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## Original article

## COVID-19 pandemic and its average recovery time in Indian states

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## ABSTRACT

**Background:** Many studies have been carried out in modelling COVID-19 pandemic. However, region-wise average duration of recovery from COVID-19 has not been attempted; hence, an effort has been made to estimate state-wise recovery duration of India's COVID-19 patients. Determining the recovery time in each region is intended to assist healthcare professionals in providing better care and planning of logistics.

**Methods:** This study used database provided by Kaggle, which takes data from the Ministry of Health & Family Welfare. The simple Linear Regression model between incidence, prevalence, and duration was used to assess the duration of COVID-19 disease in various Indian states.

**Results:** The fitted model suits ideal for most of the states, except for some union territories and northeastern states. The average time to recover from disease was ranging from 5 to 36 days in Indian states/union territories except for Madhya Pradesh. Tamil Nadu has an average recovery time of 7 days with an value of 0.96, followed by Odisha, Karnataka, West Bengal, Kerala and Chhattisgarh and the average recovery duration was estimated as 7, 13, 17, 11, 14 and 12 days respectively.

**Conclusion:** The average recovery from COVID-19 was ten or less days in twenty percentage of states, whereas in forty-four percentage of states/union territories had an average recovery duration between ten to twenty days. However, around twentyfour percentage of states/union territory recovered between twenty to thirty days. In the rest of Indian states/union territories, the average duration of recovery was more than thirty days.

## 1. Introduction

The COVID-19 was a human tragedy infecting around 99.86 million individuals, resulting in around 2.1 million deaths by January 27, 2021. India recorded the first case of COVID-19 on January 30, 2020, and cases increased steadily to hit about 10.68 million cases and 153,724 deaths by January 27, 2021. Factors like the stage of disease at admission, patient's care and so forth sway the average COVID recovery duration explicitly. The Ministry of Health has released home isolation guidelines (April 7, 2020) for very mild and pre-symptomatic COVID-19 cases to remain at home quarantine.<sup>1</sup> Furthermore, the Government and hospital's policy in admitting patients are expected to significantly influence the actual recovery duration.<sup>7</sup> According to the World Health Organisation, an act of violence related to the COVID-19 pandemic takes place due to the social stigma and discriminatory behaviours against anyone perceived to have been in contact with the virus or affected by the disease. A similar fear in the community of getting admitted to a hospital and the healthcare workers' behaviour towards the COVID-19 patients also act as possible factors in affecting the average duration. As per the

reports by The Lancet (2020), some Indian states had not recorded any suspected case, or probable COVID-19 deaths may also alter the recovery duration of COVID cases.<sup>14</sup> The improper follow-ups of patients, sensitivity and specificity of the diagnostic tests are other possible factors affecting the average duration of disease.

The incubation period of COVID-19 has been reported as 14 days with a 95% confidence interval of 8–16 days.<sup>2</sup> If the incidence of a disease is very high, and the recovery time of the disease is also high, then the prevalence of the disease increases, which puts extra health, economic and social burden on the country's economy.<sup>12</sup> A piolet study conducted in India by Barman MP et al. (2020) on 221 COVID patients found that the probability of recovery from COVID-19 in 10 days is minimal; only 4% of the patients recovered in 10 days, and about 40% of the patients in 20 days. In 25 days of treatment, about 50% of the patients were discharged from the hospital. The study also concluded that the average recovery duration of COVID-19 patients in India had been found 25 days, with a 95% confidence interval of 16 days–34 days.<sup>9</sup> The average duration of COVID-19 is generally computed from hospital-based studies rather than from the community. Therefore, the

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present study has been planned to determine the average duration of COVID-19 patients from the community.

Many studies have been carried out to model the COVID-19 pandemic in India; however, there are only a few peer-reviewed articles on the recovery period of patients with COVID-19 where the period of a patient in disease has been assessed. Knowledge of the average duration of recovery time helps the Government to prepare effective measures for the healthcare system.<sup>9</sup> Determining the average duration of recovery time from COVID-19 in each region is expected to help the health professionals for better treatment and arrangement of logistics. Hence, an effort has been made to estimate the recovery duration of India's COVID-19 patients for each state which intern expected to establish a social and economic initiative to help COVID-19 patients during the disease period and thereafter.

**2. Methods & materials**

This study has used an open-source database provided by Kaggle, which takes the data from the Ministry of Health & Family Welfare, Government of India. A statistical model was developed to study the duration of patients in COVID-19 for each state of India. Data was taken directly from the first day of reporting for each state. During data cleaning and checking for duplicates, Telangana was removed from the analysis due to the inappropriateness of the reported data. The complete data of Tripura was also not available in the dataset.

The standard relationship between Incidence & Prevalence<sup>10,11,13</sup>:

$$\text{Prevalence} = \text{Incidence} * \text{Duration} \tag{1}$$

$$\text{Duration} = \frac{\text{Prevalence}}{\text{Incidence}} = \frac{\frac{\text{Active Cases}}{\text{Exposed population}}}{\frac{\text{New Cases}}{\text{Exposed population}}} \tag{2}$$

$$\text{Duration of disease} = \frac{\text{Active Cases of COVID - 19}}{\text{New Cases of COVID - 19}} \tag{3}$$

The models to estimate the Active Cases on  $i^{\text{th}}$  day was:

$$\hat{Y} = Ae^{a_1t + a_2t^2} \text{ and } \hat{Y} = Be^{b_1t + b_2t^2 + b_3t^3} \tag{4}$$

where,  $A = e^{a_0}$ ,  $B = e^{b_0}$  and  $a_0, a_1, a_2,$  and  $b_0, b_1, b_2$  and  $b_3$  are the Regression Coefficients.

