Comparative analysis and epidemiological study of SARS-CoV-2 in first wave among different states of India

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Abstract

Severe Acute Respiratory Syndrome Corona Virus-2 (SARS-CoV-2) has now spread worldwide, and various governments are attempting to control the disease's spread to overcome the global health crisis. Data from 28 Indian states and 8 Union Territories (UTs) provide a detailed look at the transmission pathways and case fatality rate (CFR) of the SARS-CoV-2. Among the global data, India was found to be the third country with the highest mortality cases of 157K, and Maharashtra was having the most higher number of mortality cases followed by Tamil Nadu and others. The percent distribution of CFR calculated in each geographical zone of India i.e. Central, Eastern, North Eastern and Northern, Southern and Western zone were 17%, 14%, 7%, 22%, 12%, and 28%, respectively. Furthermore, the CFR was calculated for every month using a standard formula. The CFR was significantly ($P<0.01$) higher in period II comprising April to June of the year 2020. CFR was significantly different ($P<0.01$) depending on the month. Moreover, CFR was compared in different zones in India, western zone showed the highest CFR as compared to other zones. The epidemiology of SARS-CoV-2 was evaluated in patients of various ages and co-morbidities. Patients >21 years had the highest age-specific positivity rate. The prevalence of SARS-CoV-2 patients in acute and chronic disease was 12.87 and 87.13 percent, respectively. Thus, this analytical epidemiological study serves specifically in establishing a relationship between SARS-CoV-2 infection and other precipitating factors causing morbidity and mortality during the given time frame in the first wave, in the year 2020.

Introduction

In Wuhan (China 2019), a severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2) infection has completely spread all over the world, creating an emergency situation [1]. This pandemic disease has caused 3.2 million deaths and infected more than 158 million people worldwide by May 11, 2021 [2]. During the early stages of the pandemic, epidemiologic studies and disease surveillance were conducted in China [3-5], Europe [6, 7], and North America [8-10], to better understand the current SARS-CoV-2 pandemic. The majority of confirmed cases occurred in low and middle-income countries (LMICs), where a significant number of individuals were at increased risk of outcomes and faced barriers to accessing high-quality health care [11-13]. Although many more studies are needed to assess how SARS-CoV-2 affects individuals and communities [14-16], there is almost no fundamental approach available to inform intervention strategies of SARS-CoV-2 transmission dynamics and clinical outcomes [17].

At the end of the year 2019 and the beginning of 2020 year, human infection with SARS-CoV-2 was first identified in Wuhan, Hubei Province, China. Globally, as of December 31, 2019, SARS-CoV-2 cases have been reported to the World Health Organization (WHO). Fever (99%), fatigue (70%), dry cough (60%), myalgia (44%), and dyspnea are the most common symptoms of SARS-CoV-2 [18-20]. Headache, dizziness, diarrhea, nausea, and vomiting are the additional symptoms of SARS-CoV-2 that are less common [21]. Symptoms of severe illness include pharyngeal pain, dyspnea, dizziness, abdominal pain, and anorexia [19]. Elderly patients with co-morbidities such as hypertension, diabetes, cardiovascular disease, and cerebrovascular disease are experiencing negative outcomes. Lymphopenia, prolonged

prothrombin time, elevated lactate dehydrogenase, and elevated D-dimer were found in SARS-CoV-2 patients who were hospitalized, which is similar to SARS-CoV-2 that caused an outbreak in 2003 in China and MERS-CoV infections. Chest imaging reveals some bilateral patchy shadows and ground-glass opacities. Acute respiratory distress syndrome, acute cardiac injury, arrhythmias, acute kidney injury, and shock, are all SARS-CoV-2 complications [22-24]. The virus spreads at a rate of 40% in hospitals. In hospitalized patients, the mortality rate is around 4% [22-24]. During that period (first wave of COVID-19), there was a dearth of holistic data to associate them with the various clinical pictures manifested by patients affected with the disease. Eventually, it becomes necessary to make a holistic analysis based on the existing health system vis-à-vis the clinical picture, co-morbidities and other vital parameters during the first wave, where the clinical infrastructure was unprepared for such an emergency.

In India, the total cases were 10.3 million, recovered 9.9 million, and 148.4 thousand death. Non-pharmaceutical measures (traveling restrictions, public transport closure, and workplace closing) taken for limiting the spread of this pandemic incur social and economic costs. Hence, vaccination is used as an alternative (after conducting clinical trials on the duration of infectivity, the safety of the vaccine, severity of resultant disease, and efficacy of infection reduction) to overcome the spread of infectious SARS-COV2 [25,26].

