



Available online at <http://scik.org>

J. Math. Comput. Sci. 11 (2021), No. 6, 7568-7623

<https://doi.org/10.28919/jmcs/6573>

ISSN: 1927-5307

DATA ANALYSIS OF COVID-19 PANDEMIC: A MATHEMATICAL APPROACH

GEETA, ANJU PANWAR*

Department of Mathematics, Maharshi Dayanand University, Rohtak-124001, India

Copyright © 2021 the author(s). This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Abstract. The coronavirus disease 2019 (COVID-19) has spread to 219 countries and territories all around the world. There are more than 184,820,132 COVID-19 confirmed cases and over 4,002,209 deaths reported worldwide till 8 July 2021. The objective of this article is to analyze the impact of corona preventive measures on the spread of COVID-19 by using an epidemic model which is based on the logistic map. Moreover, time series analysis technique has been used to represent this impact. We applied our model on the states of India. Our findings might be a very useful tool for policy makers to take the right decisions in a timely way to control the outbreak of COVID-19 for the government of India.

Keywords: coronavirus disease 2019; corona preventive measures; logistic map; time series diagram.

2010 AMS Subject Classification: 37G15, 37M10.

1. INTRODUCTION

On 17 November 2019, the first patient was notified in Wuhan, Hubei, China for an obscure reason [26]. Directly before the eye, this cause is a flare-up in China as well as around the world. Numerous patients suffering from this disease were found related with Huanan seafood market in Wuhan, China. In the Huanan market, the sale of wildlife animals, birds, rabbit were also sale before the outbreak [10]. On 1st January 2020, Huanan seafood wholesale market was shut

*Corresponding author

E-mail address: anjupanwar15@gmail.com

Received July 29, 2021

in China and on 23 January 2020, Chinese government actualized a lockdown in Wuhan and closed by urban communities in China. This pandemic COVID-19 spread out in the whole world from China [2].

On 7 January 2020, Chinese scientists confined CORONAVIRUS DISEASE 2019 (COVID-19) caused by SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS 2 (SARS-COV-2) [24] and the side effects of COVID -19 are fever, sleepiness, sore throat, nasal clog, breathing trouble and cerebral pain [2].

On 30 January 2020, World Health Organization announced this flare-up as a general wellbeing crisis of world concern and pronounced it as pandemic on 11 March 2020 [5,6].

In worldwide there were 184,820,132 confirmed COVID-19 cases and 4,002,209 people were passed because of COVID-19 on 8 July 2021. The top 10 COVID-19 tainted nations with contaminated cases separately are the United States of America (3,34,29,396), India (3,07,09,557), Brazil (1,88,55,015), Russian Federation (57,07,452), France (56,81,827), Turkey (54,59,923), The United Kingdom (49,90,920), Argentina (45,74,340), Colombia (44.02.582), Italy (42,65,714) as on 8 July 2021 [25].

2. PRELIMINARIES

The population growth model is a chaotic nonlinear dynamical system, originally due to Pierre-Francois-Verhulst by the equation

$$(1) \quad x_{n+1} = f(x_n) = \lambda x_n(1 - x_n),$$

where x_n represents the population at any time $n = 0, 1, 2, \dots; x_n \in [0, 1]$ and λ is a control parameter which signify the rate of population growth [19].

3. MAIN RESULTS

Numerical development of pandemic model

Formulate a novel pandemic model which depends on logistic function population model by

the relation:

$$(2) \quad f(x_n) = x_{n+1} = \frac{1}{\mu} x_n (1 - x_n),$$

where x_n is the number of people tainted by COVID -19 in n number of days and $x_n \in [0, 1]$.

The nonlinear parameter $\mu \in [0, 1]$ is used to represent the corona preventive measures (in percentage) adopted by a government to eradicate coronavirus disease. These measures include social distancing, lockdown, self-quarantine, self-isolation, regular hand washing, use of face mask, vaccines, antibodies , close public buildings (Schools, Colleges, Universities, government buildings , . . . , etc.) [6]

Analysis of the novel pandemic model

In novel pandemic model x_n represents the percentage of the COVID-19 infected people and parameter μ represents the percentage of the corona preventive measures.

$x_n = 0$ represents that there are no COVID-19 infected people at time n and $x_n = 1$ represents that all people are corona positive in the system.

$\mu = 0$ (that is 0 percent) represents extinction of corona preventive measure and if $\mu = 1$ (that is 100 percent) indicates that maximum possible implementation of mitigation measures.

Time series analysis of the novel pandemic model

We can assume any percentage of corona positive people but in this case 50% people are corona positive that means $x = 0.5$. We discuss when $\mu = 0.25$ (i.e. 25%), $\mu = 0.50$ (i.e. 50%), $\mu = 0.75$ (i.e. 75%), $\mu = 1$ (i.e. 100%).

| | $\mu = 0.15$ | $\mu = 0.28$ | $\mu = 0.32$ | $\mu = 0.5$ | $\mu = 0.15$ | $\mu = 1$ |
|---|--------------|--------------|--------------|-------------|--------------|-----------|
| 0 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| 1 | 1.666666667 | 0.892857 | 0.78125 | 0.5 | 0.333333 | 0.25 |
| 2 | -7.407407407 | 0.341655 | 0.534058 | 0.5 | 0.296296 | 0.1875 |
| 3 | -415.1806127 | 0.80331 | 0.777625 | 0.5 | 0.278006 | 0.152344 |
| 4 | -1151934.145 | 0.564297 | 0.540388 | 0.5 | 0.267625 | 0.129135 |

| | | | | | | |
|----|--------------|----------|----------|-----|----------|----------|
| 5 | -8.84636E+12 | 0.878092 | 0.776152 | 0.5 | 0.261336 | 0.112459 |
| 6 | -5.2172E+26 | 0.382308 | 0.542937 | 0.5 | 0.257386 | 0.099812 |
| 7 | -1.81461E+54 | 0.843388 | 0.775489 | 0.5 | 0.254851 | 0.08985 |
| 8 | -2.1952E+109 | 0.471732 | 0.544081 | 0.5 | 0.253203 | 0.081777 |
| 9 | -3.2126E+219 | 0.890003 | 0.775178 | 0.5 | 0.252121 | 0.075089 |
| 10 | undefined | 0.349634 | 0.544616 | 0.5 | 0.251408 | 0.069451 |
| 11 | undefined | 0.812107 | 0.775029 | 0.5 | 0.250936 | 0.064627 |
| 12 | undefined | 0.544961 | 0.544871 | 0.5 | 0.250623 | 0.060451 |
| 13 | undefined | 0.885637 | 0.774958 | 0.5 | 0.250415 | 0.056796 |
| 14 | undefined | 0.361728 | 0.544994 | 0.5 | 0.250276 | 0.053571 |
| 15 | undefined | 0.824574 | 0.774924 | 0.5 | 0.250184 | 0.050701 |
| 16 | undefined | 0.516613 | 0.545053 | 0.5 | 0.250123 | 0.04813 |
| 17 | undefined | 0.891871 | 0.774907 | 0.5 | 0.250082 | 0.045814 |
| 18 | undefined | 0.344417 | 0.545082 | 0.5 | 0.250055 | 0.043715 |
| 19 | undefined | 0.806407 | 0.774899 | 0.5 | 0.250036 | 0.041804 |
| 20 | undefined | 0.557553 | 0.545096 | 0.5 | 0.250024 | 0.040056 |
| 21 | undefined | 0.881027 | 0.774895 | 0.5 | 0.250016 | 0.038452 |
| 22 | undefined | 0.374351 | 0.545102 | 0.5 | 0.250011 | 0.036973 |
| 23 | undefined | 0.836472 | 0.774893 | 0.5 | 0.250007 | 0.035606 |
| 24 | undefined | 0.488523 | 0.545106 | 0.5 | 0.250005 | 0.034338 |
| 25 | undefined | 0.892387 | 0.774892 | 0.5 | 0.250003 | 0.033159 |
| 26 | undefined | 0.342974 | 0.545107 | 0.5 | 0.250002 | 0.03206 |
| 27 | undefined | 0.804796 | 0.774892 | 0.5 | 0.250001 | 0.031032 |
| 28 | undefined | 0.56107 | 0.545108 | 0.5 | 0.250001 | 0.030069 |
| 29 | undefined | 0.879537 | 0.774891 | 0.5 | 0.250001 | 0.029165 |
| 30 | undefined | 0.378398 | 0.545108 | 0.5 | 0.25 | 0.028314 |

| | | | | | | |
|----|-----------|----------|----------|-----|------|----------|
| 31 | undefined | 0.840046 | 0.774891 | 0.5 | 0.25 | 0.027513 |
| 32 | undefined | 0.479888 | 0.545109 | 0.5 | 0.25 | 0.026756 |
| 33 | undefined | 0.891413 | 0.774891 | 0.5 | 0.25 | 0.02604 |
| 34 | undefined | 0.345701 | 0.545109 | 0.5 | 0.25 | 0.025362 |
| 35 | undefined | 0.807828 | 0.774891 | 0.5 | 0.25 | 0.024718 |
| 36 | undefined | 0.554436 | 0.545109 | 0.5 | 0.25 | 0.024107 |
| 37 | undefined | 0.882274 | 0.774891 | 0.5 | 0.25 | 0.023526 |
| 38 | undefined | 0.370952 | 0.545109 | 0.5 | 0.25 | 0.022973 |
| 39 | undefined | 0.833381 | 0.774891 | 0.5 | 0.25 | 0.022445 |
| 40 | undefined | 0.495919 | 0.545109 | 0.5 | 0.25 | 0.021941 |
| 41 | undefined | 0.892798 | 0.774891 | 0.5 | 0.25 | 0.02146 |
| 42 | undefined | 0.341821 | 0.545109 | 0.5 | 0.25 | 0.020999 |
| 43 | undefined | 0.803498 | 0.774891 | 0.5 | 0.25 | 0.020558 |
| 44 | undefined | 0.563888 | 0.545109 | 0.5 | 0.25 | 0.020136 |
| 45 | undefined | 0.87828 | 0.774891 | 0.5 | 0.25 | 0.01973 |
| 46 | undefined | 0.381802 | 0.545109 | 0.5 | 0.25 | 0.019341 |
| 47 | undefined | 0.842962 | 0.774891 | 0.5 | 0.25 | 0.018967 |
| 48 | undefined | 0.472776 | 0.545109 | 0.5 | 0.25 | 0.018607 |
| 49 | undefined | 0.89021 | 0.774891 | 0.5 | 0.25 | 0.018261 |
| 50 | undefined | 0.349057 | 0.545109 | 0.5 | 0.25 | 0.017927 |

TABLE 1. **Inverse relation between the corona preventive measures (μ) and the infected population (x_n).**

For $\mu = 0.15$, confirmed cases cross 1 within only one day. In this case, system cannot be defined. For $\mu = 0.32$, infected people are stable and it fluctuates between two values. For $\mu = 0.5, 0.75$, infected people are stable and fixed to the value 0.5, 0.25 respectively.

