

Prevalence and cross states comparison of case fatality rate and recovery rate of COVID 19/SARS-COV-2 in India

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ABSTRACT

Background and aim: CFR and RR are important indicator of disease pandemic. As of now no data is available about cross-states analysis of these. We aimed to evaluate CFR and RR of COVID-19 across majorly affected States in India. **Method:** We observed and compared data of confirmed COVID-19 cases, number of deaths, number of recovered/discharged cases and calculated CFR and RR across majorly affected States/UT in India from official database of Government of India, State Government official bulletin, accurate database worldometer. **Results:** The data showed that Gujarat, Madhya Pradesh, West Bengal reported highest CFR on 8th April, 22nd April, 6th May, 1st June 2020 (95% CI 4.91 – 6.99). Kerala showed encouraging recovery rates 24.32%, 70.31%, 93.24%, 45.81% on 8th and 22nd April, 6th May and 1st June 2020 respectively. India had an average estimated weekly Recovery rate of newly discharged/recovered cases was 32.68% from 19th March to 1st June 2020. (95% CI 20- 45.4%). (The Recovery rate across India was 80.83% as on 22nd September 2020.). **Conclusion :** The CFR of a disease varies greatly in different regions of the same Country and is influenced by numerous factors such as health control policies, medical standards, and detection efficiency and protocols apart from number of screening tests done. This comparison discusses need of evaluating policies with optimal reporting of medical history of affected persons when comparing COVID-19 case and fatality rates in different regions of the Country.

Keywords: Case fatality rate (CFR), COVID-19, India, recovery rate (RR), prevalence, SARS-COV-2

Introduction

In late December 2019, a few cases of atypical pneumonia of unknown causes with symptoms of fever, cough, difficulty in

breathing, headache, diarrhea were detected in Wuhan city of Hubei Province of China, which was primarily seen in individuals who had visited a live seafood and wet market in Wuhan.^[1] This seventh variant of Coronavirus has been named “SARS-CoV-2” by the International Committee on Taxonomy of Viruses and the illness caused by it has been named as “COVID-19” by WHO.^[2] This novel coronavirus is an unsegmented positive sense RNA virus which falls into genus betacoronavirus

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belonging to the subgenus Sarbecovirus of Coronaviridae family with 26 to 32 kilobasepairs in length containing an envelope and icosahedral capsid.^[3] The mode of viral transmission is mostly via the spread of respiratory droplets and size of viral particles measures approximately 0.125 micron, which can travel distances of more than 2 meters and contaminating the surfaces on which they settle down.^[4] Studies have reported vertical transmission of covid19 in infants from mother.^[5] The SARS CoV 2 is found in body fluids such as nasopharyngeal swabs, sputum, other lower respiratory tract secretions, saliva, blood and feces, urine.^[6] The severity of disease progression is widely influenced by the presence of comorbidities like Diabetes Mellitus, hypertension, COPD, etc., Multi organ systems (i.e. Respiratory system, cardiovascular system, renal system, gastrointestinal system, nervous system, coagulation cascade, immune response) which may be involved as the disease progresses to severe form and can ultimately culminate into death by causing Acute respiratory distress syndrome or heart failure or

renal failure or shock and/or multi-organ failure.^[7,8] The current gold standard test for screening a suspected case is real-time reverse transcriptase polymerase chain reaction (rRT-PCR) of respiratory secretions because it provides the highest yield. As of now there is no specific COVID19 antiviral treatment for all cases with limited usage of Remdesivir allowed for severe cases only. Currently available optimized supportive care is the mainstay of treatment namely proper nutrition, symptomatic treatment, acid base balance, monitoring of vitals, monitoring the markers (Neutrophil: lymphocyte ratio, D-dimer, CRP) and respiratory support. Number of trials are going on for the drugs like Hydroxychloroquine and Chloroquine, Favipiravir, Remdesivir, Lopinavir/Ritonavir, Nitazoxanide, Ivermectin as a possible treatment in mild-moderate to severely affected COVID-19 cases.^[9] The current outbreak of coronavirus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), continues to spread, and as of 22nd September 2020 it has reached to 215 countries