95% Confidence Interval (CI) of predicted active cases on each day was computed as:

$$95\% \text{ CI} = e^{\text{Predicted Number of log(Active Cases)} \pm 1.96 * \text{SE}(\text{Predicted number of log(Active Cases)})} \tag{5}$$

$$95\% \text{ CI} = e^{Ae^{a_1t + a_2t^2} \pm 1.96 * \text{sqrt}\left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d}\right)} \tag{6}$$

where, S.E. for Quadratic model was computed as:

$$\text{S.E.}(\text{Predicted Number of Active Cases at } x_i \text{ day}) = \text{S.D.} \sqrt{\frac{1}{n} + \frac{(x_i - \bar{x})^2}{\sum (x_i - \bar{x})^2} + \frac{(x_i^2 - \bar{x}^2)^2}{\sum (x_i^2 - \bar{x}^2)^2}} \tag{7}$$

where S.D. is the Standard Deviation of  $y$ , which is calculated as:

$$\text{S.D.} = \sqrt{\frac{\sum (y - \hat{y})^2}{n - 1}} \tag{8}$$

where,  $y$  is the log transformation of seven days moving average of Total Active Cases,  $\hat{y}$  is the predicted number of the Active Cases, and 'n' is the number of days Active Cases were observed. The coefficient of determination ( $R^2$ ) is evaluated to assess the good fit of the model. The entire

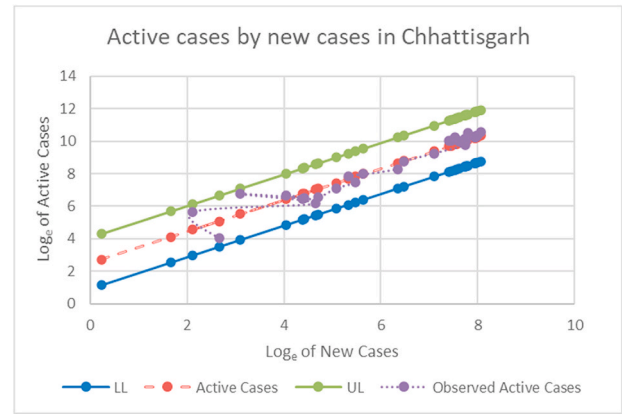


Fig. 1. Active cases by new cases in Chhattisgarh

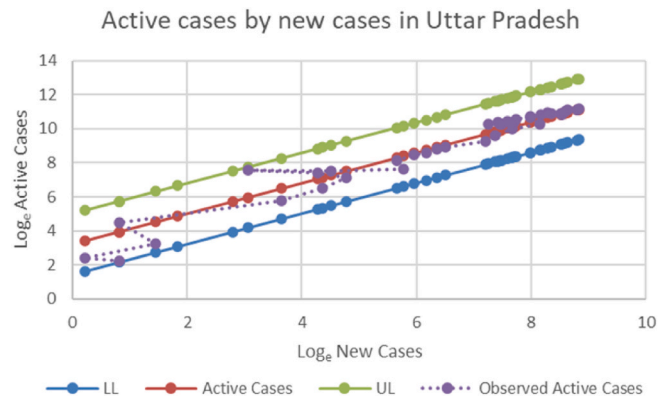


Fig. 2. Active cases by new cases in Uttar Pradesh

discussion and result section will be based on six regions in accordance with The National Family Health Survey (NFHS) division.

**3. Results**

The prediction model was performed with respect to each state. Histogram for the standardized residual of the fitted regression model with log of active cases as dependent variable looked plausible where residuals approximated a normal distribution with no weird shapes or low values or extremely high values. Normal P-P plot demonstrated that the distribution of standardized residual deviates only moderately from a distribution that was classically bell-shaped. The scatter plot indicated that the distribution of residuals across the expected values was equal,

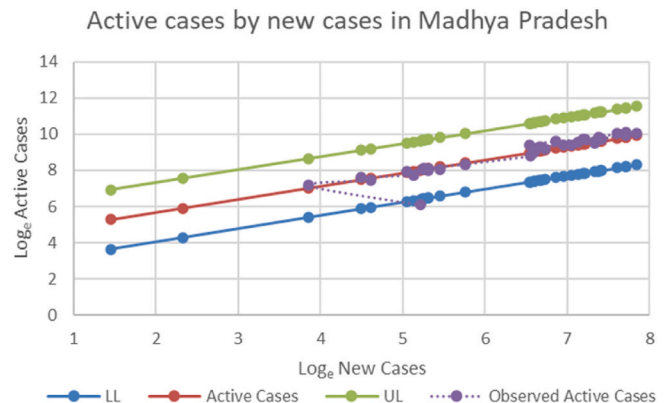
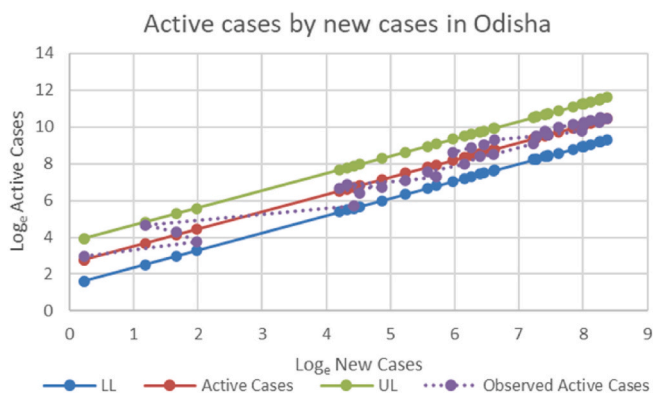


Fig. 3. Active cases by new cases in Madhya Pradesh

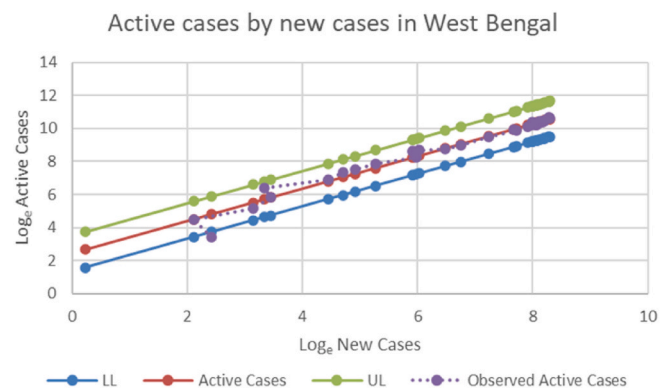
**Table 1**  
Average recovery duration in days of COVID-19 patients in Indian states.