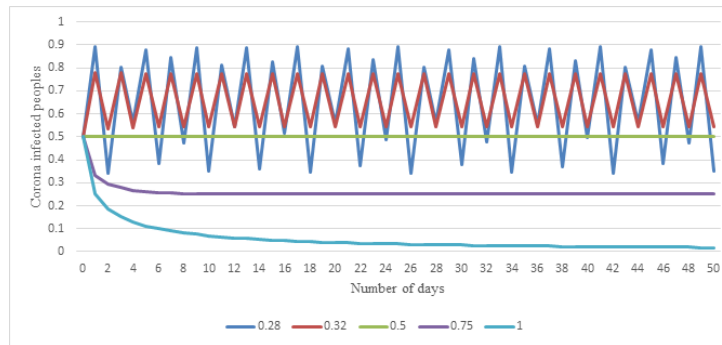


FIGURE 1. Time series plot to analysis the effect of corona preventive measure $\mu = 0.28, \mu = 0.32, \mu = 0.5, \mu = 0.75, \mu = 1$ on the size of COVID-19 infected people.

Table 1 and Figure 1 show that if the preventions adopted strictly, it will reduce the corona infected patients.

4. APPLICATIONS

Analysis of COVID-19 outbreak in India:

The first COVID-19 tainted patient affirmed in Kerala on 30 January 2020, when a student returned back from Wuhan, China [12, 21]. India government imposed a 14 hours intentional public curfew known as 'Janata Curfew' on 22 March 2020. The Government of India proclaimed a 21 days national lockdown from 25 March 2020 to 14 April 2020 to forestall the spread of corona virus disease in human. The second period of lockdown stretched out upto 3 May 2020 and afterward reached out upto 31 May 2020 [11, 21]. Indian government launched 'Arogyasetu' application for tracking the COVID-19 positive people [23].

The national lockdown is expected to incur losses of more than 35,000 crores rupees every day during the lockdown [4]. During the COVID-19 outbreak 69 suicide cases were registered in India on 3 May 2020 [28]. India has almost one-fifth of the world's population and is second leading country as far as population on the planet. On 8 July 2021, India is second top country affected by COVID-19 disease with 3,07,09,557 cases.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 30.1.2020 | 1 | 1 | 0 |
| 29.2.2020 | 31 | 3 | 0 |
| 31.3.2020 | 62 | 1635 | 47 |
| 30.4.2020 | 92 | 34867 | 1154 |
| 31.5.2020 | 123 | 190648 | 5404 |
| 30.6.2020 | 153 | 585791 | 17410 |
| 31.7.2020 | 184 | 1697054 | 36556 |
| 31.8.2020 | 215 | 3687942 | 65437 |
| 30.9.2020 | 245 | 6310266 | 98708 |
| 31.10.2020 | 276 | 8183396 | 122151 |
| 30.11.2020 | 306 | 9463256 | 137659 |
| 31.12.2020 | 337 | 10286312 | 149018 |
| 31.1.2021 | 368 | 10758629 | 154428 |
| 28.2.2021 | 396 | 11112057 | 157194 |
| 31.3.2021 | 427 | 12220717 | 162960 |
| 30.4.2021 | 457 | 19157197 | 211839 |
| 31.5.2021 | 488 | 28173883 | 331911 |
| 30.6.2021 | 518 | 30410768 | 399489 |

TABLE 2. Total number of COVID-19 confirmed cases and deaths in India.

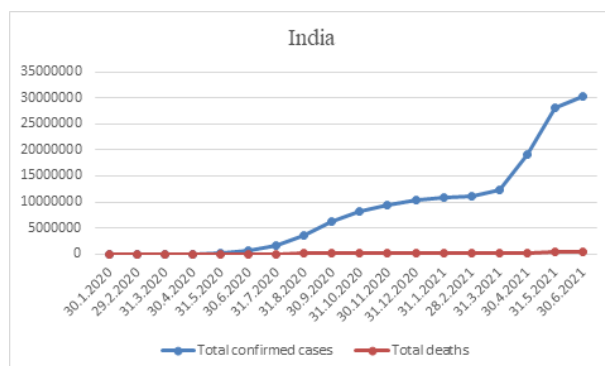


FIGURE 2. Confirmed cases and deaths in India.

Analysis of COVID-19 outbreak in Andaman and Nicobar

First COVID-19 affirmed case occur in Andaman and Nicobar on 26 March 2020. On Janata Curfew day 22 March 2020, Andaman and Nicobar has no active case of COVID-19. Toward the finish of second period of lockdown 3 May 2020, the territory has a single COVID-19 active case and afterward all prevention were followed by government which results no active case of COVID-19 in Andaman and Nicobar on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 26.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 36 | 33 | 0 |
| 31.5.2020 | 67 | 33 | 0 |
| 30.6.2020 | 97 | 97 | 0 |
| 31.7.2020 | 128 | 548 | 5 |
| 31.8.2020 | 159 | 3132 | 46 |
| 30.9.2020 | 189 | 3835 | 53 |
| 31.10.2020 | 220 | 4332 | 59 |
| 30.11.2020 | 250 | 4710 | 61 |
| 31.12.2020 | 281 | 4945 | 62 |
| 31.1.2021 | 312 | 4994 | 62 |
| 28.2.2021 | 340 | 5020 | 62 |
| 31.3.2021 | 371 | 5083 | 62 |
| 30.4.2021 | 401 | 5949 | 67 |
| 31.5.2021 | 432 | 7005 | 115 |
| 30.6.2021 | 462 | 7467 | 128 |

TABLE 3. Total number of COVID-19 confirmed cases and deaths in Andaman and Nicobar.

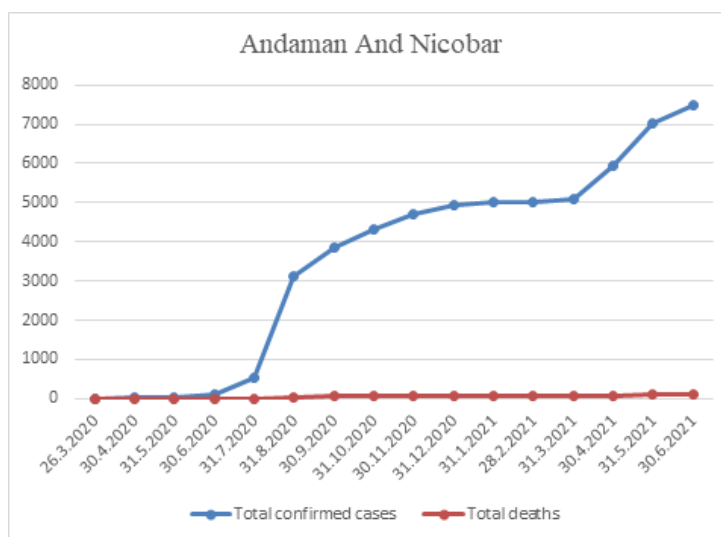


FIGURE 3. Confirmed cases and deaths in Andaman and Nicobar.

Analysis of COVID-19 outbreak in Andhra Pradesh

First COVID-19 affirmed case occur in Andhra Pradesh on 12 March 2020. On Janata Curfew day 22 March 2020, Andhra Pradesh has 6 active cases of COVID-19. On the first day of national lockdown 25 March 2020, Andhra Pradesh has 10 active cases. Toward the end of the first period of lockdown 14 April 2020, the territory has 457 COVID-19 active cases. The second phase of lockdown finished to 3 May 2020, right now 1062 COVID-19 active cases and afterward all prevention were followed by the government which result 1169 active cases of COVID-19 in Andhra Pradesh on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 12.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 50 | 1403 | 31 |
| 31.5.2020 | 81 | 3571 | 62 |
| 30.6.2020 | 111 | 14595 | 187 |
| 31.8.2020 | 173 | 434771 | 3969 |
| 30.9.2020 | 203 | 693484 | 5828 |
| 31.10.2020 | 234 | 823348 | 6690 |
| 30.11.2020 | 264 | 868064 | 6992 |
| 31.12.2020 | 295 | 882286 | 7108 |

| Date | No. of days | Total confirmed cases | Total deaths |
|-----------|-------------|-----------------------|--------------|
| 31.1.2021 | 326 | 887836 | 7153 |
| 28.2.2021 | 354 | 889916 | 7169 |
| 31.3.2021 | 385 | 901989 | 7217 |
| 30.4.2021 | 415 | 1101690 | 7992 |
| 31.5.2021 | 446 | 1693085 | 10930 |
| 30.6.2021 | 476 | 1889513 | 12706 |

TABLE 4. Total number of COVID-19 confirmed cases and deaths in Andhra Pradesh.

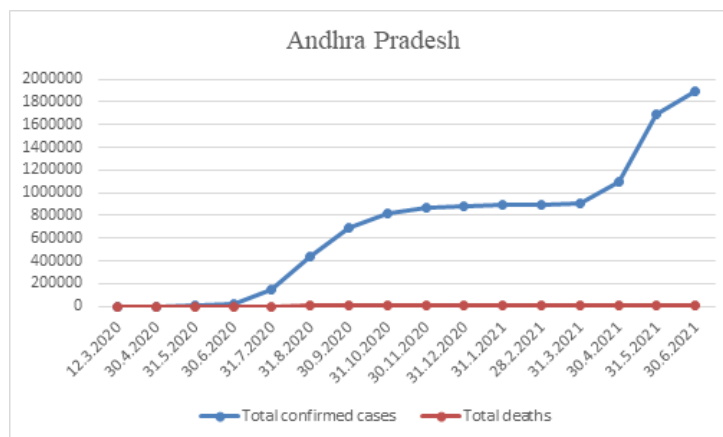


FIGURE 4. Confirmed cases and deaths in Andhra Pradesh.

Analysis of COVID-19 outbreak in Arunachal Pradesh

First COVID-19 affirmed case occur in Arunachal Pradesh on 1 April 2020. Toward the finish of first period of lockdown 14 April 2020, the territory has a single COVID-19 active case and afterward all prevention were followed by Government which results no active case of COVID-19 in Arunachal Pradesh on 3 May 2020. That implies all preventions were followed by the state government.

| Date | No. of days | Total confirmed cases | Total deaths |
|-----------|-------------|-----------------------|--------------|
| 1.4.2020 | 1 | 1 | 0 |
| 31.5.2020 | 61 | 4 | 0 |

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 30.6.2020 | 91 | 191 | 1 |
| 31.7.2020 | 122 | 1591 | 3 |
| 31.8.2020 | 153 | 4112 | 7 |
| 30.9.2020 | 183 | 9796 | 16 |
| 31.10.2020 | 214 | 14852 | 37 |
| 30.11.2020 | 244 | 16296 | 54 |
| 31.12.2020 | 275 | 16719 | 56 |
| 31.1.2021 | 306 | 16828 | 56 |
| 28.2.2021 | 334 | 16836 | 56 |
| 31.3.2021 | 365 | 16845 | 56 |
| 30.4.2021 | 395 | 18420 | 59 |
| 31.5.2021 | 426 | 27272 | 115 |
| 30.6.2021 | 456 | 35857 | 172 |

TABLE 5. Total number of COVID-19 confirmed cases and deaths in Arunachal Pradesh.