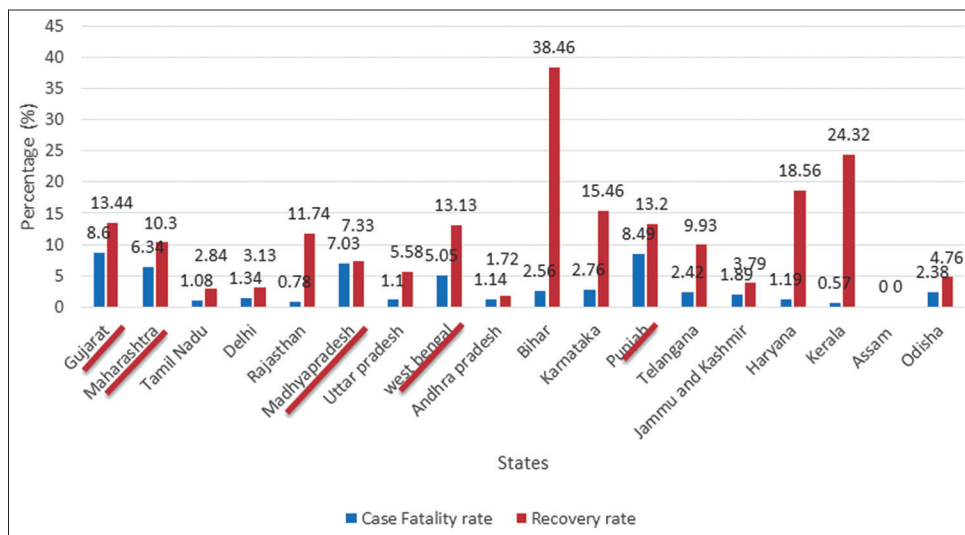


Figure 1: CFR AND RR ON 8TH APRIL 2020 (Underlined States shows highest CFR)

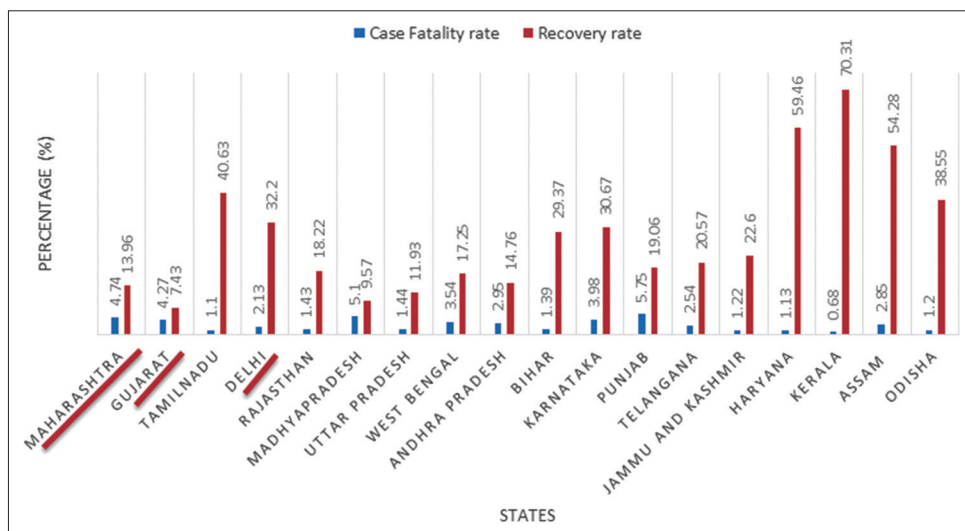


Figure 2: CFR VS RR ON 22ND APRIL (Underlined states shows highest outbreak and positive COVID-19 Cases)

with total of 31,452,223 cases and 968,239 deaths. In India, Total confirmed COVID-19 cases have reached to 55,60,105 and total of 88,965 deaths as on 22nd September 2020, which account for 9.18% of total deaths around the globe.^[10]

As of 21st September 2020, Calculated Case fatality rate of India has reduced to 1.59% as compared to 3.38% in April.^[11] It is important to measure case fatality and recovery rate over period of time to check disease severity and to reduce the severity of risk in disease pandemic from a public health perspective. In current study, we observed Prevalence, case fatality rate and recovery rate across all affected States/UT in India.