Region	State	R Square	F Statistic	B	b <sub>1</sub>	Average Duration (Days)	Lower Limit	Upper limit
Central	Chhattisgarh	0.941	4184.161	2.511	0.969	12.319	10.406	14.583
	Uttar Pradesh	0.883	2101.031	3.222	0.896	25.073	19.353	32.484
	Madhya Pradesh	0.761	835.595	4.225	0.726	68.360	50.348	92.814
East	Odisha	0.956	5823.254	2.562	0.940	12.958	11.168	15.035
	West Bengal	0.948	4789.756	2.441	0.980	11.482	9.497	13.881
	Bihar	0.923	3143.014	2.808	0.914	16.569	13.637	20.132
North	Jharkhand	0.871	1695.179	3.204	0.867	24.631	19.806	30.632
	Rajasthan	0.937	4179.219	2.650	0.952	14.157	11.801	16.984
	Jammu and Kashmir	0.932	3737.557	2.604	1.007	13.518	11.337	16.118
	Himachal Pradesh	0.915	2802.949	2.914	0.898	18.424	15.930	21.309
	Uttarakhand	0.901	2441.060	2.986	0.899	19.815	16.625	23.616
	Haryana	0.891	2274.574	3.440	0.806	31.181	25.567	38.029
	Delhi	0.870	1884.836	3.123	0.892	22.704	17.157	30.043
	Punjab	0.802	1112.494	3.609	0.811	36.918	28.370	48.042
	Chandigarh	0.789	986.271	3.457	0.740	31.725	26.839	37.502
	Ladakh	0.750	829.768	3.337	0.806	28.140	23.760	33.327
Northeast	Manipur	0.936	3776.925	1.598	1.224	4.943	4.213	5.800
	Arunachal Pradesh	0.863	1568.943	1.838	1.193	6.283	5.073	7.783
	Meghalaya	0.856	1414.242	3.140	0.878	23.105	19.702	27.097
	Assam	0.850	1423.111	3.540	0.842	34.464	26.671	44.534
	Nagaland	0.671	417.574	2.869	0.980	17.625	12.427	24.999
	Sikkim	0.669	401.005	3.353	0.754	28.580	22.841	35.760
	Mizoram	0.588	368.827	2.743	0.955	15.540	12.208	19.782
South	Tamil Nadu	0.967	8117.149	1.911	1.061	6.758	5.710	7.999
	Karnataka	0.950	5227.651	2.804	0.968	16.514	13.753	19.829
	Kerala	0.946	5514.687	2.629	0.966	13.861	11.882	16.170
	Andhra Pradesh	0.898	2381.962	2.940	0.926	18.909	14.610	24.472
	Telangana	0.840	2767.206	2.936	0.935	18.836	15.647	22.675
	Puducherry	0.826	1257.392	3.133	0.878	22.945	18.743	28.089
	Andaman and Nicobar Islands	0.804	1052.745	1.967	1.139	7.150	5.993	8.530
West	Gujarat	0.920	3043.271	2.251	1.056	9.494	7.450	12.098
	Goa	0.884	1949.522	2.036	1.064	7.664	6.167	9.524
	Maharashtra	0.864	1746.580	3.102	0.965	22.240	15.389	32.142
	Dadra, Nagar Haveli, Daman and Diu	0.732	593.038	2.688	0.835	14.699	12.449	17.355

p value is < 0.05 for all states, B = unstandardized beta coefficient, b<sub>1</sub> = slope of the regression line.



**Fig. 4.** Active cases by new cases in Odisha



**Fig. 5.** Active cases by new cases in West Bengal

suggesting that the model was homoscedastic. Statistical models have been constructed for the duration of patients under COVID-19 across all states in India. The model fitted well for all the regions. Log of new cases and log of observed cases were plotted against the log of predicted active cases with the corresponding upper and lower confidence limits.

### 3.1. Central region

Log of new cases was plotted against log of predicted active cases with the corresponding upper and lower confidence limits and was found linear for central states of India comprising the states Chhattisgarh, Uttar Pradesh, and Madhya Pradesh (Figs. 1–3). Even though the model fit was enough to predict the average duration of COVID-19, there was a significant difference in the average duration between central

states. Madhya Pradesh ( $R^2 = 0.76$ ) has an average duration as high as 68 days (CI = 50.348–92.814), whereas Uttar Pradesh ( $R^2 = 0.88$ ) with 25 days (CI = 19.35–32.48) and Chhattisgarh ( $R^2 = 0.94$ ) with 12 days (CI = 10.40–14.58) (Table 1).

### 3.2. Eastern region

Log of new cases against log of predicted active cases was plotted for Odisha, West Bengal, Bihar, and Jharkhand (Figs. 4–7). The average duration in days where a patient remains infected is identified as 11 days (CI = 9.49–13.88) in the state of West Bengal ( $R^2 = 0.94$ ), while the average days increased to 25 days (CI = 19.80–30.63) in Jharkhand ( $R^2 = 0.87$ ). Duration of disease in Odisha ( $R^2 = 0.95$ ) and Bihar ( $R^2 = 0.92$ ) are 13 days (CI = 11.16–15.03) and 17 days (CI = 13.63–20.13)