Therefore, the present study was designed to analyze the data on mortality and morbidity vis-à-vis in different states /geographical zones of India along with various age groups and co-morbidities of patients across the timeline of the year 2020.

Material And Methods

SARS-CoV-2 data was collected from online available sources (<https://api.covid19india.org>), co-morbidities and age group of SARS-CoV-2 patients data were taken from the website of National Centre for Disease Control, New Delhi. SARS-CoV-2 data for twelve months of the first wave was collected from January to December 2020 and also, classified into four different periods. Period I contained January to March; period II contained April to June, period III contained July to September, while period IV contained October to December of the year 2020. Further, data of SARS-CoV-2 was analyzed in different geographical zones of India as well as information based on different states of India cutting across co-morbidities and different age groups. The geo-epidemiological analysis was done using open source software, QGIS (Quantum GIS development Team, 2021).

Statistical analysis

Case Fatality Ratio

The CFR of SARS-CoV-2 was calculated by the given formula:

CFR%= number of deaths*100/ Confirmed cases

Percent of Distribution

Percent of distribution is a measure of how a variable (Such as total cases) is distributed among the component parts that make up the total. The calculation of percent distribution is relatively simple and is derived from division of each component part by total to get a percent of the distribution.

Least Squares Means Analysis

Least squares means analysis was used to estimate the variance components and parameter (LSMLMW, version-2.0) [27]. The following model was used to analyze the effect of various SARS-CoV-2 factors.

Model 1:

$$Y_{ij} = \mu + \text{Period}_i + \text{month}_j$$

Where Y_{ij} is the observation of i^{th} period (Jan-March, April-June, July-September, October-December 2020, j^{th} month)

E_{ij} = random residual error associated with observation with mean 0 and variance 1

μ = population of mean

Period_i = fixed effect of i^{th} period (Jan-March, April-June, July-September, October-December 2020, $i=1,2,3,4$)

Month_j = fixed effect of j^{th} period (Jan to Dec 2020, $j=1$ to 12)

Result

Epidemiology, different geographical zones of India

The data of case fatality ratio (CFR) was calculated in 36 Indian states/UTs. Punjab, Maharashtra, and Sikkim had highest 3.22, 2.44 and 2.20 case fatality percent in India as compared to other states of India (Fig.1). Similarly, the CFR in India's various zones were calculated in all the six geographical zones used in the current study viz., Central Zone, Eastern Zone, North Eastern Zone, Northern Zone, Southern Zone, and Western Zone. Western zone of India had highest CFR percentage as compared to other zones (Fig. 2). The CFR percent of the Central Zone, Eastern Zone, North Eastern Zone, Northern Zone, Southern Zone, and Western Zone were 1.42, 1.15, 0.60, 1.77, 0.94, and 2.33, respectively,

Case Fatality Ratio

Least squares means of case fatality ratio (CFR) rates were examined from January 2020 to December 31, 2020, spanning 337 days. Coefficient variation, R squared and average of CFR were 17.91, 0.884, and 1.908% respectively over the year. The CFR was calculated for every month of the year 2020. CFR% was at its highest between April-June (Fig. 3). ANOVA of month-wise data showed a significant effect ($p<0.01$) on CFR (Table 1). Furthermore, the least squares means were examined in different period of months and classified into 4 (four) distinct periods, namely period I (Jan to Mar 2020), period II (Apr to Jun 2020) period III (Jul to Sept 2020) and period IV (Oct to Dec 2020). CFR of the period was calculated as per the data of deceased, eventually 'zero' deceased or 'zero' CFR data were removed from the data analysis for least squares means. Co efficient variation, R squared and average of CFR in different period were 27.97, 0.768 and 1.908%, respectively. The least squares mean of CFR of different periods were presented in Table 2. The CFR was significantly ($P<0.01$) higher in period II comprising April to June of the year 2020. Also it was observed that there was significant difference in the CFRs while comparing month-wise data (Table 3). The CFR percentage was calculated for each state by period, as shown in Fig. 4. The CFR of Indian states was comparatively higher from April to June as compared to January to March, July to September, and October to December of the year 2020.