Materials and Method

Sources of data

We collected data of daily number of COVID-19 confirmed cases and daily number of COVID-19 deaths published by official database of “Government of India” and “State Government”, accurate database- “Worldometer, “Our world

in data” from 19th March 2020 to 1st June 2020.^[12-28] Data from those States/UT had small number of cases were not included in our estimation of CFR (Case Fatality Rate) and Recovery rate.

Atomic data was recorded according to States/UT and “CFR and RR” were compared for States/UT with number of confirmed deaths >10. Due to rapid increase in data, we extracted and compared CFR and RR from date of 8th April 2020, 22nd April 2020, 6th May 2020, 1st June 2020 of all majorly affected States/UT. We observed CFR and RR of weekly confirmed newly diseased and recovered/discharged COVID-19 cases in India from 19th March to 1st June 2020.

We calculated CFR (%) and RR (%) by using f As per mentioned.

Case fatality rate (%) (SARS-COV-2):

$$\frac{\text{Total Number of Confirmed deaths due to SARS-COV-2}}{\text{Total Number of Confirmed cases of SARS-COV-2}} \times 100$$

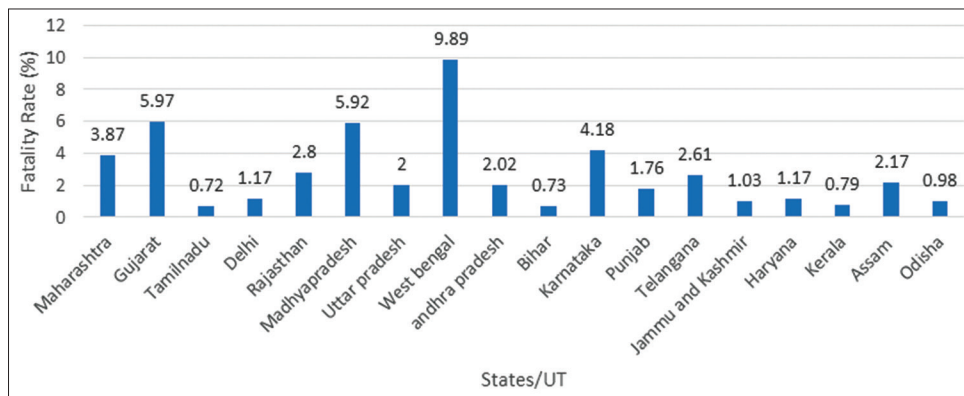


Figure 3: Fatality rate on 6th May 2020

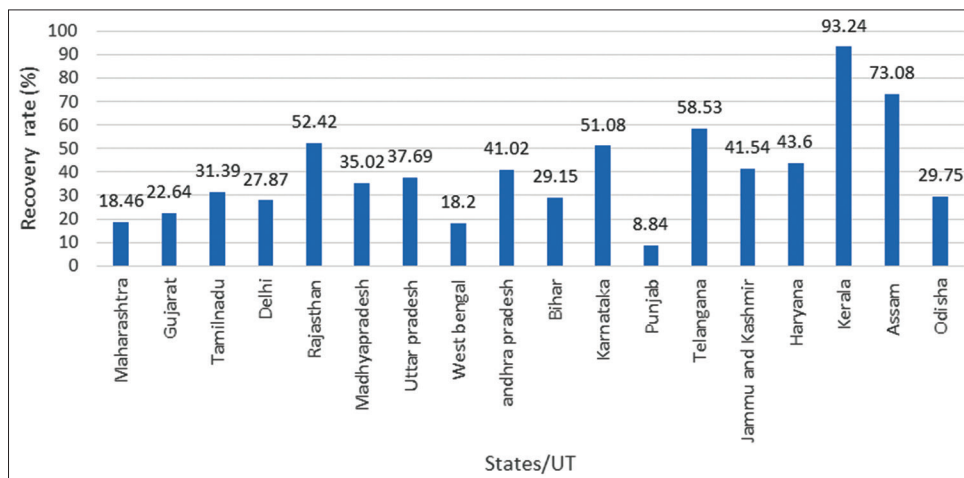


Figure 4: Recovery rate on 6th May 2020

Recovery rate (%) (SARS-COV-2):

$$\frac{\text{Total Number of recovered cases from SARS – COV – 2}}{\text{Total Number of Confirmed cases of SARS – COV – 2}} \times 100$$

We used SPSS Software version 20 for the data analysis. This study was performed using public database available and as it was observational data analysis without any intervention hence, Ethical permission was waived.