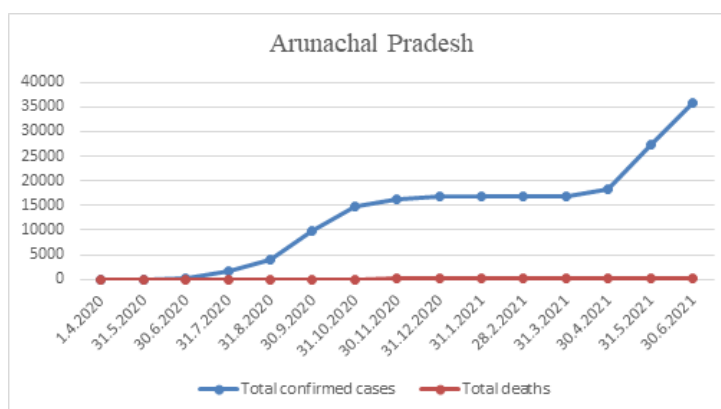


FIGURE 5. Confirmed cases and deaths in Arunachal Pradesh.

Analysis of COVID-19 outbreak in Assam

First COVID-19 affirmed case occur in Assam on 31 March 2020. Toward the finish of first period of lockdown 14 April 2020, the territory has 32 COVID-19 active cases. The second phase of lockdown finished to 3 May 2020, right now 9 COVID-19 active cases and afterward

all prevention were followed by the government which result 1147 active cases of COVID-19 in Assam on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 31.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 31 | 43 | 1 |
| 31.5.2020 | 62 | 1340 | 4 |
| 30.6.2020 | 92 | 8408 | 12 |
| 31.7.2020 | 123 | 40270 | 98 |
| 31.8.2020 | 154 | 109041 | 306 |
| 30.9.2020 | 184 | 182396 | 697 |
| 31.10.2020 | 215 | 206351 | 930 |
| 30.11.2020 | 245 | 212776 | 981 |
| 31.12.2020 | 276 | 216211 | 1045 |
| 31.1.2021 | 307 | 217141 | 1082 |
| 28.2.2021 | 335 | 217537 | 1092 |
| 31.3.2021 | 366 | 218412 | 1105 |
| 30.4.2021 | 396 | 253123 | 1307 |
| 31.5.2021 | 427 | 411216 | 3365 |
| 30.6.2021 | 457 | 508484 | 4509 |

TABLE 6. Total number of COVID-19 confirmed cases and deaths in Assam.

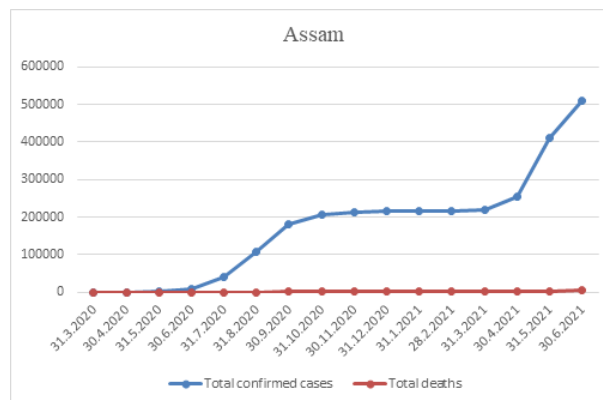


FIGURE 6. Confirmed cases and deaths in Assam.

Analysis of COVID-19 outbreak in Bihar

First COVID-19 confirmed case occur in Bihar on 22 March 2020. On Janata Curfew day 22 March 2020, Bihar has 2 active cases of COVID-19. On the first day of national lockdown 25 March 2020, state has 4 active cases and at the end of first phase of lockdown 14 April 2020, the territory has 36 COVID-19 active cases. The second phase of lockdown finished to 3 May 2020, right now 389 COVID-19 active cases and afterward all prevention were followed by the government which result 2264 active cases of COVID-19 in Bihar on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 22.3.2020 | 1 | 2 | 0 |
| 30.4.2020 | 40 | 425 | 2 |
| 31.5.2020 | 71 | 3807 | 23 |
| 30.6.2020 | 101 | 9987 | 68 |
| 31.7.2020 | 132 | 50987 | 298 |
| 31.8.2020 | 163 | 136337 | 694 |
| 30.9.2020 | 193 | 182906 | 904 |
| 31.10.2020 | 224 | 216764 | 1090 |
| 30.11.2020 | 254 | 235616 | 1264 |
| 31.12.2020 | 285 | 252792 | 1397 |
| 31.1.2021 | 316 | 260719 | 1501 |
| 28.2.2021 | 344 | 262534 | 1541 |
| 31.3.2021 | 375 | 265527 | 1576 |
| 30.4.2021 | 405 | 470317 | 2560 |
| 31.5.2021 | 436 | 706761 | 5163 |
| 30.6.2021 | 466 | 721914 | 9588 |

TABLE 7. Total number of COVID-19 confirmed cases and deaths in Bihar.

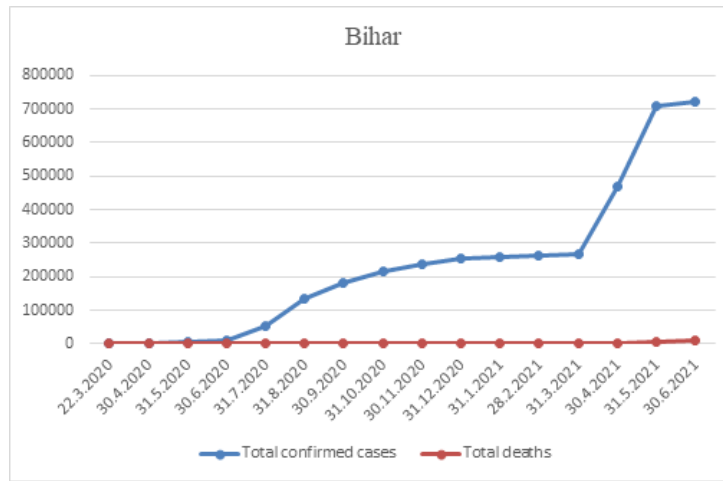


FIGURE 7. Confirmed cases and deaths in Bihar .

Analysis of COVID-19 outbreak in Chandigarh

First COVID-19 confirmed case occur in Chandigarh on 19 March 2020. On Janata Curfew day 22 March 2020, Chandigarh has 6 COVID-19 active cases. On the first day of national lockdown 25 March 2020, Chandigarh has 7 active cases and at the end of first period of lockdown 14 April 2020, the territory has 14 COVID-19 active cases. Toward the finish of second phase of lockdown 3 May 2020, right now 77 COVID-19 active cases are there and afterward all prevention were followed by the government which result 90 active cases of COVID-19 in Chandigarh on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 19.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 43 | 74 | 0 |
| 31.5.2020 | 74 | 293 | 4 |
| 30.6.2020 | 104 | 440 | 6 |
| 31.7.2020 | 135 | 1051 | 15 |
| 31.8.2020 | 166 | 4346 | 56 |
| 30.9.2020 | 196 | 11938 | 162 |
| 31.10.2020 | 227 | 14476 | 226 |
| 30.11.2020 | 257 | 17409 | 277 |

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 31.12.2020 | 288 | 19748 | 317 |
| 31.1.2021 | 319 | 20925 | 334 |
| 28.2.2021 | 347 | 21770 | 352 |
| 31.3.2021 | 378 | 26999 | 379 |
| 30.4.2021 | 408 | 42647 | 478 |
| 31.5.2021 | 439 | 706761 | 753 |
| 30.6.2021 | 469 | 721914 | 808 |

TABLE 8. Total number of COVID-19 confirmed cases and deaths in Chandigarh.

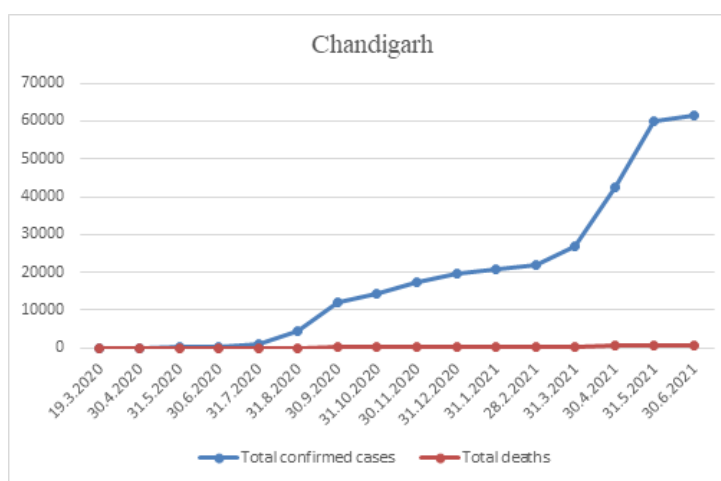


FIGURE 8. Confirmed cases and deaths in Chandigarh.

Analysis of COVID-19 outbreak in Chhattisgarh

First COVID-19 affirmed case occur in Chhattisgarh on 19 March 2020. On Janata Curfew day 22 March 2020, state has a single COVID-19 active case. On the first day of national lockdown 25 March 2020, Chhattisgarh has 3 active cases and at the end of first period of lockdown 20 active cases of COVID-19 on 14 April 2020. The second phase of lockdown ended to 3 May 2020, at this time 21 COVID-19 active cases and afterward all prevention were followed by the government which result 383 active cases of COVID-19 in Chhattisgarh on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|-----------|-------------|-----------------------|--------------|
| 19.3.2020 | 1 | 1 | 0 |

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 30.4.2020 | 43 | 40 | 0 |
| 31.5.2020 | 74 | 498 | 1 |
| 30.6.2020 | 104 | 2858 | 13 |
| 31.7.2020 | 135 | 9192 | 54 |
| 31.8.2020 | 166 | 31503 | 277 |
| 30.9.2020 | 196 | 113602 | 957 |
| 31.10.2020 | 227 | 187270 | 2101 |
| 30.11.2020 | 257 | 237322 | 2861 |
| 31.12.2020 | 288 | 279575 | 3371 |
| 31.1.2021 | 319 | 305367 | 3701 |
| 28.2.2021 | 347 | 312560 | 3835 |
| 31.3.2021 | 378 | 349187 | 4170 |
| 30.4.2021 | 408 | 728700 | 8581 |
| 31.5.2021 | 439 | 971463 | 13048 |
| 30.6.2021 | 469 | 994480 | 13439 |

TABLE 9. Total number of COVID-19 confirmed cases and deaths in Chhattisgarh.

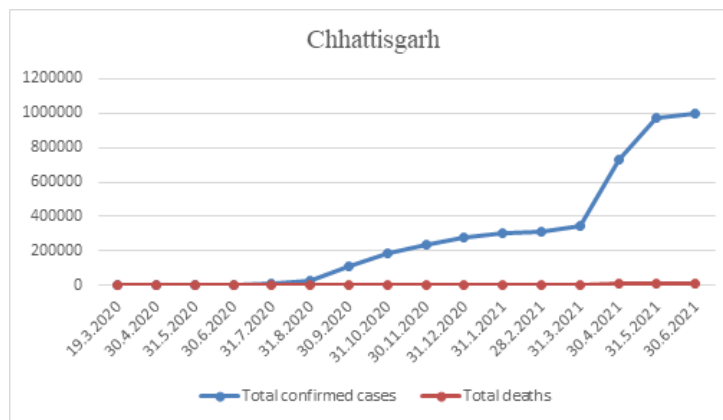


FIGURE 9. Confirmed cases and deaths in Chhattisgarh .