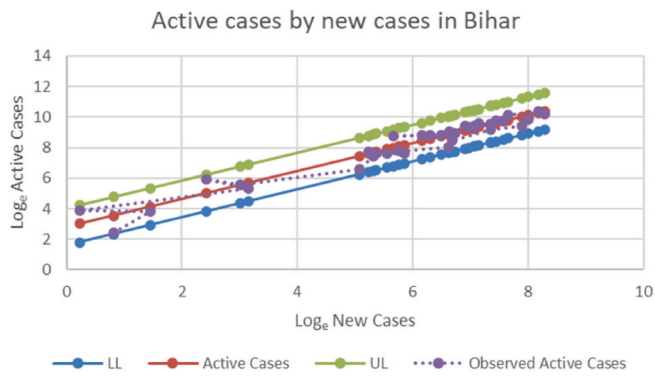


Fig. 6. Active cases by new cases in Bihar

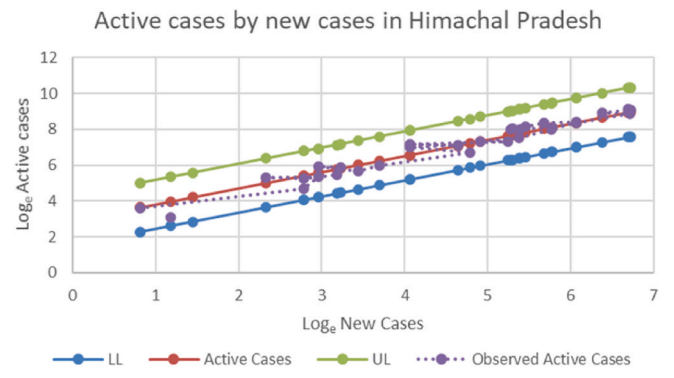


Fig. 10. Active cases by new cases in Himachal Pradesh

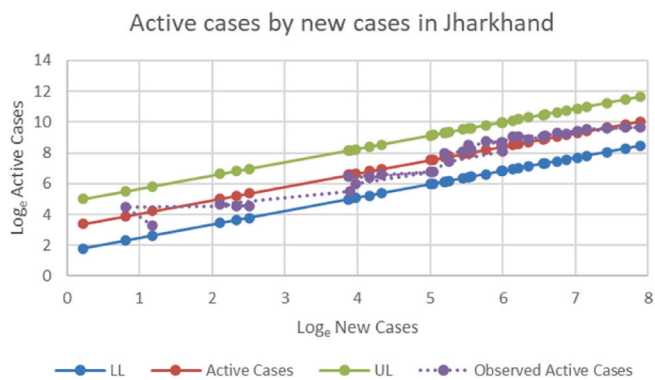


Fig. 7. Active cases by new cases in Jharkhand

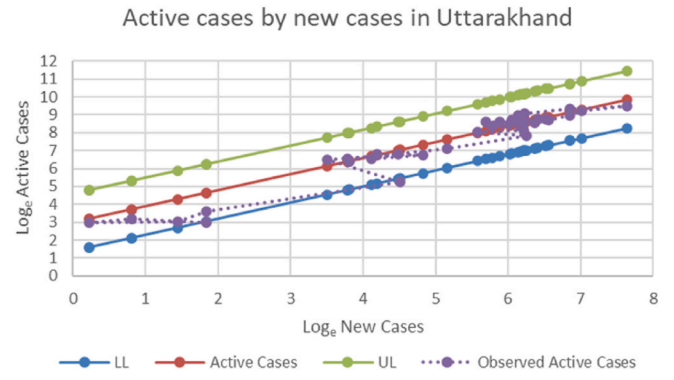


Fig. 11. Active cases by new cases in Uttarakhand

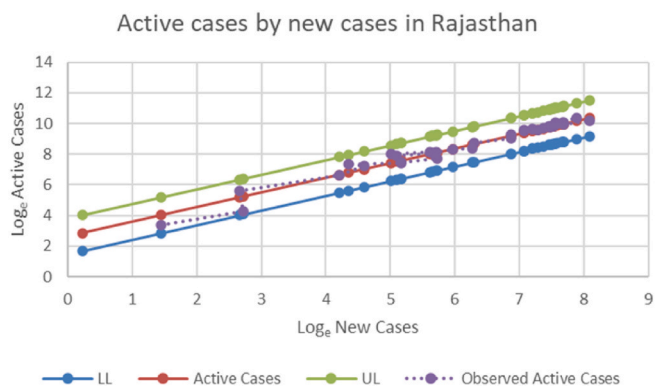


Fig. 8. Active cases by new cases in Rajasthan

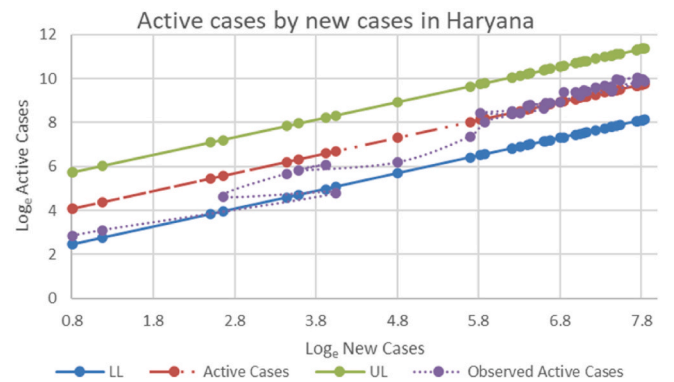


Fig. 12. Active cases by new cases in Haryana

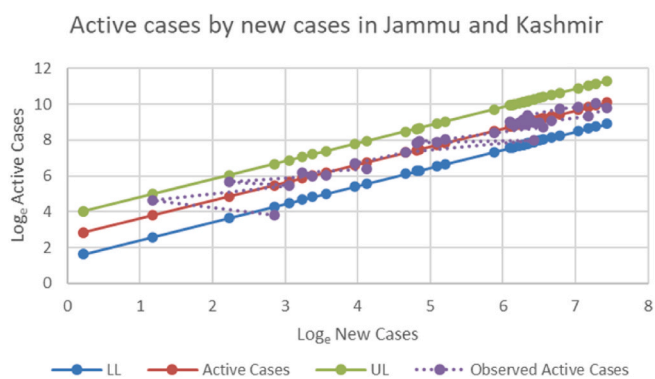


Fig. 9. Active cases by new cases in Jammu and Kashmir

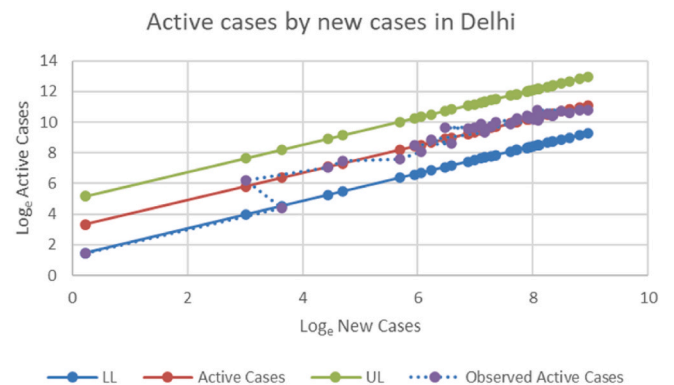


Fig. 13. Active cases by new cases in Delhi

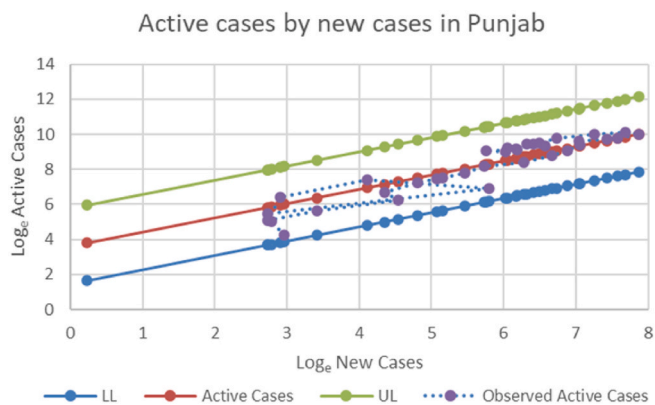


Fig. 14. Active cases by new cases in Punjab

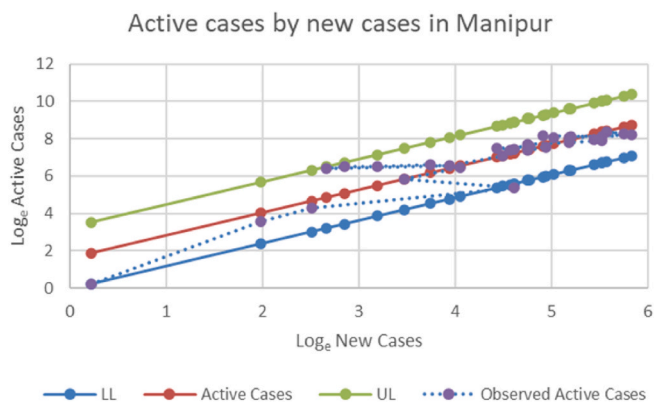


Fig. 17. Active cases by new cases in Manipur

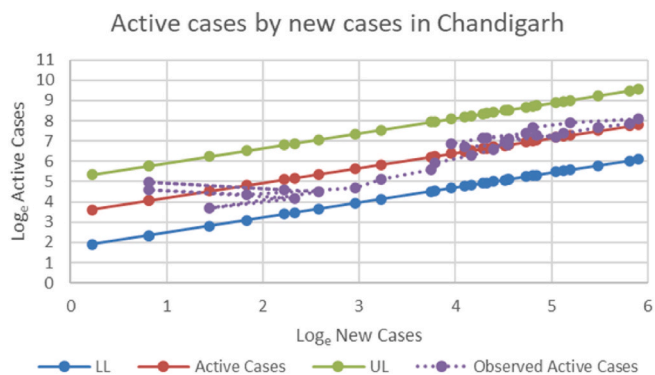


Fig. 15. Active cases by new cases in Chandigarh

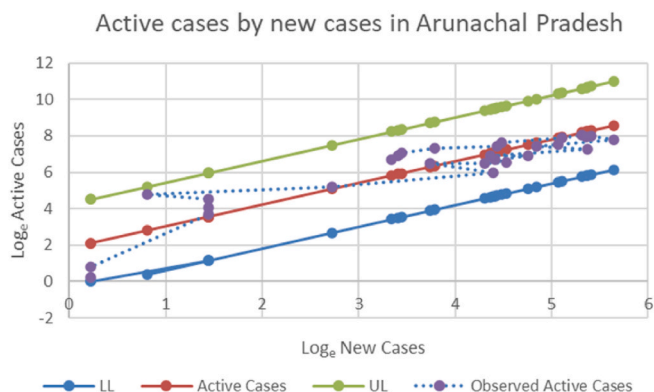


Fig. 18. Active cases by new cases in Arunachal Pradesh

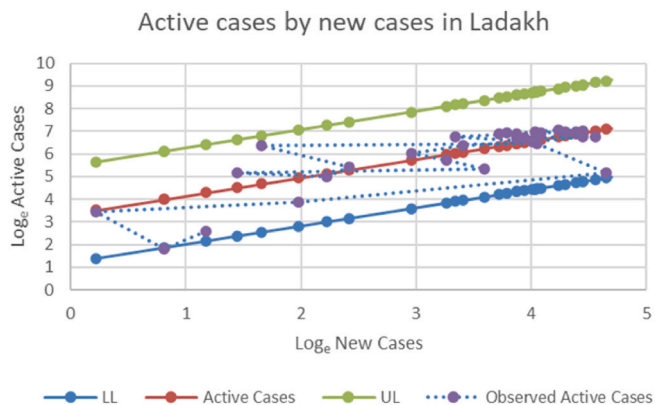


Fig. 16. Active cases by new cases in Ladakh

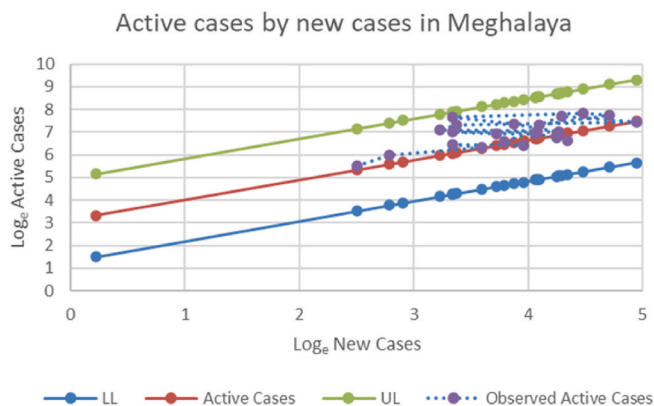


Fig. 19. Active cases by new cases in Meghalaya

respectively (Table 1).