Results

Total number of confirmed SARS-COV-2 cases were highest in Maharashtra followed by Tamil Nadu, Delhi and Gujarat as on 1st June 2020. Maharashtra remained most affected State since outbreak in India. Right from early in the outbreak, Maharashtra had highest number of confirmed COVID-19 cases followed by Tamil Nadu and Delhi as on 8th April 2020 [Figure 1]. The data showed that Gujarat,

Madhya Pradesh, West Bengal reported highest CFR on 8th April, 22nd April [Figure 2], 6th May, 1st June 2020, respectively (95% CI 4.91-6.99). We observed that CFR of Uttar Pradesh had continuously increased from 1.1% on 8th April to 2.65% on 1st June 2020 (95% CI 1.13-2.46).

As of 1st June, Most of the States recorded CFR < 3% except Gujarat, Madhya Pradesh, West Bengal, and Maharashtra, Telangana (95% CI 0.90-1.78%).

On 6th May West Bengal had the highest death rate (9.89%) [Figure 3]. An average calculated CFR of Kerala was 0.71% (95% CI: 0.59-0.82%), which was the lowest amongst all other States.

Kerala showed encouraging recovery rate in the first wave with 24.32%, 70.31%, 93.24%, 45.81% on 8th and 22nd April, 6th May

Table 1: The comparison of case fatality rate (CFR) and recovery rate (RR) between different States/UT (n=18) (Only States/UT with total cases over 1,000 cases on 1st June 2020 depicted.)

States/UT	Total Cases (n)	Total Deaths (n)	Total Recovered (n)	Active Cases (n)	Case Fatality rate (%)	Recovery rate (%)
Maharashtra	70013	2361	30108	37544	3.37	43.00
Tamil Nadu	23495	187	13170	10138	0.79	56.05
Delhi	20834	523	8746	11565	2.51	41.97
Gujarat	17217	1063	10780	5374	6.17	62.61
Rajasthan	9100	199	6213	2688	2.18	68.27
Uttar Pradesh	8361	222	5030	3109	2.65	60.16
Madhya Pradesh	8283	359	5003	2921	4.33	60.40
West Bengal	5772	325	2306	3141	5.63	39.95
Bihar	3945	23	1741	2181	0.58	44.13
Karnataka	3408	52	1328	2028	1.52	38.96
Andhra Pradesh	3676	64	2374	1238	1.74	64.58
Telangana	2792	88	1491	1213	3.15	53.40
Jammu and Kashmir	2601	31	946	1624	1.19	36.37
Haryana	2356	21	1054	1281	0.89	44.73
Punjab	2301	44	2000	257	1.91	86.91
Odisha	2104	9	1245	850	0.42	59.17
Assam	1486	3	285	1198	0.20	19.17
Kerala	1327	11	608	708	0.82	45.81

Table 2: Weekly CFR and RR of Newly confirmed diseased and Recovered/Discharged COVID-19 Cases in India

Date	Weekly Confirmed New Covid 19 cases (n)	Weekly discharged/ Recovered New COVID 19 Cases (n)	Weekly Confirmed New COVID 19 Death (n)	Weekly Fatality Rate of New Confirmed Death (%)	Weekly Recovery Rate of Newly discharged/ recovered cases (%)
19 th -26 th March 2020	532	12	30	5.63	2.25
26 th March-02 nd April 2020	1815	141	53	2.92	7.76
2 nd -09 th April 2020	4183	444	158	3.77	10.61
9 th -16 th April 2020	6704	1132	222	3.31	16.88
16 th -23 rd April 2020	9608	3245	273	2.84	33.77
23 rd -30 th April 2020	11826	4047	432	3.65	34.22
30 th April -07 th May 2020	21485	7717	735	3.42	35.91
7 th -14 th May 2020	25696	11235	759	2.95	43.72
14 th -21 st May 2020	36176	20542	935	2.58	56.78
21 st -27 th May 2020	39881	19172	951	2.38	48.07
27 th May-01 st June 2020	40268	28029	1073	2.66	69.60