Percent of distribution of SARS-CoV-2 cases in India

In the current study, we estimated the case fatality ratio (CFR) percent in various geographical zones of the country. In India, the Percent distribution of CFR in Central, Eastern, North Eastern, Northern, Southern, and western were 17%, 14%, 7%, 22%, 12%, and 28%, respectively (Figure 5). Maharashtra had a significantly ($P<0.01$) higher percentage of SARS-CoV-2 positive cases than the other states. By December 2020, India had reported several million cases of SARS-CoV-2; with cases trending showed their percent distribution among different zones of India. The percent of distribution of SARS-CoV-2 positive patients were 7.0% in Central Zone, 8.0% in Eastern zone, 12.0% in North Eastern, 25.0% Northern, 24.0% in Southern zone and 24.0% in Western Zone (Fig. 6A). The highest positive SARS-CoV-2 cases were found in Northern zone (25%) followed by Western zone (24%) and the Southern zone (24%) of India. The percent of the distribution of mortality was highest in the Western zone (38%) followed by the Northern zone (29%) than others (Fig. 6B).

Effect of SARS-CoV-2 in various age groups

The trend of SARS-CoV-2 cases was estimated in a different age groups based on the limited data available from online. There were four age groups identified: <20 years (10-20 years), >21 years (21-50 years), >51 years (51-80 years), and >81 years (81-90 years). Incidence rate among different age groups was evaluated in the Indian population. Age-specific estimates ranged from 12.37% at ages <20 years to 0.09% at ages >81years. Age-specific SARS-CoV-2 incidence rate showed that the >21 years age group was most affected, while the old (>81 years) age group were the least affected in India (Fig. 7). Similarly, age-specific data showed an almost similar trend on the statista website ([India: COVID-19 cases by age group 2021 | Statista](#)).

Co-morbidities in SARS-CoV-2 patient in India

Co-morbidity data was classified into two different categories in the present analysis i.e. acute and chronic. The acute diseases included cardiac affections, Asthma, Bronchitis and Neuromuscular affections, while chronic disease included Hypertension, Diabetes, Liver disease, chronic renal diseases, Chronic obstructive pulmonary disease (COPD), Immuno-compromised conditions and Malignancy. The incidence percent of SARS-CoV-2 patient in acute and chronic disease exhibited 12.87 and 87.13 percent, respectively (Fig. 8). The chronic patients were significantly affected by SARS-CoV-2. From the all co morbidities, hypertension was the most reported followed by diabetes and liver disease. CFR for SARS-CoV-2 was shown to be increased with presence of co-morbidities [28-30] such as hypertension (CFR=6.0%), diabetes (CFR=7.3%), cardiovascular disease (CFR=10.5%), chronic respiratory disease (CFR= 6.3%) and neoplasm (5.6%).

SARS-CoV-2 trend over the period

SARS-CoV-2 trend was analyzed during January, 2020 to December 2020. We plotted the trend of SARS-CoV-2 cases and analyzed its impact across the timeline of 2020. However, the trend of SARS-CoV-2 confirmed cases were slightly higher after the month of May, 2020 than before. Similarly, SARS-CoV-2 patients had the same mortality trend as SARS-CoV-2 confirmed cases (Fig. 9 and Fig.10).

Discussion

Our findings are based on extensive surveillance and contact-tracing data collected from 36 Indian states/UTs. Present investigation was carried out in different states of India and moreover comparative analysis was conducted cutting across various age groups and co-morbidities with comparisons drawn from a previous study which conducted a similar analysis but only in two state viz., Andhra Pradesh and Tamil Nadu [1].

SARS-CoV-2 had been reported from 58 countries and territories around the world as of February 28, 2020, and one international conveyance, the Diamond Princess Cruise Ship [31]. As of December 29, 2020, there had been 4 million new SARS-CoV-2 cases and 72,000 new deaths were reported. This brings the cumulative numbers to over 79 million reported cases and over 1.7 million deaths globally since the start of the pandemic. [32]. This study shows that, in India a total number of 11.06 Million SARS-CoV-2 cases, total 0.16 Million death cases and 10.75 Million recovered cases have been reported. Out of the total cases, 2.13 Million cases mostly reported from Maharashtra, with 51,993 death cases. Similarly, the vast majority of cases (78,824 out of 83,704; 0.9416 - 95 percent CI 0.94 to 0.9433) and deaths (2,790 out of 2,859; 0.9758 95 percent CI 0.9696 to 0.9809) have been reported from mainland China [32]. The first U.S. cases of non-travel-related SARS-CoV-2 were confirmed on February 26 and 28, 2020, which clearly suggested the community transmission in U.S. by late February [33]. The aforesaid data is very important that elucidates the severity of the first pandemic wave of Covid-19 in states majorly affected. Hence, in the current study to get a clear picture, we analyzed all the 36 Indian states/UTs of the country for a comprehensive analysis on various parameters vis-à-vis SARS-CoV-2 infection.