### 3.3. Northern region

In the northern region, log of new cases against log of predicted active cases was plotted with the corresponding upper and lower confidence limits for the states Rajasthan, Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Haryana, Delhi, Punjab, Chandigarh, and Ladakh and were found to be linear (Figs. 8–16). The average duration of days in Rajasthan ( $R^2 = 0.93$ ) and Jammu Kashmir ( $R^2 = 0.93$ ) is 14 days (CI = 11.80–16.98) (CI = 11.33–16.11), Himachal Pradesh ( $R^2 = 0.91$ ) takes around 18 days (CI = 15.93–21.30) while Uttarakhand ( $R^2 = 0.90$ ) takes around 20 days (CI = 116.62–23.61) followed by Haryana ( $R^2 = 0.89$ ) 31 days (CI = 25.56–38.02) and Chandigarh ( $R^2 = 0.78$ ) 32 days (CI =

26.83–37.50). With an average length of 36 days, Punjab ( $R^2 = 0.8$ ) has the highest recovery rate among the northern states (CI = 28.37–48.04). Delhi ( $R^2 = 0.87$ ) has an average recovery time of 22 days, having a confidence interval of 17 days–30 days. The union territories like Ladakh ( $R^2 = 0.75$ ), which has a model fit of 75% ( $R^2 = 0.75$ ) and has an average recovery duration of 28 days (CI = 23.76–33.32) (Table 1).

### 3.4. Northeastern region

Log of new cases against log of predicted active cases with the upper and lower confidence limits was plotted for northeast states, including Manipur, Arunachal Pradesh, Meghalaya, Assam, Nagaland, Sikkim, and Mizoram (Figs. 17–22). High model fit was found in states of Manipur