Analysis of COVID-19 outbreak in Dadra and Nagar Haveli and Daman and Diu

First COVID-19 affirmed case occur in Dadra and Nagar Haveli and Daman and Diu on 5 May

2020. All prevention were followed by government which results Dadra and Nagar Haveli and Daman and Diu has single active case of COVID-19 on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 5.5.2020 | 1 | 1 | 0 |
| 30.6.2020 | 57 | 213 | 0 |
| 31.7.2020 | 87 | 1149 | 2 |
| 31.8.2020 | 117 | 2367 | 2 |
| 30.9.2020 | 147 | 3040 | 2 |
| 31.10.2020 | 178 | 3249 | 2 |
| 30.11.2020 | 208 | 3327 | 2 |
| 31.12.2020 | 238 | 3361 | 2 |
| 31.1.2021 | 269 | 3380 | 2 |
| 28.2.2021 | 297 | 3388 | 2 |
| 31.3.2021 | 328 | 3628 | 2 |
| 30.4.2021 | 358 | 7661 | 4 |
| 31.5.2021 | 389 | 10217 | 4 |
| 30.6.2021 | 419 | 10563 | 4 |

TABLE 10. Total number of COVID-19 confirmed cases and deaths in Dadra and Nagar Haveli and Daman and Diu.

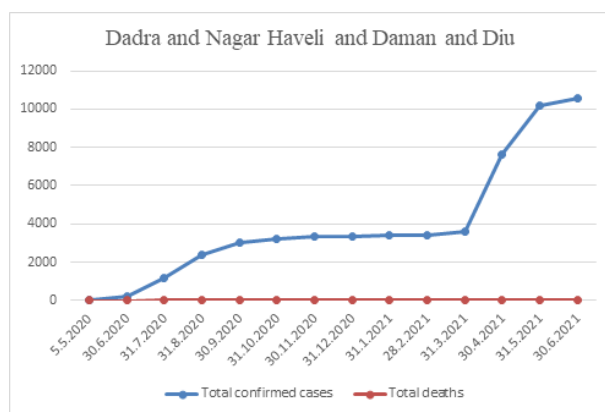


FIGURE 10. Confirmed cases and deaths in Dadra and Nagar Haveli and Daman and Diu.

Analysis of COVID-19 outbreak in Delhi

First COVID-19 confirmed case occur in Delhi on 2 March 2020. On Janata Curfew day 22 March 2020, COVID-19 Delhi has 28 active cases of COVID-19. On the first day of national lockdown 25 March 2020, Delhi has 35 active cases and at the end of first period of lockdown 14 April 2020, COVID-19 active cases are 1500. Toward the finish of second phase of lockdown 3 May 2020, right now 3123 COVID-19 active cases and afterward all prevention were followed by the government which result 10893 active cases of COVID-19 in Delhi on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 2.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 60 | 3515 | 59 |
| 31.5.2020 | 91 | 19844 | 473 |
| 30.6.2020 | 121 | 87360 | 2742 |
| 31.7.2020 | 152 | 135598 | 3963 |
| 31.8.2020 | 183 | 174748 | 4444 |
| 30.9.2020 | 213 | 279715 | 5361 |
| 31.10.2020 | 244 | 386706 | 6511 |
| 30.11.2020 | 274 | 570374 | 9174 |
| 31.12.2020 | 305 | 625369 | 10536 |
| 31.1.2021 | 336 | 635096 | 10853 |
| 28.2.2021 | 364 | 639289 | 10910 |
| 31.3.2021 | 395 | 662430 | 11027 |
| 30.4.2021 | 425 | 1149333 | 16147 |
| 31.5.2021 | 456 | 1426240 | 24237 |
| 30.6.2021 | 486 | 1434188 | 24977 |

TABLE 11. Total number of COVID-19 confirmed cases and deaths in Delhi.

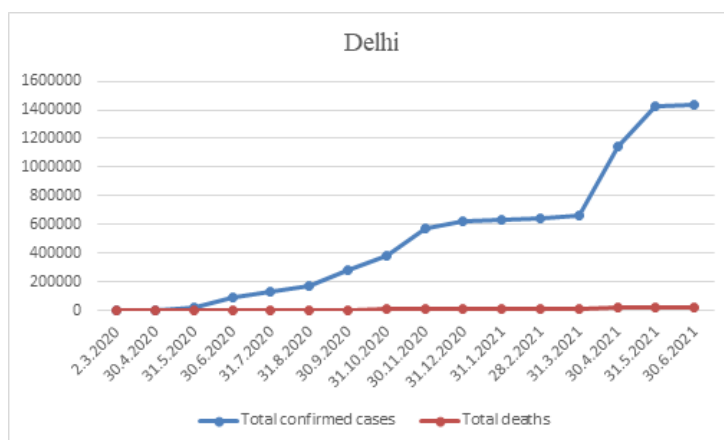


FIGURE 11. Confirmed cases and deaths in Delhi.

Analysis of COVID-19 outbreak in Goa

First COVID-19 confirmed case occur in Goa on 25 March 2020. On the first day of national lockdown 25 March 2020, the state has 3 active cases and at the end of first period of lockdown 2 active cases of COVID-19 on 14 April 2020. At the completion of second phase of lockdown 3 May 2020, right now Goa is COVID-19 free state and afterward all prevention were followed by the government which result 27 active cases of COVID-19 in Goa on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 25.3.2020 | 1 | 3 | 0 |
| 30.4.2020 | 37 | 7 | 0 |
| 31.5.2020 | 68 | 70 | 0 |
| 30.6.2020 | 98 | 1315 | 3 |
| 31.7.2020 | 129 | 5913 | 45 |
| 31.8.2020 | 160 | 17418 | 192 |
| 30.9.2020 | 190 | 33418 | 428 |
| 31.10.2020 | 221 | 43626 | 604 |
| 30.11.2020 | 251 | 47963 | 688 |
| 31.12.2020 | 282 | 51066 | 739 |
| 31.1.2021 | 313 | 53409 | 768 |
| 28.2.2021 | 341 | 54986 | 795 |

| Date | No. of days | Total confirmed cases | Total deaths |
|-----------|-------------|-----------------------|--------------|
| 31.3.2021 | 372 | 58039 | 830 |
| 30.4.2021 | 402 | 92052 | 1168 |
| 31.5.2021 | 433 | 155666 | 2649 |
| 30.6.2021 | 463 | 166689 | 3054 |

TABLE 12. Total number of COVID-19 confirmed cases and deaths in Goa.

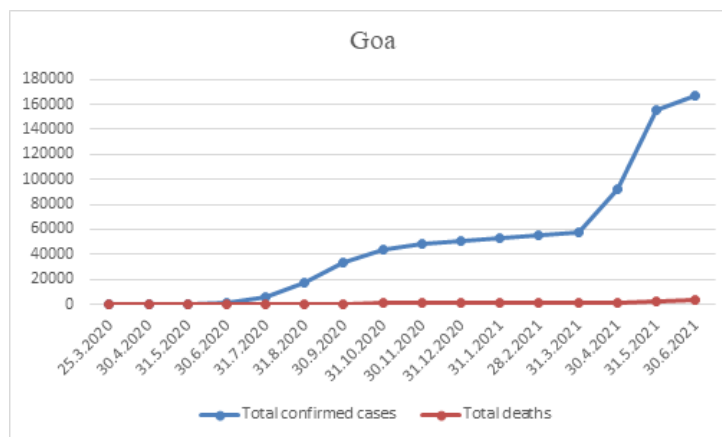


FIGURE 12. Confirmed cases and deaths in Goa.

Analysis of COVID-19 outbreak in Gujarat

First COVID-19 affirmed case occur in Gujarat on 19 March 2020. On Janata Curfew day 22 March 2020, Gujarat has 18 active cases of COVID-19. On the first day of national lockdown 25 March 2020, state has 38 active cases and at the completion of first period of lockdown state has 563 COVID-19 active cases on 14 April 2020. Towards the finish of second phase of lockdown 3 May 2020, right now 4096 active cases of COVID-19 and afterward all prevention were followed by the government which result 5837 active cases of COVID-19 in Gujarat on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 19.3.2020 | 1 | 2 | 0 |
| 30.4.2020 | 43 | 4395 | 214 |
| 31.5.2020 | 74 | 16794 | 1038 |
| 30.6.2020 | 104 | 32643 | 1848 |
| 31.7.2020 | 135 | 61438 | 2441 |
| 31.8.2020 | 166 | 96435 | 3022 |
| 30.9.2020 | 196 | 137394 | 3453 |
| 31.10.2020 | 227 | 172944 | 3719 |
| 30.11.2020 | 257 | 209780 | 3989 |
| 31.12.2020 | 288 | 245038 | 4306 |
| 31.1.2021 | 319 | 261540 | 4387 |
| 28.2.2021 | 347 | 269889 | 4410 |
| 31.3.2021 | 378 | 307698 | 4519 |
| 30.4.2021 | 408 | 567777 | 7183 |
| 31.5.2021 | 439 | 809169 | 9833 |
| 30.6.2021 | 469 | 823523 | 10059 |

TABLE 13. Total number of COVID-19 confirmed cases and deaths in Gujarat.

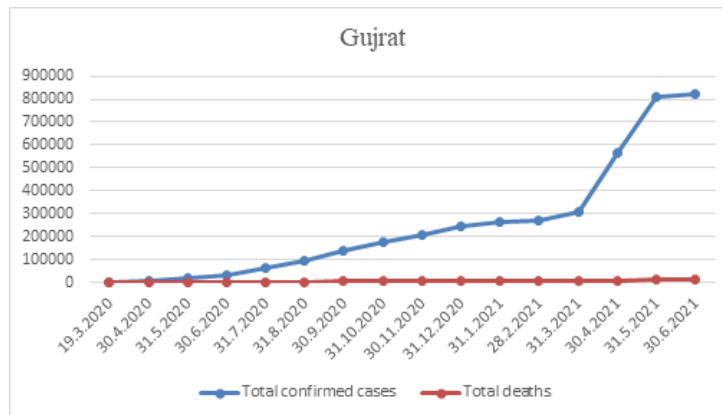


FIGURE 13. Confirmed cases and deaths in Gujarat.

Analysis of COVID-19 outbreak in Haryana

First COVID-19 affirmed case occur in Haryana on 4 March 2020. On Janata Curfew day 22 March, 2020 the state has 21 active cases of COVID-19. On the first day of national lockdown 25 March 2020, the territory has 31 active cases and at the completion of first phase of lockdown there are 140 COVID-19 active cases on 14 April 2020. Toward the finish of second period of lockdown 3 May 2020, at this time 192 active cases of COVID-19 and afterward all prevention were followed by the government which result 1023 active cases of COVID-19 in Haryana on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 4.3.2020 | 1 | 14 | 0 |
| 30.4.2020 | 58 | 339 | 4 |
| 31.5.2020 | 89 | 2091 | 20 |
| 30.6.2020 | 119 | 14548 | 236 |
| 31.7.2020 | 150 | 34965 | 421 |
| 31.8.2020 | 181 | 64732 | 689 |
| 30.9.2020 | 211 | 128599 | 1382 |
| 31.10.2020 | 242 | 167210 | 1789 |
| 30.11.2020 | 272 | 234126 | 2428 |
| 31.12.2020 | 303 | 262325 | 2905 |
| 31.1.2021 | 334 | 267897 | 3018 |
| 28.2.2021 | 362 | 270784 | 3048 |
| 31.3.2021 | 393 | 290800 | 3155 |
| 30.4.2021 | 423 | 487978 | 4216 |
| 31.5.2021 | 454 | 756635 | 8303 |
| 30.6.2021 | 484 | 768639 | 9431 |

TABLE 14. Total number of COVID-19 confirmed cases and deaths in Haryana.

