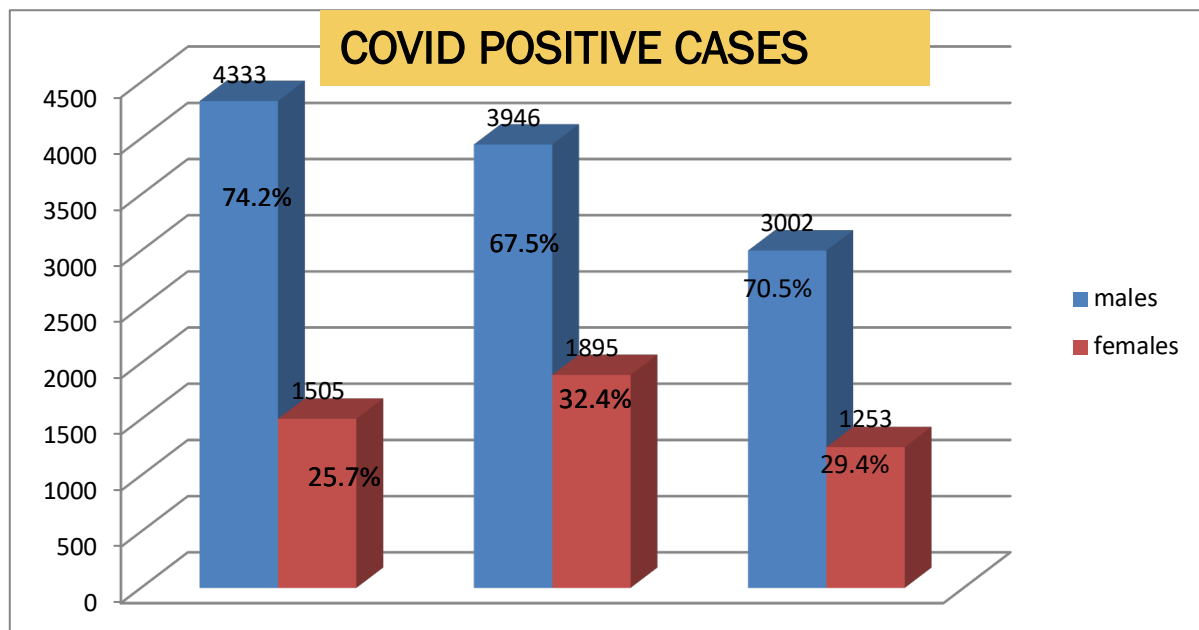


Figure 1: Comparison of COVID-19 Positive cases with gender variation in 1st, 2nd and 3rd wave

Most affected age in first wave was 51 – 70 years (35.02%), in which 71.4% were males and 28.64% were females followed by 31 – 50-year age group (32.6%). In 2nd wave most affected age group was 31 – 50 years (39.7%) in which 67.81% were

males and 32.18% were females followed by 18 – 30-year age group (28.9%), while in 3rd wave more younger age group consisting 18-30 years old were the most affected ones (42.54%) in which 71.76% were males and 28.23% were females.

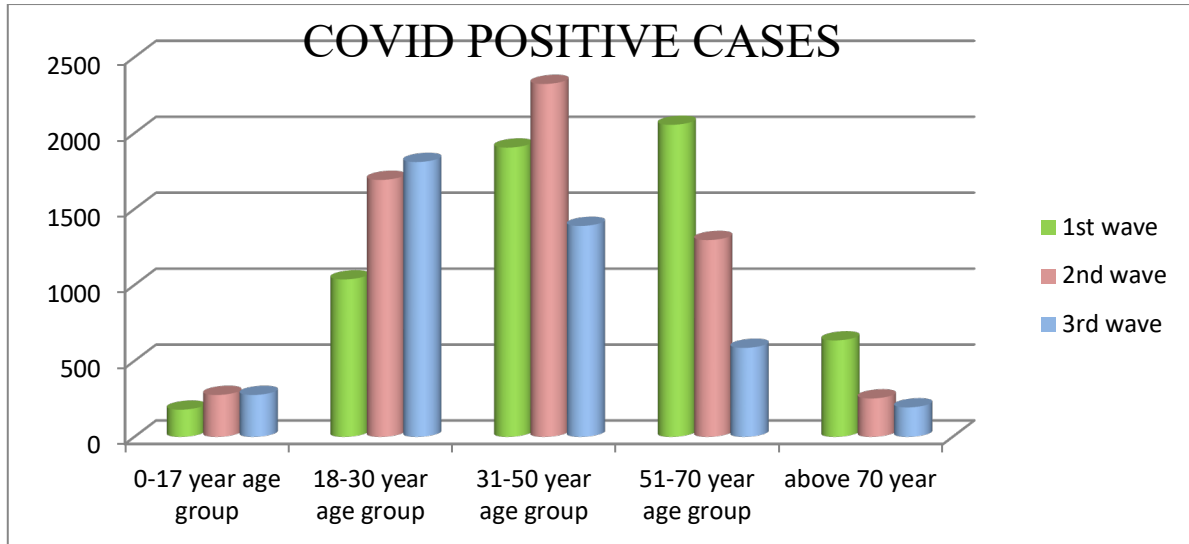


Figure 2: Comparison of COVID-19 Positive cases in different age groups in 1st, 2nd and 3rd wave