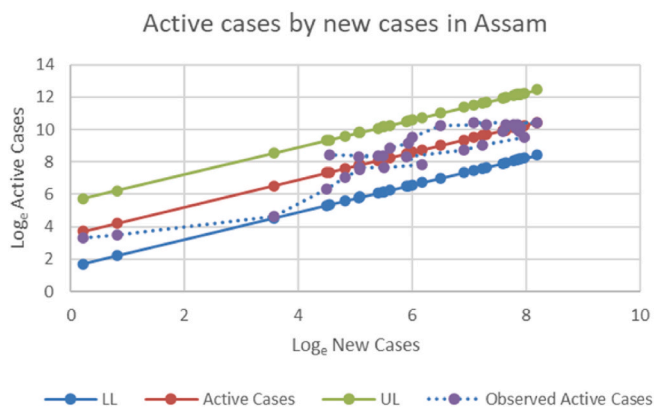


Fig. 20. Active cases by new cases in Assam

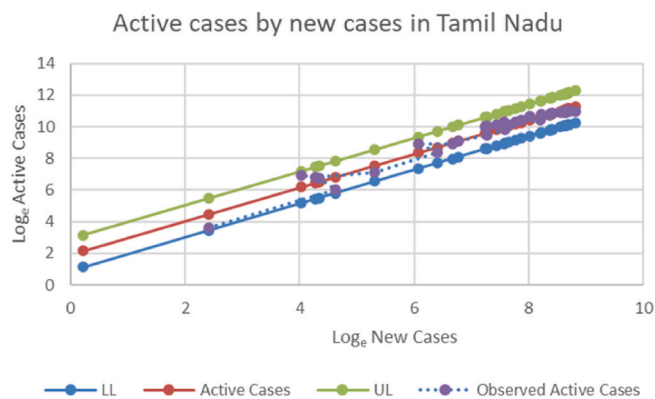


Fig. 23. Active cases by new cases in Tamil Nadu

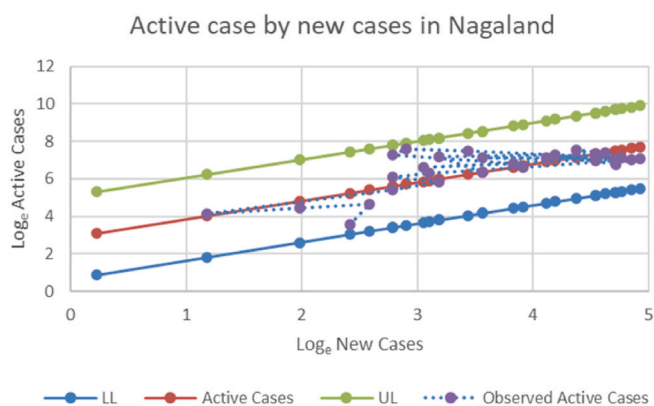


Fig. 21. Active cases by new cases in Nagaland

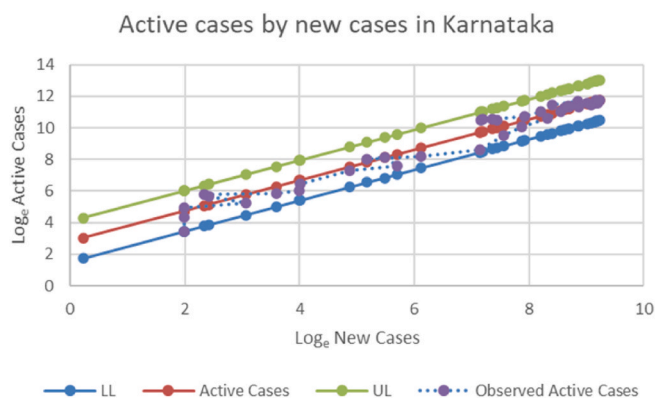


Fig. 24. Active cases by new cases in Karnataka

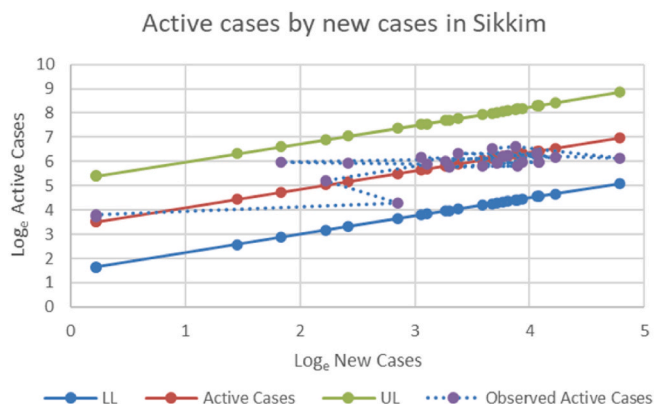


Fig. 22. Active cases by new cases in Sikkim

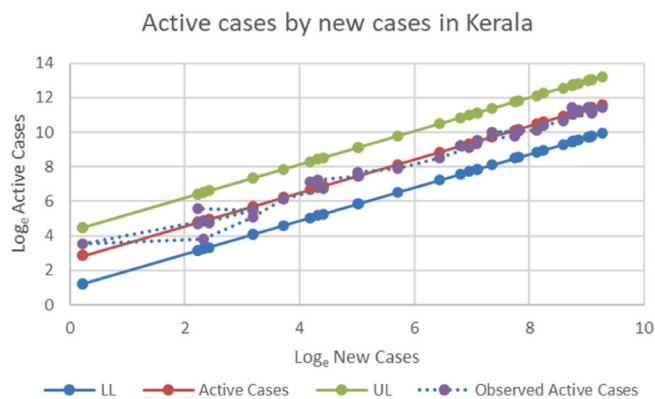


Fig. 25. Active cases by new cases in Kerala

( $R^2 = 0.93$ ), Arunachal Pradesh ( $R^2 = 0.86$ ), Meghalaya ( $R^2 = 0.85$ ) and Assam ( $R^2 = 0.85$ ) with average recovery days of 5, 6, 23, 34 days (Table 1). Nagaland ( $R^2 = 0.67$ ) has a model fit of 67% ( $R^2 = 0.67$ ) and has a duration of 18 days (CI = 12.4–24.9), similarly Sikkim ( $R^2 = 0.66$ ) with a model fit of 67% ( $R^2 = 0.67$ ) and duration of 29 days (CI = 22.84–35.76). Finally, Mizoram ( $R^2 = 0.58$ ) has the least model fit with 59% ( $R^2 = 0.59$ ) and a duration of 16 days (CI = 12.20–19.78) (Table 1).

### 3.5. Southern region

For southern states named Tamil Nadu, Karnataka, Kerala, Andhra Pradesh, with the union territories of Puducherry, and Andaman and

Nicobar Islands, log of new cases against log of predicted active cases with the upper and lower confidence limits were plotted (Figs. 23–28). Andhra Pradesh ( $R^2 = 0.89$ ) takes an average of 19 days (CI = 14.61–24.47, 15.64–22.67) to recover, where Andaman and Nicobar Islands ( $R^2 = 0.8$ ) and Tamil Nadu ( $R^2 = 0.96$ ) take an average of 7 days (CI = 5.99–8.53, 5.71–7.99) to recover, followed by Kerala ( $R^2 = 0.94$ ) with 14 days (CI = 11.88–16.17), Karnataka ( $R^2 = 0.95$ ) with 17 days (CI = 13.75–19.82), and Puducherry ( $R^2 = 0.82$ ) with 23 days (CI = 18.74–28.08) (Table 1).