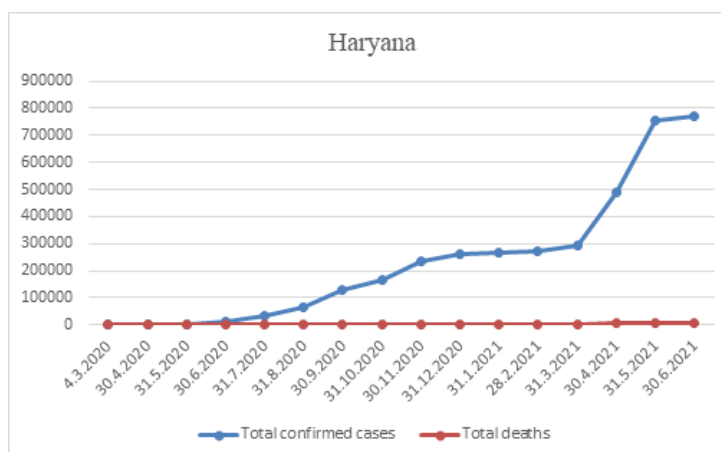


FIGURE 14. Confirmed cases and deaths in Haryana.

Analysis of COVID-19 outbreak in Himachal Pradesh

First COVID-19 confirmed case occur in Himachal Pradesh on 20 March 2020. On Janata Curfew day 22 March 2020, the state has 2 active cases of COVID-19. On the first day of national lockdown 25 March 2020, Himachal Pradesh has 3 active cases and at the end of first phase of lockdown 15 active cases of COVID-19 on 14 April 2020. Toward the finish of second period of lockdown 3 May 2020, right now single COVID-19 active case in Himachal Pradesh and afterward all prevention were followed by the government which result 206 active cases of COVID-19 in Himachal Pradesh on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 20.3.2020 | 1 | 2 | 0 |
| 30.4.2020 | 42 | 40 | 2 |
| 31.5.2020 | 73 | 331 | 6 |
| 30.6.2020 | 103 | 953 | 9 |
| 31.7.2020 | 134 | 2564 | 13 |
| 31.8.2020 | 165 | 6116 | 37 |
| 30.9.2020 | 195 | 14976 | 181 |
| 31.10.2020 | 226 | 22059 | 312 |
| 30.11.2020 | 256 | 40518 | 635 |
| 31.12.2020 | 287 | 55277 | 922 |

| Date | No. of days | Total confirmed cases | Total deaths |
|-----------|-------------|-----------------------|--------------|
| 31.1.2021 | 318 | 57536 | 967 |
| 28.2.2021 | 346 | 58645 | 982 |
| 31.3.2021 | 377 | 63605 | 1035 |
| 30.4.2021 | 407 | 99287 | 1484 |
| 31.5.2021 | 438 | 190330 | 3127 |
| 30.6.2021 | 468 | 202123 | 3463 |

TABLE 15. Total number of COVID-19 confirmed cases and deaths in Himachal Pradesh.

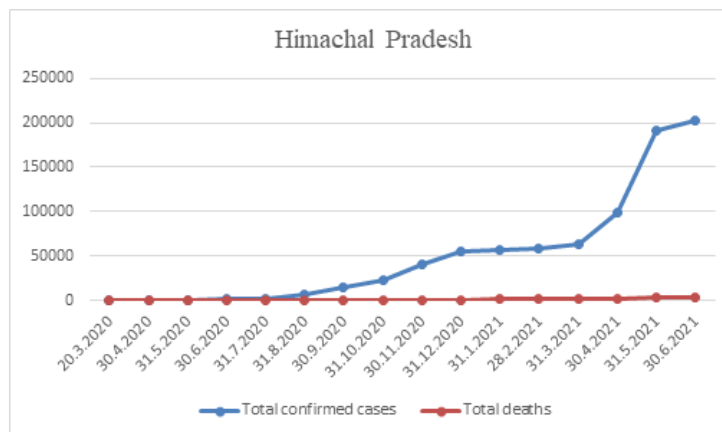


FIGURE 15. Confirmed cases and deaths in Himachal Pradesh.

Analysis of COVID-19 outbreak in Jammu and Kashmir

First COVID-19 affirmed case occur in Jammu and Kashmir on 9 March 2020. On Janata Curfew day 22 March 2020, Jammu and Kashmir has 4 active cases of COVID-19. On the first day of national lockdown 25 March 2020, the territory has 11 active cases and at the finish of first phase of lockdown 244 COVID-19 active cases on 14 April 2020. Toward the finish of second period of lockdown 3 May 2020, right now 406 active cases of COVID-19 and afterward all prevention were followed by the government which result 1491 active cases of COVID-19 in Jammu and Kashmir on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 9.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 53 | 614 | 8 |
| 31.5.2020 | 84 | 2446 | 28 |
| 30.6.2020 | 114 | 7497 | 101 |
| 31.7.2020 | 145 | 20359 | 377 |
| 31.8.2020 | 176 | 37163 | 694 |
| 30.9.2020 | 206 | 75070 | 1181 |
| 31.10.2020 | 237 | 94785 | 1478 |
| 30.11.2020 | 267 | 110224 | 1694 |
| 31.12.2020 | 298 | 120971 | 1883 |
| 31.1.2021 | 329 | 124506 | 1936 |
| 28.2.2021 | 357 | 126441 | 1957 |
| 31.3.2021 | 388 | 130960 | 1994 |
| 30.4.2021 | 418 | 176083 | 2283 |
| 31.5.2021 | 449 | 290465 | 3907 |
| 30.6.2021 | 479 | 315662 | 4323 |

TABLE 16. Total number of COVID-19 confirmed cases and deaths in Jammu and Kashmir.

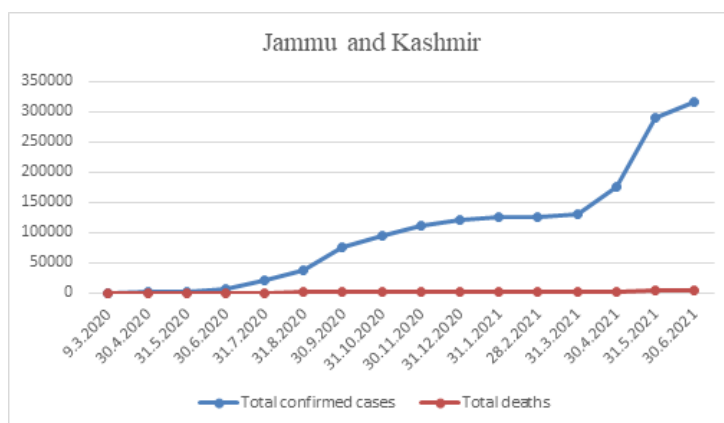


FIGURE 16. Confirmed cases and deaths in Jammu and Kashmir.

Analysis of COVID-19 outbreak in Jharkhand

First COVID-19 affirmed case occur in Jharkhand on 31 March 2020. At the end of first period of lockdown 25 active case of COVID-19 on 14 April 2020. Toward the finish of second phase of lockdown 3 May 2020, the state has 85 COVID-19 active cases and afterward all prevention were followed by the government which result 374 active cases of COVID-19 in Jharkhand on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 31.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 31 | 110 | 3 |
| 31.5.2020 | 62 | 635 | 5 |
| 30.6.2020 | 92 | 2490 | 15 |
| 31.7.2020 | 123 | 11314 | 106 |
| 31.8.2020 | 154 | 41656 | 417 |
| 30.9.2020 | 184 | 83651 | 713 |
| 31.10.2020 | 215 | 101761 | 884 |
| 30.11.2020 | 245 | 109151 | 964 |
| 31.12.2020 | 276 | 115113 | 1030 |
| 31.1.2021 | 307 | 118692 | 1072 |
| 28.2.2021 | 335 | 119950 | 1090 |
| 31.3.2021 | 366 | 124202 | 1113 |
| 30.4.2021 | 396 | 233411 | 2660 |
| 31.5.2021 | 427 | 337774 | 4991 |
| 30.6.2021 | 457 | 345610 | 5113 |

TABLE 17. Total number of COVID-19 confirmed cases and deaths in Jharkhand.

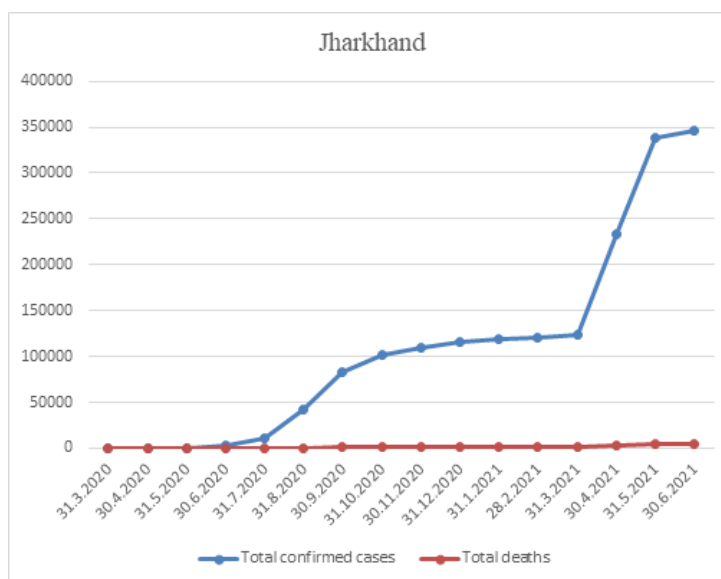


FIGURE 17. Confirmed cases and deaths in Jharkhand.

Analysis of COVID-19 outbreak in Karnataka

First COVID-19 confirmed case occur in Karnataka on 9 March 2020. On Janata Curfew day 22 March 2020, Karnataka has 24 active cases of COVID-19. On the first day of national lockdown 25 March 2020, the state has 47 active cases and at the completion of first period of lockdown the territory has 179 active cases of COVID-19 on 14 April 2020. Toward the finish of second phase of lockdown ended to 3 May 2020, right now 295 COVID-19 active cases and afterward all prevention were followed by the government which result 1950 active cases of COVID-19 in Karnataka on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 9.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 53 | 565 | 22 |
| 31.5.2020 | 84 | 3221 | 49 |
| 30.6.2020 | 114 | 15242 | 246 |
| 31.7.2020 | 145 | 124115 | 2314 |
| 31.8.2020 | 176 | 342423 | 5702 |
| 30.9.2020 | 206 | 601767 | 8864 |
| 31.10.2020 | 237 | 823412 | 11168 |

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 30.11.2020 | 267 | 884897 | 11778 |
| 31.12.2020 | 298 | 919496 | 12090 |
| 31.1.2021 | 329 | 939387 | 12217 |
| 28.2.2021 | 357 | 951251 | 12331 |
| 31.3.2021 | 388 | 997004 | 12567 |
| 30.4.2021 | 418 | 1523142 | 15523 |
| 31.5.2021 | 449 | 2604431 | 29090 |
| 30.6.2021 | 479 | 2843810 | 35040 |

TABLE 18. Total number of COVID-19 confirmed cases and deaths in Karnataka.