Table 1: Gender and age variation in three different waves of COVID-19

| Positive Cases | 0-17 Year | | 18-30 Year | | 31-50 Year | | 51-70 Year | | > 70 Year | |
|----------------|-----------|--------|------------|--------|------------|--------|------------|--------|-----------|--------|
| | Male | Female | Male | Female | Male | Female | Male | Female | Male | Female |
| First Wave | 117 | 62 | 781 | 256 | 1460 | 445 | 1467 | 588 | 482 | 153 |
| Second Wave | 162 | 114 | 1208 | 484 | 1576 | 748 | 826 | 470 | 176 | 77 |
| Third Wave | 164 | 112 | 1299 | 511 | 993 | 396 | 411 | 175 | 135 | 59 |

Table 2: Total number of deaths with gender variation in three waves of COVID-19

| | Male | | Female | |
|-------------|----------|-----------|----------|-----------|
| | Positive | Death | Positive | Death |
| First Wave | 4333 | 47(1.08%) | 1505 | 23(1.5%) |
| Second Wave | 3946 | 219(5.5%) | 1895 | 106(5.5%) |
| Third Wave | 3002 | 30(0.99%) | 1253 | 14(1.1%) |

When we talk about mortality among covid positive cases then it was 1.1% in first wave which was increased to 5.5% during the second wave but significantly decreased in third wave comprising 1.0%. A maximum number of COVID-19 positive deaths during the first wave of pandemic occurred in September 2020 and during the second wave in April 2021. We

have also found that mortality was higher in females as compared to males in the first and third wave but was almost same in 2nd wave. In all the three waves above 50 years age group acquires the maximum portion among the deaths due to COVID-19 whereas younger age group (0-17 years) has least number of deaths.

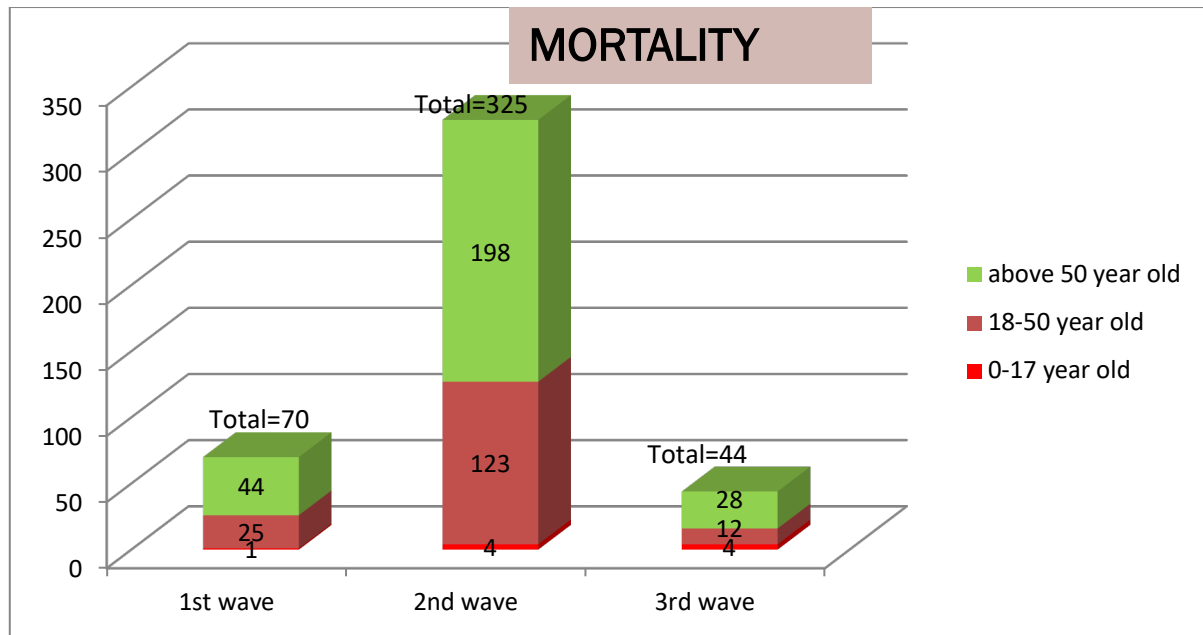


Figure 3: Mortality in different age groups in three different waves of COVID-19

Discussion

A retrospective cohort study of the COVID-19 pandemic during the three waves, was conducted at RUHS Hospital, Jaipur(India). The COVID-19 pandemic has resulted in both deaths and recoveries; there is no room for mistakes, as one wrong or delayed decision can worsen the situation [9]. Higher testing rates have led to the identification of more cases; thus, differences in the identified number of cases and the actual number of cases largely depend on the extent of testing and diagnosis [10].