### 3.6. Western region

In western states, Gujarat, Goa, Maharashtra Dadra, Nagar Haveli, Daman and Diu, log new cases against log predicted active cases along

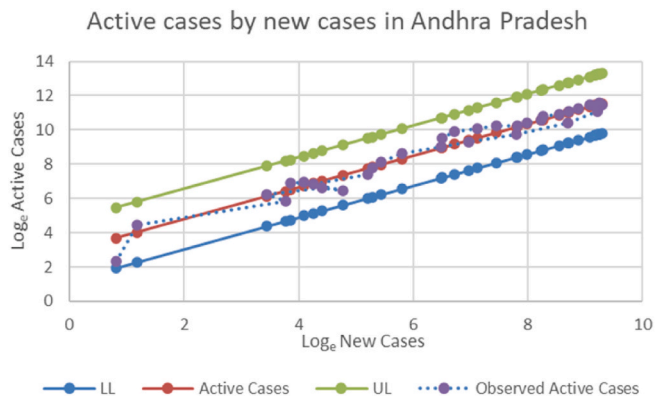


Fig. 26. Active cases by new cases in Andhra Pradesh

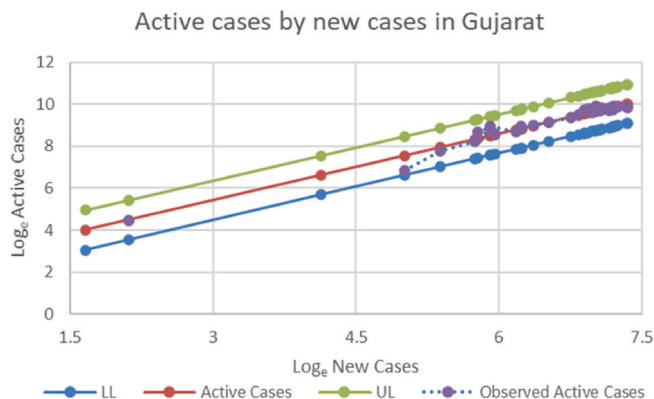


Fig. 29. Active cases by new cases in Gujarat

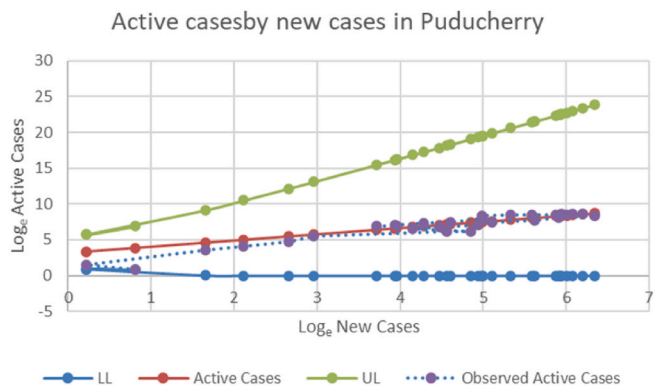


Fig. 27. Active cases by new cases in Puducherry

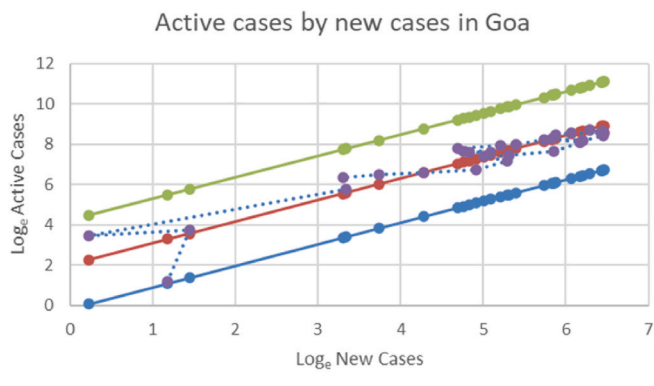


Fig. 30. Active cases by new cases in Goa

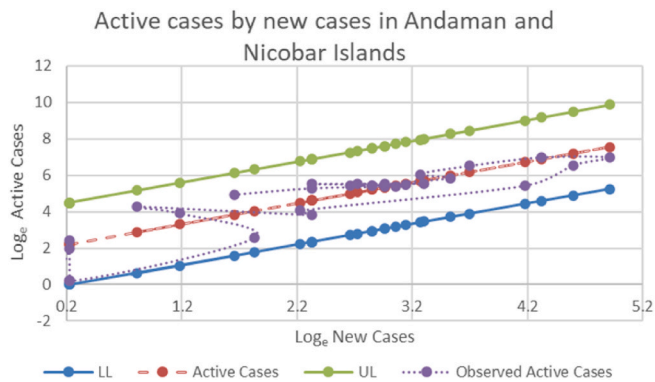


Fig. 28. Active cases by new cases in Andaman and Nicobar Islands

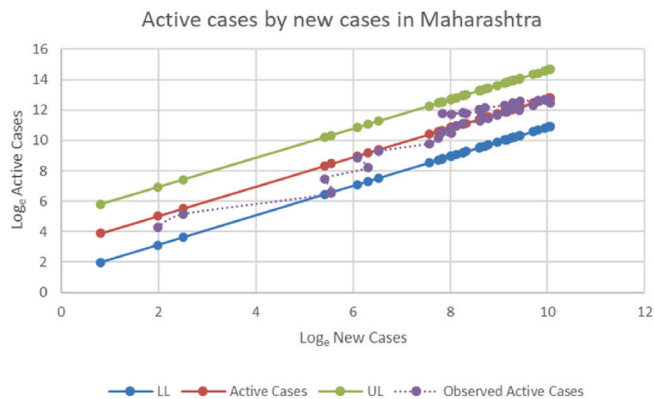


Fig. 31. Active cases by new cases in Maharashtra

with its upper and lower confidence limits was plotted (Figs. 29–32). Dadra and Nagar Haveli and Daman and Diu ( $R^2 = 0.73$ ) have a model fit of 73% ( $R^2 = 0.73$ ) and have a duration of 15 days with a confidence interval of 12.44 days and 17.35 days wherein Goa ( $R^2 = 0.88$ ) and Gujarat ( $R^2 = 0.92$ ) the duration is almost equal, almost 8–10 days (CI = 7.45–12.09, 6.16–9.52). Maharashtra ( $R^2 = 0.86$ ) has an average recovery time of 22 days, with a confidence interval of 15 days–32 days (Table 1).