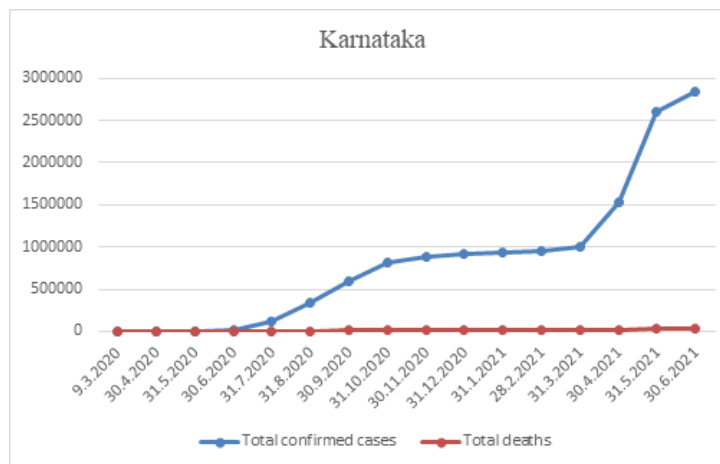


FIGURE 18. Confirmed cases and deaths in Karnataka.

Analysis of COVID-19 outbreak in Kerala

First COVID-19 affirmed case occur in Kerala on 30 January 2020. On Janata Curfew day 22 March 2020, Kerala has 64 active cases of COVID-19. On the first day of national lockdown 25 March 2020, the state has 115 active cases and at the end of first period of lockdown 14 April 2020, COVID-19 active cases are 173. Toward the finish of second phase of lockdown 3 May 2020, right now 95 active cases of COVID-19 in Kerala and then lastly all prevention were followed by the government which result 670 active cases of COVID-19 in Kerala on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 30.1.2020 | 1 | 1 | 0 |
| 29.2.2020 | 31 | 3 | 0 |
| 31.3.2020 | 62 | 241 | 2 |
| 30.4.2020 | 92 | 496 | 4 |
| 31.5.2020 | 123 | 1270 | 10 |
| 30.6.2020 | 153 | 4443 | 25 |
| 31.7.2020 | 184 | 23614 | 74 |
| 31.8.2020 | 215 | 75386 | 295 |
| 30.9.2020 | 245 | 196107 | 743 |
| 31.10.2020 | 276 | 433106 | 1485 |
| 30.11.2020 | 306 | 602983 | 2245 |
| 31.12.2020 | 337 | 760934 | 3073 |
| 31.1.2021 | 368 | 929179 | 3744 |
| 28.2.2021 | 396 | 1059404 | 4198 |
| 31.3.2021 | 427 | 1124585 | 4622 |
| 30.4.2021 | 457 | 1571184 | 5309 |
| 31.5.2021 | 488 | 2526580 | 8816 |
| 30.6.2021 | 518 | 2924166 | 13236 |

TABLE 19. Total number of COVID-19 confirmed cases and deaths in Kerala.

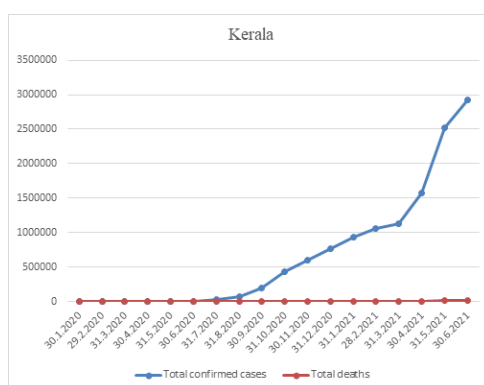


FIGURE 19. Confirmed cases and deaths in Kerala.

Analysis of COVID-19 outbreak in Ladakh

First COVID-19 affirmed case occur in Ladakh on 7 March 2020. On Janata Curfew day 22 March 2020, Ladakh has 13 COVID-19 active cases. On the first day of national lockdown 25 March 2020, the territory has 13 active cases and at the completion of first period of lockdown 5 active cases of COVID-19 on 14 April 2020. Toward the finish of second phase of lockdown 3 May 2020, at this time 25 COVID-19 active cases in Ladakh and afterward all prevention were followed by the government which result 30 active cases of COVID-19 in Ladakh on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 7.3.2020 | 1 | 2 | 0 |
| 30.4.2020 | 55 | 22 | 0 |
| 31.5.2020 | 86 | 77 | 0 |
| 30.6.2020 | 116 | 973 | 1 |
| 31.7.2020 | 147 | 1404 | 7 |
| 31.8.2020 | 178 | 2681 | 34 |
| 30.9.2020 | 208 | 4269 | 58 |
| 31.10.2020 | 239 | 6270 | 75 |
| 30.11.2020 | 269 | 8415 | 117 |
| 31.12.2020 | 300 | 9466 | 127 |
| 31.1.2021 | 331 | 9720 | 130 |
| 28.2.2021 | 359 | 9818 | 130 |
| 31.3.2021 | 390 | 10157 | 130 |
| 30.4.2021 | 420 | 13969 | 143 |
| 31.5.2021 | 451 | 18662 | 189 |
| 30.6.2021 | 481 | 20073 | 202 |

TABLE 20. Total number of COVID-19 confirmed cases and deaths in Ladakh.

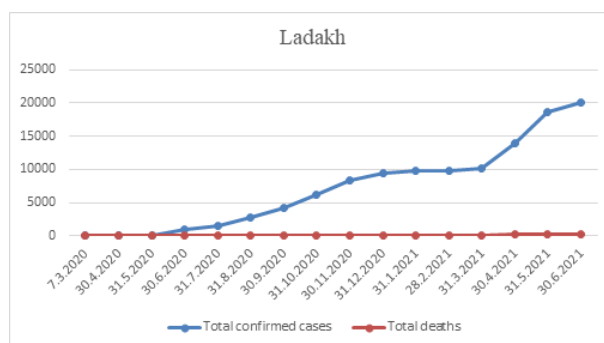


FIGURE 20. Confirmed cases and deaths in Ladakh.

Analysis of COVID-19 outbreak in Lakshadweep

First COVID-19 affirmed case occur in Lakshadweep on 18 Jan 2021, and on that day 13 more COVID-19 confirmed cases registered in Lakshadweep. Till now 15 Feb 2021, no deaths in Lakshadweep.

| Date | No. of days | Total confirmed cases | Total deaths |
|-----------|-------------|-----------------------|--------------|
| 18.1.2021 | 1 | 14 | 0 |
| 25.1.2021 | 8 | 67 | 0 |
| 31.1.2021 | 14 | 87 | 0 |
| 28.2.2021 | 42 | 382 | 1 |
| 31.3.2021 | 73 | 723 | 1 |
| 30.4.2021 | 103 | 2767 | 4 |
| 31.5.2021 | 134 | 8077 | 33 |
| 30.6.2021 | 164 | 9770 | 48 |

TABLE 21. Total number of COVID-19 confirmed cases and deaths in Lakshadweep.

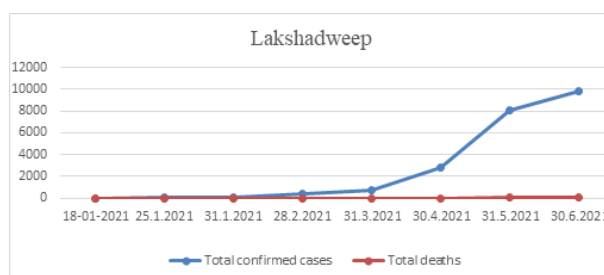


FIGURE 21. Confirmed cases and deaths in Lakshadweep.

Analysis of COVID-19 outbreak in Madhya Pradesh

First COVID-19 confirmed case occur in Madhya Pradesh on 4 March 2020. On Janata Curfew day 22 March 2020, the state has 6 active cases of COVID-19. On the first day of national lockdown 25 March 2020, Madhya Pradesh has 15 active cases and at the end of first phase of lockdown 624 active cases of COVID-19 on 14 April 2020. Toward the finish of second phase of lockdown 3 May 2020, at this time 1883 COVID-19 active cases and then afterward all prevention were followed by the government which result 2897 active cases of COVID-19 in Madhya Pradesh on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 4.3.2020 | 1 | 4 | 0 |
| 30.4.2020 | 58 | 2625 | 137 |
| 31.5.2020 | 89 | 8089 | 350 |
| 30.6.2020 | 119 | 13593 | 572 |
| 31.7.2020 | 150 | 31806 | 867 |
| 31.8.2020 | 181 | 63965 | 1394 |
| 30.9.2020 | 211 | 128047 | 2316 |
| 31.10.2020 | 242 | 171359 | 2951 |
| 30.11.2020 | 272 | 206128 | 3260 |
| 31.12.2020 | 303 | 241791 | 3606 |
| 31.1.2021 | 334 | 255112 | 3810 |
| 28.2.2021 | 362 | 261766 | 3864 |
| 31.3.2021 | 393 | 295511 | 3986 |
| 30.4.2021 | 423 | 563327 | 5616 |
| 31.5.2021 | 454 | 780030 | 8067 |
| 30.6.2021 | 484 | 789804 | 8969 |

TABLE 22. Total number of COVID-19 confirmed cases and deaths in Madhya Pradesh.

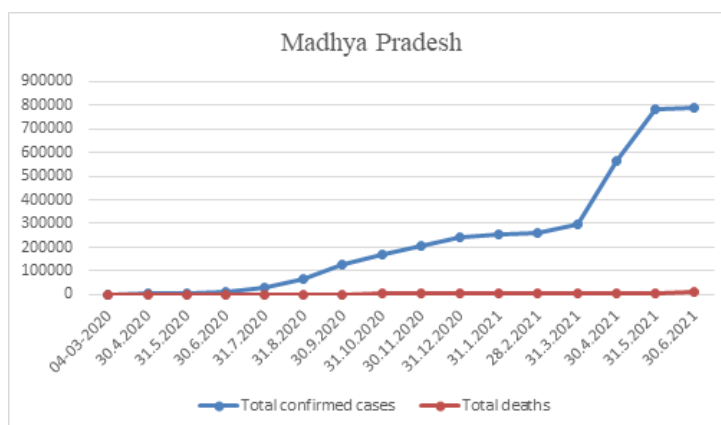


FIGURE 22. Confirmed cases and deaths in Madhya Pradesh.