and 1st June 2020, respectively [Figures 1,2,4]. Although the SARS-COV-2 outbreak led to highest Case Fatality rate in Gujarat in the first wave with immense improvement as the time went by, the recovery rate (RR) was always acceptable with 62.61% as on 1st June 2020 [Table 1].

India had an average estimated Weekly Recovery rate of newly discharged/recovered cases of 32.68% from 19th March to 1st June 2020. (95% CI 20-45.4%). Overall, weekly Recovery rate increased from 2.25% on 19th-26th March 2020 to 69.60% on 27th May-01st June 2020. Average weekly CFR of newly confirmed COVID-19 death for this time duration was found to be 3.28% (95% CI 2.75-3.81%) [Table 2].

Discussion

This study aimed to observe the patterns of CFR and RR of different States/UT during an ongoing COVID-19 pandemic using recent State-level data.

In early of COVID-19 outbreak in India, testing capacity was in its nascent state. This attributed to high Case fatality of >3% during April 2020. Subsequently, Case fatality rate has decreased due to the improved efficiency of detection thus increasing the denominator in calculation, greater awareness of management strategies, better accessibility to COVID-19 care facilities and probably attenuated virulence yielding a CFR of 2.82% in India as on 1st June 2020. (MEAN: 2.83%, SD: 0.52, 95% CI: 2.72-2.94%).^[29]

Incidence of COVID-19 varies from State to State and depends on factors such as infectivity, local factors like public health management strategies like contact tracing, population density and demographics, number of samples tested and timely implementation of mitigation strategies.^[1] Maharashtra, Gujarat, Tamil Nadu and Delhi were majorly affected States among others in India in this first phase. Case fatality rate had remained high in Gujarat, Madhya Pradesh and West Bengal from 19th April to 1st June. West Bengal is worst affected State with an average CFR of 6.02%. Uttar Pradesh had an increasing trend in CFR with an estimate of 2.62% (95% CI 1.13-2.46).

A major challenge with accurate measurement of CFR is the total number of confirmed COVID-19 cases. Asymptomatic cases of COVID-19 could be left out of the denominator, which leads to overestimation of CFR. For example, as of 16th May Gujarat has tested 10,548 samples with 1057 Confirmed new COVID-19 cases and CFR hence decreased to 5.6% from “6.1% on 15th May”. Prior to 16th May, Gujarat had tested at an estimated average of 4356 samples. (95% CI 3680-4830), whereas, after 16th May Gujarat started testing at an average of 4901 samples (95% CI: 4360-5440), with reported average of 350 confirmed cases per day.

India is amongst the worst affected country in the world as on 21st September 2020. Number of cases have been increasing with

increase in outpatient clinic as well as emergency department. Primary care physician can play a crucial role in COVID-19 response by triaging mild from severe disease thus differentiating patients with COVID-19 symptoms who could be managed without hospitalization by making an early diagnosis and providing primary care management thus may reduce in hospital burden, and unnecessary burden on indoor hospital services.

In summary, The CFR of the COVID-19 disease varies greatly in different regions of our Country and is affected by numerous factors such as underreported deaths and confirmed cases due to COVID-19 which are important indicators of disease characteristics and are vital in forming strategies at national and state level from public health perspectives. There is paucity of published data on Case Fatality Rate over period of time of various States/UT in India.

This study shows that by comparing inter-state CFR and RR the reorientation of testing policies has yielded higher total cases but with higher reporting denominator of affected person, the COVID-19 case fatality rates and Recovery rates in different regions of the Country has changed drastically over a period of time. This shall and has helped Healthcare leaders and Policy makers to form strategies to orient strategy towards bringing down case Fatality rate and Recovery rate of their region over a period of time thus improving overall health care scenario.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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