#### 4. Discussion

The model suited ideal for most states, some union territories and northeastern states considered to have a reduced fit in identifying the average time. The average time of recovery from the disease in India

ranges from 5 days to 68 days. However, Hospital studies by Manash et al. (2020) showed that COVID-19 patients in India have an estimated recovery time of 25 days (CI = 16 days–34 days). The recovery period estimated for male and female patients and patients belonging to different age groups is also not statistically significant.<sup>9</sup> The rigorous proof for the relation between age-independent incidence, prevalence and time duration was initially provided by Keiding (1991). Miettinen (1976), Freeman and Hutchison (1980) had earlier presented heuristic derivations for the same special case. A related identity has also been proven by Keiding (1991) (see Freeman and Hutchison, 1980, p. 709). The relationships between time period and cohort measures under general growth were addressed by Preston (1987).<sup>3</sup> The relationship between prevalence, incidence, and disease duration is studied in a



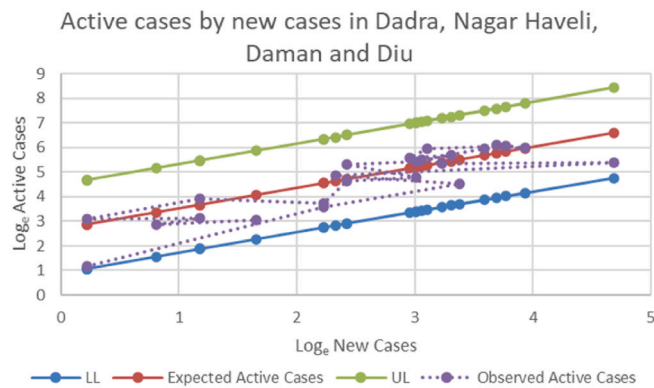


Fig. 32. Active cases by new cases in Dandra, Nagar Haveli, Daman and Diu

linear relationship for a stable population. The nationwide lockdown due to COVID-19 has produced the closed population's situation where migration is considered negligible.<sup>4</sup> The average recovery time in Madhya Pradesh (approx. 68 days) and Manipur (approx. 5 days) was found to be outliers when compared with other states in India. As per Lancet, Madhya Pradesh and Telangana found a high overall vulnerability (index value more than 0.75) for the management of and response to the COVID-19.<sup>8</sup>

In India, the first positive case was registered in Kerala on January 27, 2020; however, the first case of COVID-19 in North East India was found precisely in Manipur, which was a bit late compared to other regions of India.<sup>15</sup> Studies showed that Assam and Meghalaya had a very low potential compared to Tripura in controlling the present pandemic situation. A moderate potentiality to control the situation was found in Arunachal Pradesh and Nagaland. Sikkim and Mizoram have a very high potentiality than Manipur to control COVID-19.<sup>16</sup> In this study, the model fits best for the states of Manipur, Arunachal Pradesh, Meghalaya and Assam, with average recovery days of 5, 6, 23, 34 days correspondingly and reduced fit for Nagaland with 18 days, Sikkim with 29 days. Mizoram has the least fit and an average duration of 16 days.

On the west side of India, Dadra and Nagar Haveli and Daman and Diu have the least model fit and have a duration of 15 days, whereas Gujarat, Goa, and Maharashtra have a high model fit the duration is almost equal, almost 9, 7, and 22 days correspondingly. Testing in the Union territories became functional only on April 6, 2020, after which 23,023 samples have been tested to date January 21, 2021. Center explicitly enforced lockout, door-to-door survey and screening were scheduled, and 400 teams along with personnel from the Health and Education Department were dispatched to the field to perform comprehensive health screenings.<sup>6</sup>

The significant finding from the study by Kapil Ghosh et al.(2020) shows the inaccessibility of testing centres in the Eastern (Odisha, West Bengal, Bihar, and Jharkhand) Central and extreme Northern portion of India.<sup>17</sup> The average duration of days where a patient remains in COVID-19 is approximately 11, 13, 17, 25 days in West Bengal, Odisha, Bihar, and Jharkhand. Every state in the eastern region has a good model fit. While central states like Chhattisgarh, Uttar Pradesh has a moderate fit with 12 and 25 average recovery days. Madhya Pradesh is considered as an outlier with a reduced fit and average recovery days of 68. Assessing the northern region, the average duration of days in Rajasthan and Jammu Kashmir is 14 days; Himachal Pradesh takes around 18 days while Uttarakhand takes around 20 days, followed by Haryana 31 days and Chandigarh 32 days. The maximum duration taken by a state in the northern region is Punjab, with 36 days. The union territories like Ladakh, which has a reduced model fit and has an average duration of 28 days for a patient to be in the disease. Goel K et al. (2020) has studied and found that Srinagar-Leh highway opening and Iran pilgrimage returnees were the major challenges to estimate the actual data of COVID patients. The study also suggested that there is a need for a more robust

surveillance system.<sup>5</sup> Lockdown as restricting the migration of population and decision taken by the government to quarantine the population may greatly reduce the risk of continued spread of the epidemic in India.<sup>18</sup> Towards the south, Andhra Pradesh takes approximately an average of 19 days to recover. Andaman and Nicobar Islands and Tamil Nadu takes an average of 7 days correspondingly for the recovery, followed by Kerala with 14 days, Karnataka with 17 days, and Puducherry 23 days.

## 5. Conclusion

Tamil Nadu was identified as the best fit for the model with an  $R^2$  value of 0.96, and Mizoram was identified to have the least fit with an  $R^2$  value of 0.58. At the same time, Manipur was identified to have the least average recovery duration with 4.94 days and the highest in Madhya Pradesh with 68 days. Despite the fact that the data was derived from government sources, the data quality and patient follow-up were not ensured by the database. Government and the hospitals' policies in admitting, fear in the community of getting admitted to a hospital and the healthcare workers' behaviour towards the COVID-19 patients, sensitivity and specificity of the diagnostic tests may also be some factors that could have caused the outlying in cases of Madhya Pradesh and Manipur. To an extent, the patients remaining in-home and migration in each state's population is identified as a limitation to the study. However, most of the states have different situations concerning COVID-19 and have unique problems to tackle, so it is preferred to consider these situations while comparing each state's average duration.

## Conflict of interest

We hereby declare that the article entitled "COVID-19 pandemic and its average recovery time in Indian states" does not have any conflict of interest involved.

We also declared that this research article is nowhere submitted for publication.

## Ethical approval and consent to participate

Not applicable.

## Availability of supporting data

Open repository of Github.

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## Declaration of competing interest

The authors declare that they have no conflict of interest.

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