Analysis of COVID-19 outbreak in Maharashtra

First COVID-19 confirmed case occur in Maharashtra on 9 March 2020. On Janata Curfew day 22 March 2020, the state has 74 active cases of COVID-19. On the first day of national lockdown 25 March 2020, Maharashtra has 122 active cases and at the completion of first period of lockdown 14 April 2020, COVID-19 active cases are 2243. Toward the finish of second phase of lockdown 3 May 2020, at this point on time 10331 COVID-19 active cases and afterward all prevention were followed by the government which result 36040 active cases of COVID-19 in Maharashtra on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 9.3.2020 | 1 | 2 | 0 |
| 30.4.2020 | 53 | 10498 | 459 |
| 31.5.2020 | 84 | 67655 | 2286 |
| 30.6.2020 | 114 | 174761 | 7855 |
| 31.7.2020 | 145 | 422118 | 14994 |
| 31.8.2020 | 176 | 792541 | 24583 |
| 30.9.2020 | 206 | 1384446 | 36662 |
| 31.10.2020 | 237 | 1678406 | 43911 |
| 30.11.2020 | 267 | 1823896 | 47151 |
| 31.12.2020 | 298 | 1932112 | 49521 |

| Date | No. of days | Total confirmed cases | Total deaths |
|-----------|-------------|-----------------------|--------------|
| 31.1.2021 | 329 | 2026399 | 51082 |
| 28.2.2021 | 357 | 2155070 | 52164 |
| 31.3.2021 | 388 | 2812980 | 54649 |
| 30.4.2021 | 418 | 4602472 | 68813 |
| 31.5.2021 | 449 | 5746892 | 95344 |
| 30.6.2021 | 479 | 6061404 | 121945 |

TABLE 23. Total number of COVID-19 confirmed cases and deaths in Maharashtra.

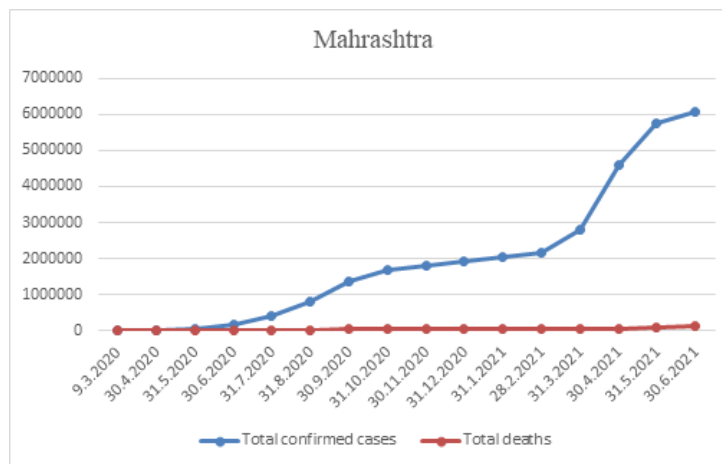


FIGURE 23. Confirmed cases and deaths in Maharashtra.

Analysis of COVID-19 outbreak in Manipur

First COVID-19 confirmed case occur in Manipur on 24 March 2020. Toward the finish of first period of lockdown 14 April 2020, Manipur has a single active case of COVID-19. The completion of second period of lockdown 3 May 2020, right now Manipur is COVID-19 free state and afterward all prevention were followed by the government which result 60 active cases of COVID-19 in Manipur on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 24.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 38 | 2 | 0 |
| 31.5.2020 | 69 | 71 | 0 |
| 30.6.2020 | 99 | 1234 | 0 |
| 31.7.2020 | 130 | 2621 | 5 |
| 31.8.2020 | 161 | 6254 | 28 |
| 30.9.2020 | 191 | 10985 | 67 |
| 31.10.2020 | 222 | 18504 | 168 |
| 30.11.2020 | 252 | 25047 | 281 |
| 31.12.2020 | 283 | 28190 | 355 |
| 31.1.2021 | 314 | 29070 | 371 |
| 28.2.2021 | 342 | 29273 | 373 |
| 31.3.2021 | 373 | 29400 | 374 |
| 30.4.2021 | 403 | 31586 | 405 |
| 31.5.2021 | 434 | 50751 | 807 |
| 30.6.2021 | 464 | 69790 | 1150 |

TABLE 24. Total number of COVID-19 confirmed cases and deaths in Manipur.

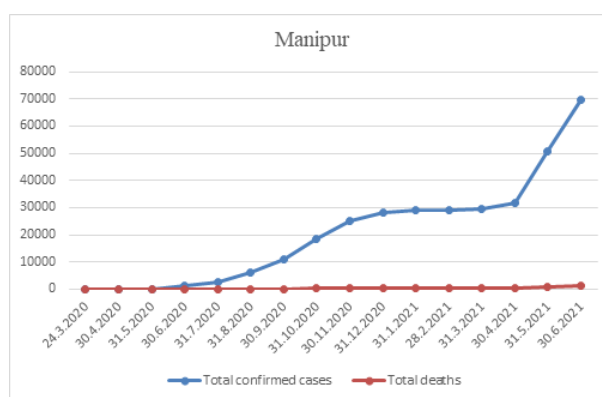


FIGURE 24. Confirmed cases and deaths in Manipur.

Analysis of COVID-19 outbreak in Meghalaya

First COVID-19 affirmed case occur in Meghalaya on 13 April 2020. Toward the finish of

second phase of lockdown 3 May 2020, at this point of time Meghalaya has a single COVID-19 active case and afterward all prevention were followed by the government which result 14 active cases of COVID-19 in Meghalaya on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 13.4.2020 | 1 | 1 | 0 |
| 31.5.2020 | 49 | 27 | 1 |
| 30.6.2020 | 79 | 53 | 1 |
| 31.7.2020 | 110 | 823 | 5 |
| 31.8.2020 | 141 | 2368 | 10 |
| 30.9.2020 | 171 | 5639 | 49 |
| 31.10.2020 | 202 | 9452 | 88 |
| 30.11.2020 | 232 | 11810 | 111 |
| 31.12.2020 | 263 | 13408 | 139 |
| 31.1.2021 | 294 | 13764 | 146 |
| 28.2.2021 | 322 | 13962 | 148 |
| 31.3.2021 | 353 | 14065 | 150 |
| 30.4.2021 | 383 | 16846 | 171 |
| 31.5.2021 | 414 | 35598 | 578 |
| 30.6.2021 | 444 | 49513 | 838 |

TABLE 25. Total number of COVID-19 confirmed cases and deaths in Meghalaya.

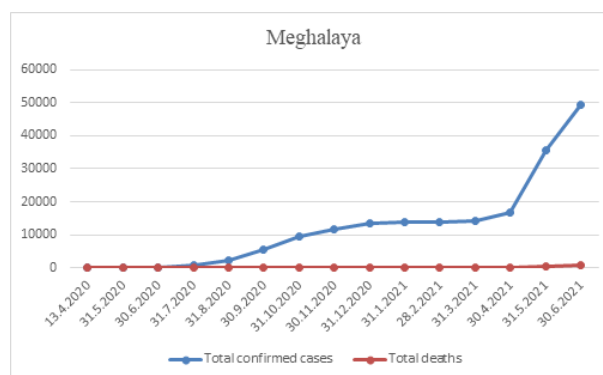


FIGURE 25. Confirmed cases and deaths in Meghalaya.

Analysis of COVID-19 outbreak in Mizoram

First COVID-19 confirmed case occur in Mizoram on 25 March 2020. Toward the finish of second phase of lockdown 3 May 2020, the state has a single COVID-19 active case and afterward all prevention were followed by the government which result no active case of COVID-19 in Mizoram on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 25.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 37 | 1 | 0 |
| 31.5.2020 | 68 | 1 | 0 |
| 30.6.2020 | 98 | 160 | 0 |
| 31.7.2020 | 129 | 408 | 0 |
| 31.8.2020 | 160 | 1011 | 0 |
| 30.9.2020 | 190 | 1986 | 0 |
| 31.10.2020 | 221 | 2722 | 1 |
| 30.11.2020 | 251 | 3825 | 5 |
| 31.12.2020 | 282 | 4204 | 8 |
| 31.1.2021 | 313 | 4372 | 9 |
| 28.2.2021 | 341 | 4423 | 10 |
| 31.3.2021 | 372 | 4473 | 11 |
| 30.4.2021 | 402 | 6019 | 15 |
| 31.5.2021 | 433 | 12087 | 40 |
| 30.6.2021 | 463 | 20075 | 93 |

TABLE 26. Total number of COVID-19 confirmed cases and deaths in Mizoram.

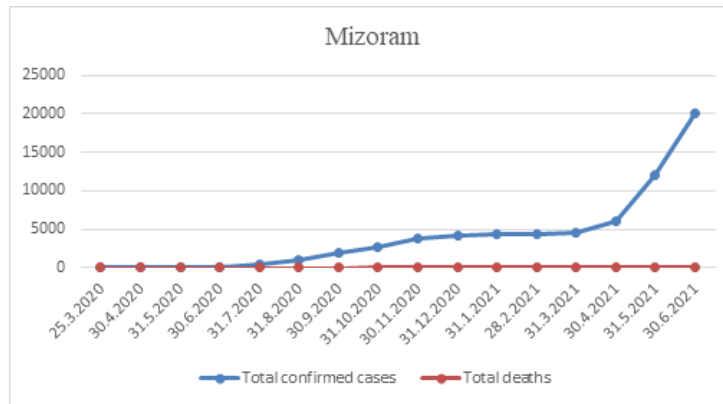


FIGURE 26. Confirmed cases and deaths in Mizoram.

Analysis of COVID-19 outbreak in Nagaland

First COVID-19 affirmed case occur in Nagaland on 25 May 2020. All prevention were followed by the government which result 43 active cases of COVID-19 in Nagaland on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 25.5.2020 | 1 | 3 | 0 |
| 30.6.2020 | 37 | 459 | 0 |
| 31.7.2020 | 68 | 1693 | 4 |
| 31.8.2020 | 99 | 3950 | 8 |
| 30.9.2020 | 129 | 6163 | 12 |
| 31.10.2020 | 160 | 9047 | 39 |
| 30.11.2020 | 190 | 11186 | 64 |
| 31.12.2020 | 221 | 11927 | 79 |
| 31.1.2021 | 252 | 12094 | 88 |
| 28.2.2021 | 280 | 12200 | 91 |
| 31.3.2021 | 311 | 12340 | 91 |
| 30.4.2021 | 341 | 13976 | 104 |
| 31.5.2021 | 372 | 21680 | 363 |
| 30.6.2021 | 402 | 25239 | 495 |

TABLE 27. Total number of COVID-19 confirmed cases and deaths in Nagaland.

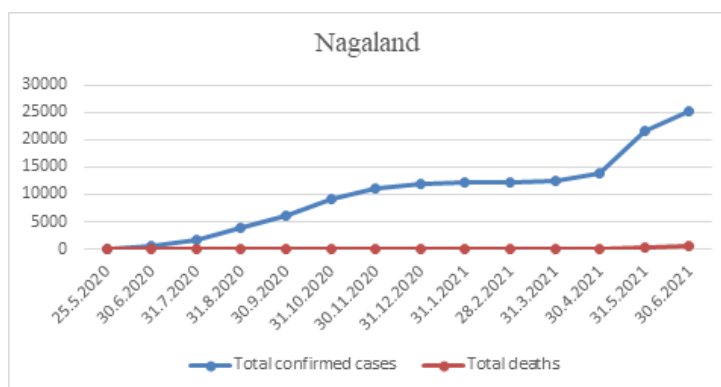


FIGURE 27. Confirmed cases and deaths in Nagaland.