Further, this study compared the CFR among the states that reported a large number of SARS-CoV-2 cases at 12 months of the pandemic, namely Jan 2020 to December 2020. As per our current analysis, it is reported that Maharashtra (2.441%), Punjab (3.215 %) and Sikkim (2.201 %) had highest CFR than other states of India. In a previous study, similar analysis has been conducted for the southern states viz., Tamil Nadu and Andhra Pradesh. The findings showed that CFR in all ages was 2.06 (1.98 to 2.14%), and CFR in various ages was also examined [1]. However the global picture for CFR as far as the first wave of Covid-19 was also studied in a specified period (12th -23rd of March, 2020) of the pandemic which showed higher CFR rates in Italy (6.22%), China (3.91%), Iran (3.62%), USA (3.07%) and Spain (2.12%) [34]. The case-fatality ratio was calculated in Turkey as well as European countries include the findings in Turkey, Italy, Spain, UK, Germany, France, Switzerland, Belgium, Netherland, Austria, Portugal and Norway were 1.85, 3.95, 4.01, 4.40, 0.41, 1.979, 1.019, 3.393, 3.496, 0.660, 2.249 and 0.531 percent, respectively [35].

To begin, assume that the number of deaths reported is equal to or very close to the actual value in the investigation, which may not be the case in many countries. The CFR was calculated for each period, namely period I (January to March 2020), period II (April to June 2020), period III (July to September 2020) and period IV (October to December 2020). Our finding also proved that the CFR was significantly increased due to lack of facilities in the initial days and thereafter the CFR trend decreased as facilities were getting improved. Ideally, the CFR should be low at first due to the incubation time and delay in developing complications from the infection, which was gradually increased until it reaches a plateau that will eventually become the ultimate CFR for the diseases. Although the number of cases started increasing in the period II and III, it is also to be noted that the number of samples tested were also proportionally higher during that period. With the first case reported in India during January 2020 to the start of the first wave, the number of labs equipped to test the samples were very less in number, but eventually the testing centers increased in India [36, 37]. The first wave in India occurred relatively for a longer period of time, and the reasons may be due to multiple lockdowns and restrictions.

In the present investigation, SARS-CoV-2 patients suffered with several co-morbidities which were further classified into two: Acute and Chronic. The incidence percent of acute and chronic were 12.87% and 87.13%, respectively. In India, it is important to know the mortality rates related to different age groups and underlying co-morbidities. Further the first wave saw a high risk for co-morbid patients affected with SARS-CoV-2, which is due to dearth of knowledge attitude and practices (KAP) for a relatively new disease with less proven treatment protocols. Hence, it is important to analyse the data of covid-19 in co-morbid patients, so that it could be a model for implementation in high-risk populations [38]. Also the lessons learnt from first wave of covid-19 is altogether different compared to the second wave, with the first wave having non-mutated vanilla strain that showed less positive cases but more CFR. The vanilla strain thus exacerbated the condition in patients with co-morbidities due to lack of KAP and clinical infrastructure.

Furthermore, elderly patients with underlying co-morbidities such as diabetes, hypertension, cerebrovascular disease and cardiovascular disease, are more likely to have negative outcomes