India has faced three waves of COVID-19 with different variants of SARS-Cov2 virus, with the second wave being more severe, more transmissible and having maximum number of deaths during that phase with covid positivity. Studying the relationship of patient age and gender with viral clades in these two periods revealed that the population under 10 year of age was least affected whereas the population of 11 – 60-year-old was most affected.

Reddy MM et al[11] shows that the increase in positivity was markedly higher in older age groups in the second wave (about four times higher than the first

wave) while in our study we have found that there was a shift of positivity towards the younger age in second wave and in third wave as they were least vaccinated till that time. In the first wave, most affected age group was 51 – 70-year-old (35.2%) in 2nd wave 31–50-year age group people were more affected (39.7%) while it was shifted to further younger age group of 18-30 years old in third wave (42.5%).

Our study shows that positivity was higher in males in all three waves (74.2%, 67.5%, 70.6% respectively) likewise in the studies of Reddy MM et al[11] (73.1% in 1st wave, 67.8% in 2nd wave) and Sarkar A et al[12] (64.9% in 1st wave, 71.09% in 2nd wave), which may be because of more exposure as predominantly males are main earning member as compared to females in our Indian society so there is more mobilisation of males and they are more likely to get infected. It was also found that, approximately 67% of the deaths were attributed to the male gender in COVID-19 positive group in first and second wave and 68% in third wave. This male preponderance can be attributed to high exposure rate and high-risk behaviour in males like smoking, tobacco chewing,

alcohol consumption, lifestyle related non-communicable diseases [13, 14].

In India the second wave has led to devastating consequences, particularly among the young population. Studies have shown that various circulating double mutant and triple mutant strains of SARS-CoV-2 across different regions of India, which are more pathogenic than the initial strains. Such altered transmissibility and pathogenicity indicate the evolution of the virus [15]. Budhiraja S et al [16] showed in their study that mortality increased by almost 40% in wave-2, likewise, we have also found that a greater number of deaths has been identified in second wave as compared to the first wave (5.5% v/s 1.1%) and cases were more severe in second wave which may be due to mutated variant of covid-19 which was more transmissible and dangerous than the previous one. The main risk sources of spread were close contact with a previously confirmed patient, active and community surveillance, and cluster communities. Due to the highly transmissible nature of COVID-19, delayed intervention may have led to rapid spread.

There were mild symptoms in first wave like cold, cough, loss of smell and taste with significant weakness while second wave shares severer symptoms primarily on respiratory system with breathlessness and pneumonia like symptoms reported in higher proportions in India. On the other hand, symptoms in third wave comprise mild respiratory distress with low grade fever, cold and cough. A combination of loss of smell and taste, fatigue, persistent cough, and loss of appetite resulted in the best model in the study by Larsen et al [17]. Further evaluation of these combinations of symptoms can yield better predictive results. Further studies may be required to see if the symptoms vary according to various strains of the virus and also if there is any variation in relation to risk factors such as obesity, previous

heart disease, and COPD. Future studies using these models can yield better results in surveillance and containing this infectious disease.

Moreover, in future suggestions that when a virus is widely circulating in a population and causing many infections, the likelihood of the virus mutating increases [18, 19]. The more opportunities a virus has to spread, the more it replicates [20, 21]. Priority should be given to vaccinating high-risk groups everywhere to global protection against new variants and minimize the risk of transmission [22].

The present study shows significant differences between three waves of the COVID-19 pandemic in Jaipur city of Rajasthan (India), which may be attributable to a lack of strong social distancing policies and public health interventions. The main risk sources were close contact with a previously confirmed case of COVID-19 and community risk.

Clade distribution varied in India with a shift from the highly prevalent GR clade (40.09%) in period I to the G clade (46%) in period II. As clade variation corresponded to the emergence of new variants or the disappearance of prevalent variants, PANGOLIN lineage analysis in these two periods in India revealed that the outbreak was due to the emergence of B.1.617 and B.1.618 SARS-CoV-2 variants, which might be responsible for the variation in clade distribution [12]. Second wave was more severe because of new delta variant in India. Lineage analysis showed that in this period, B.1.617.2 (52%) and B.1.617.1 (17.96%) were the two prevalent SARS-CoV-2 variants in India [12]. Non-availability of hospital beds could also have contributed towards higher mortality. Besides the steep rise of the cases, there has been more involvement of the younger demography in second wave and also in third wave.

Conclusion

There is need of further studies for delineating exact role of various factors and it is necessary to remain vigilant of newer Covid variants and to study age, gender relationship with these variants to prevent morbidity and mortality in future. Acceleration of screening among workers should be made so that they can enter the health service system as soon as possible and confirmed cases could be isolated. Early and timely interventions with strengthened social distancing policies should be implemented to effectively suppress and control the COVID-19 pandemic.

Vaccination is of utmost importance so as to prevent transmission and to decrease severity of the disease. Higher utilization of healthcare systems has underlined the need for meticulous pandemic preparedness for future.

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