[39]. People of any age who have underlying medical conditions such as hypertension or diabetes have a worse prognosis [40]. Diabetic patients have higher morbidity and mortality rates, as well as more hospitalizations and intensive care unit (ICU) admissions [40]. Diabetic patients are more prone to the deleterious effects of the Covid-19 which is due to the fact that the inflammatory processes are elevated because of constant glucose recognition by C type lectin receptors and advance glycation end products (AGEs) that subsequently culminates into an uncontrollable proinflammatory response leading to 'cytokine storms' [41-42]. Similarly patients affected with hypertension are medicated with anti-hypertensive drugs that increase the expression of ACE2 receptors and release of proprotein convertase, which eventually aids the entry and multiplication of SARS-CoV-2 through these receptors, leading to high risk of infections and other clinical complications in them. Because in Italy alone the mortality associated with hypertension due to covid-19 is 73.8 per cent which is much alarming [43]. People with chronic obstructive pulmonary disease (COPD) or any other respiratory illness are more likely to develop severe SARS-CoV-2 illness [44]. SARS-CoV-2 infection is four times more likely in patients with COPD than in patients without COPD [44]. The elderly, particularly those in long-term care facilities and people of any age with serious underlying medical conditions are at a higher risk of contracting SARS-CoV-2, according to current research and clinical expertise [45]. The poorly orchestrated immune response coupled with severely elevated ACE2 receptor and furin expression exacerbates the lung condition leading to COPD, hypoxemia and mortality [43]. The population having chronic health conditions like cardiovascular, diabetes or lung disease is not only at a higher risk of developing severe illness, but also has higher chances of mortality if they become ill [46]. People with uncontrolled medical conditions such as hypertension, diabetes, lung, liver, and kidney disease, smokers, transplant recipients cancer patients on chemotherapy, and patients on long-term steroid therapy are more likely to contract SARS-CoV-2 [45]. Chronic obstructive pulmonary disease (COPD), among other co-morbidities, has been linked to poor disease progression. A four-fold increase in mortality in patients with pre-existing COPD who were diagnosed with SARS-CoV-2 has been found in a meta-analysis of multiple Chinese studies [44]. Similarly obesity with higher BMI predisposes to all the risks including hypertension, diabetes, hypothyroidism all of which are excellent playground for risk of Covid-19 related complications and mortality [47].

The influence of age on number of positive cases and disease severity has also been analysed in this study. The age criteria were classified into 4 different class intervals namely: <20 years, >21-50 years, >51-80 years and >80 years. Out of these, the incidence percentage was higher in >21-50 years class of interval followed by others. It is essential to know critical age groups which are most affected during pandemic situation, so that the effective preventive measures can be under taken for the high risk group. It is shown that the CFR of SARS-CoV-2 increase with ages [45,48] across different countries. Italian population (23%) was either 65 years of age or older [49]. This would explain the higher mortality rates of Italy compared to other countries. A similar study has been reported by Russell and his coworkers, for the detection of infection and CFR for SARS-CoV-2 in February 2020 using age-adjusted data (0-9 years, 10-19 years, 20-29 years, 30-39 years, 40-49 years, 50-59 years, 60-69 years, 70-79 years, 80-89 years) from the outbreak on the Diamond Princess cruise ship. The highest CFR of 14.8% was detected in the age

group between 80-89 years, and the contrasting findings in the children with mild symptoms and less positivity shows the age-specific affection during the first wave of the pandemic [50]. Similarly, the CFR rate of SARS-CoV-2 is reported to be higher in older adults than younger individuals i.e. 42% for those above 65 years and 65% below 65 years; and the association of chronic conditions and risk of dying across different age groups follows the same trend [51]. This study also reported that the global mortality cases stood at 2.68 million. The mortality cases were higher in United State (538K) followed by Brazil (282K) and India (157K). This depicts that India has the third highest mortality rate globally during the reported period. In India, Maharashtra recorded high mortality followed by Tamil Nadu and others. Similarly earlier studies reported that in TN, the crude death rate was 2.44 per lakh population; while the elderly (>75y) showed a mortality of 22.72 per cent. Also the study pin points that around 85% affected were reported to have one or more comorbidities including higher proportion of diabetes followed by hypertension and others [52]. Whereas in one study conducted in Maharashtra it was reported that the age group from 31-60 years were majorly affected due to Covid-19 during the first wave with the mean age being 45.8 years, while hypertension was the most common comorbidity followed by diabetes [53]. And the overall percentage of mortality due to SARS-CoV-2 cases was significantly higher in Western zone as compared to other zones. Wuhan had a higher mortality rate of 4.9 percent, while its' province Hubei had a lower mortality rate of 3.1%. In China, a significant proportion of deaths (26%) occurred in people over the age of 60. However, at this stage in the epidemic's evolution, temptations to make policy decisions based on mortality data should be avoided [54]. The age-specific SARS-CoV-2 death rate in Korea was higher among patients over 70 years of age with underlying diseases in their circulatory system such as arrhythmia, cerebral infarction, hypertension and myocardial infarction [55]. A recent study has proved the highest mortality rate per million inhabitants of SARS-CoV-2 cases in Belgium between April 11, 2020, and August 26, 2020 [56].

Similarly, two groups of countries emerged, one with a higher mortality rate (Spain, Italy, and the United Kingdom) and the other with a lower mortality rate (USA, Germany, China). This analysis showed that the mortality in Maharashtra was higher because of the poor adherence to the safety norms and due to the most visited, crowded place in India. Furthermore, countries like Iran begun to report or test cases only after higher fatalities [57]. It is also to be noted that higher CFR values were reported at the initial stages of the pandemic.

There lies a relational trend between higher CFR rates and advancement of the pandemic in the first wave of 2020. This could be largely due to the temporal adaptation of the virus in the population. This explains why period II showed the peak CFR, followed by a decreasing trend in the CFR.

Similarly, the first wave in India has non-immunization control, where vaccination was not practiced widely in the population. The pandemic dynamics of the first wave actually represents the vanilla strain (un-mutated) that created the pathogenesis without any herd immunity. This data can further be compared with the second wave CFR and disease pattern caused by a novel strain (delta and delta plus variant) in the future. The comparison of these data on CFR vis-à-vis the immunization that was started

at various stages of second wave could provide a meaningful conclusion on the pandemic dynamics and herd immunity.

Conclusion

SARS-CoV-2 is an infectious disease that poses a significant threat to global health and will most likely persist until an effective vaccine is developed or herd immunity is achieved. India was the third highest country in respect to mortality cases. The overall CFR rate was higher during April to June, 2020 period as compared to other periods. And the overall percentage of mortality due to SARS-CoV-2 cases was significantly higher in Western zone as compared to other zones. Many factors played a key role in the transmission dynamics, and one reason may be due to imposing lockdowns that led to large scale migration of peoples from western India to other parts, precipitating higher spread and mortality. Besides, the western zone (cities like Mumbai, Ahmedabad etc.) is an important business hub and international gateway for Indian sub-continent. Hypertension was the most commonly reported co-morbidity, followed by diabetes and liver disease. In India, it is important to know the mortality rates related to different age groups and underlying co-morbidities. As a result, this study could be implemented for high-risk populations which are predisposed toward viral pathogenesis and also effectively utilize the limited resources that our nation's healthcare system possesses. This study may be validated using additional data and associated with other factors. Also, this study can be useful in containing and effectively devising the strategies for future pandemics and outbreaks. This complete information will provide researchers, clinicians, and other health care professionals to think rationally in recognizing the gaps which can be fulfilled by proper management and effective use of the already existing system that we have till newer and effective medications are not available. Thus the current epidemiological analysis based on age-groups, co-morbid factors and geographical zones of India presented their critical interrelationships that influenced the morbidity and mortality during the first pandemic wave of Covid-19 (2020).

Declarations

Conflict of interest

The authors declared no conflict of interest.

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Disclaimers

The views expressed in the submitted articles are own and not an official position of the Institution of Funder.

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Tables

Table 1. ANOVA of CFR in different months of the year 2020

Source	D.F	Sum of Squares	Mean Squares	F	P
Month	11	288.105	26.191	224.292	0.0000
					P<0.001

Month, January to December 2020; D.F, degree of freedom; F, F value; P, probability

Table 2. Least Squares means (LSM) of CFR in different period

Period	Month	Year	Days	LSM
Period 1	Jan-March	2020	62	0.622±0.605
Period 2	April-June	2020	91	3.094±0.499
Period 3	July-September	2020	92	2.045±0.497
Period 4	October-December	2020	92	1.464±0.497

Table 3. ANOVA of Case Fatality Ratio (CFR) in different period

Source	D.F	Sum of Squares	Mean Squares	F	Prob
Period	3	250.421	83.473	367.509	0.0000
					P<0.001

Period , January to December, April to June, July to September and October to December 2020; D.F, degree of freedom; F, F value; P, probability

Figures

Figure 1

CFR percentage in different states of India

Figure 2

CFR percentage in different zones of India

Figure 3

Least Squares Mean (LSM) of CFR% in various months of 2020.

Figure 4

CFR percentage in Period v/s different zones of India

Figure 5

Percent of Distribution of Case Fatality Ratio of SARS-CoV-2 patients in different zones of India

Figure 6

a. Percent of distribution of SARS-CoV-2 cases in different zones in India

b. Percent of distribution of SARS-CoV-2 mortality % in different zones in India

Figure 7

Histogram of SARS-CoV-2 cases in different age group in India

Figure 8

Percentage of distribution of different co-morbidities in SARS-CoV-2 patients in India

Figure 9

Trend of SARS-CoV-2 confirmed cases in different month of 2020

Figure 10

Trend of SARS-CoV-2 deceased in different month of 2020