Analysis of COVID-19 outbreak in Odisha

First COVID-19 confirmed case occur in Odisha on 16 March 2020. On Janata Curfew day 22 March 2020, the state has 2 active cases of COVID-19. On the first day of national lockdown 25 March 2020, Odisha has 2 active cases and at the completion of first period of lockdown 14 April 2020, the state has 41 COVID-19 active cases. Toward the finish of second phase of lockdown 3 May 2020, right now 101 active cases of COVID-19 and then lastly all prevention were followed by the government which result 813 active cases of COVID-19 in Odisha on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 16.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 46 | 143 | 1 |
| 31.5.2020 | 77 | 1948 | 9 |
| 30.6.2020 | 107 | 7065 | 32 |
| 31.7.2020 | 138 | 31877 | 214 |
| 31.8.2020 | 169 | 103536 | 545 |
| 30.9.2020 | 199 | 219119 | 895 |
| 31.10.2020 | 230 | 290116 | 1373 |
| 30.11.2020 | 260 | 318307 | 1787 |
| 31.12.2020 | 291 | 329001 | 1921 |
| 31.1.2021 | 322 | 335072 | 1959 |

| Date | No. of days | Total confirmed cases | Total deaths |
|-----------|-------------|-----------------------|--------------|
| 28.2.2021 | 350 | 337191 | 1969 |
| 31.3.2021 | 381 | 340917 | 1974 |
| 30.4.2021 | 411 | 444194 | 2096 |
| 31.5.2021 | 442 | 764997 | 2807 |
| 30.6.2021 | 472 | 909800 | 4071 |

TABLE 28. Total number of COVID-19 confirmed cases and deaths in Odisha.

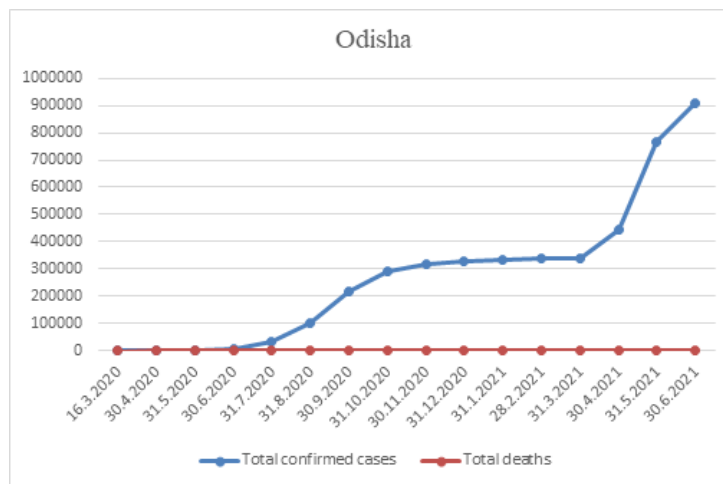


FIGURE 28. Confirmed cases and deaths in Odisha.

Analysis of COVID-19 outbreak in Puducherry

First COVID-19 confirmed case occur in Puducherry on 17 March 2020. On the first day of national lockdown 25 March 2020, the state has a single active case of COVID-19 and at the completion of first phase of lockdown 14 April 2020, the territory has 6 COVID-19 active cases. Toward the finish of second phase of lockdown COVID-19 active cases on 3 May 2020 and afterward all prevention were followed by the government which result 45 active cases of COVID-19 in Puducherry on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 17.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 45 | 8 | 0 |
| 31.5.2020 | 76 | 70 | 0 |
| 30.6.2020 | 106 | 714 | 12 |
| 31.7.2020 | 137 | 3472 | 48 |
| 31.8.2020 | 168 | 14411 | 228 |
| 30.9.2020 | 198 | 27544 | 521 |
| 31.10.2020 | 229 | 35013 | 592 |
| 30.11.2020 | 259 | 36968 | 610 |
| 31.12.2020 | 290 | 38132 | 633 |
| 31.1.2021 | 321 | 39068 | 648 |
| 28.2.2021 | 349 | 39725 | 668 |
| 31.3.2021 | 380 | 41468 | 682 |
| 30.4.2021 | 410 | 58622 | 805 |
| 31.5.2021 | 441 | 104453 | 1536 |
| 30.6.2021 | 471 | 117249 | 1749 |

TABLE 29. Total number of COVID-19 confirmed cases and deaths in Puducherry.

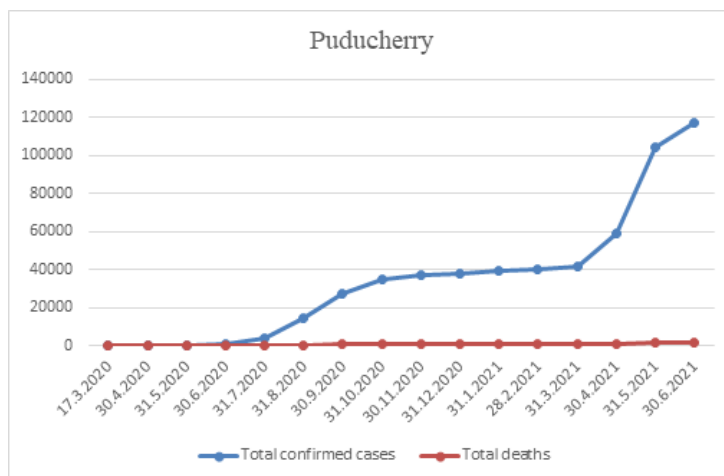


FIGURE 29. Confirmed cases and deaths in Puducherry.

Analysis of COVID-19 outbreak in Punjab.

First COVID-19 confirmed case occur in Punjab on 9 March 2020. On Janata Curfew day 22 March 2020, the state has 21 COVID-19 active cases. On the first day of national lockdown 25 March 2020, Punjab has 31 active cases and at the completion of first phase of lockdown 144 COVID-19 active cases on 14 April 2020. Toward the finish of second phase of lockdown 3 May 2020, right now 964 active cases of COVID-19 and afterward all prevention were followed by the government which result 231 active cases of COVID-19 in Punjab on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 9.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 53 | 480 | 20 |
| 31.5.2020 | 84 | 2263 | 45 |
| 30.6.2020 | 114 | 5568 | 144 |
| 31.7.2020 | 145 | 16119 | 386 |
| 31.8.2020 | 176 | 53992 | 1453 |
| 30.9.2020 | 206 | 113886 | 3406 |
| 31.10.2020 | 237 | 133658 | 4203 |
| 30.11.2020 | 267 | 152091 | 4807 |
| 31.12.2020 | 298 | 166522 | 5341 |
| 31.1.2021 | 329 | 173276 | 5615 |
| 28.2.2021 | 357 | 182176 | 5832 |
| 31.3.2021 | 388 | 239734 | 6868 |
| 30.4.2021 | 418 | 370973 | 9022 |
| 31.5.2021 | 449 | 567607 | 14550 |
| 30.6.2021 | 479 | 595609 | 16052 |

TABLE 30. Total number of COVID-19 confirmed cases and deaths in Punjab.

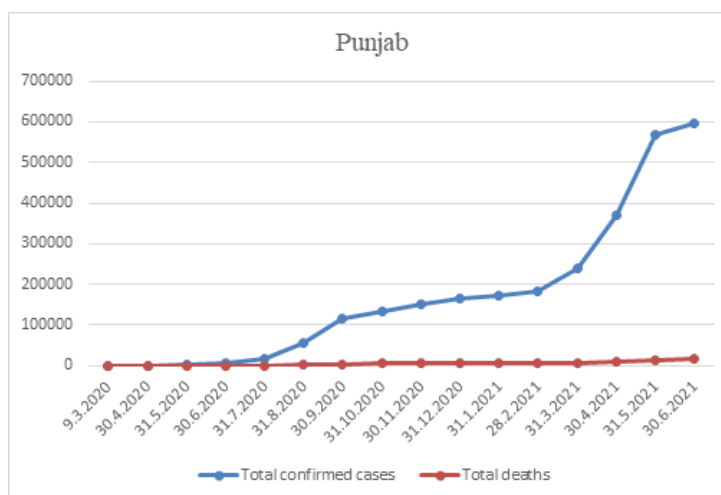


FIGURE 30. Confirmed cases and deaths in Punjab.

Analysis of COVID-19 outbreak in Rajasthan

First COVID-19 confirmed case occur in Rajasthan on 3 March 2020. On Janata Curfew day 22 March 2020, the state has 29 COVID-19 active cases. On the first day of national lockdown 25 March 2020, Rajasthan has 38 active cases and at the end of first phase of lockdown 847 COVID-19 active cases on 14 April 2020. Toward the finish of second phase of lockdown 3 May 2020, at this point of time 1459 COVID-19 active cases and afterward all prevention were followed by the government which result 2605 active cases of COVID-19 in Rajasthan on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 3.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 59 | 2584 | 58 |
| 31.5.2020 | 90 | 8831 | 194 |
| 30.6.2020 | 120 | 18008 | 413 |
| 31.7.2020 | 151 | 42083 | 680 |
| 31.8.2020 | 182 | 81693 | 1056 |
| 30.9.2020 | 212 | 135292 | 1486 |
| 31.10.2020 | 243 | 196993 | 1907 |
| 30.11.2020 | 273 | 268063 | 2312 |

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 31.12.2020 | 304 | 308243 | 2696 |
| 31.1.2021 | 335 | 317491 | 2766 |
| 28.2.2021 | 363 | 320336 | 2787 |
| 31.3.2021 | 394 | 333149 | 2818 |
| 30.4.2021 | 424 | 598001 | 4239 |
| 31.5.2021 | 455 | 939958 | 8385 |
| 30.6.2021 | 485 | 953422 | 8921 |

TABLE 31. Total number of COVID-19 confirmed cases and deaths in Rajasthan.

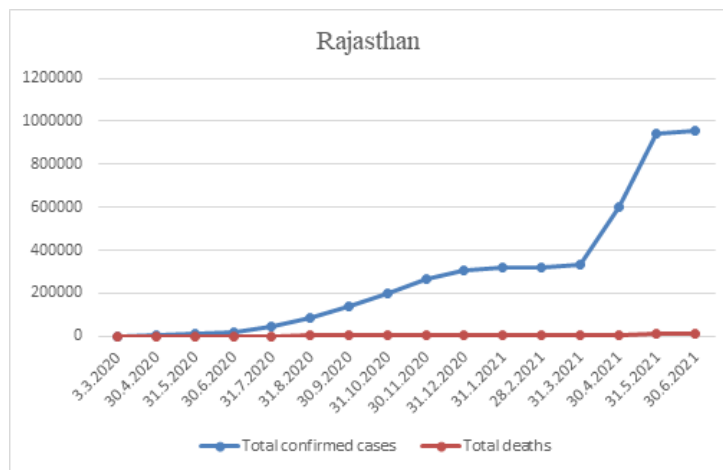


FIGURE 31. Confirmed cases and deaths in Rajasthan.

Analysis of COVID-19 outbreak in Sikkim

First COVID-19 affirmed case occur in Sikkim on 23 May 2020. All prevention were followed by the government which result single active case of COVID-19 in Sikkim on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|-----------|-------------|-----------------------|--------------|
| 23.5.2020 | 1 | 1 | 0 |
| 30.6.2020 | 39 | 88 | 0 |
| 31.7.2020 | 70 | 639 | 1 |
| 31.8.2020 | 101 | 1652 | 3 |
| 30.9.2020 | 131 | 2931 | 37 |

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 31.10.2020 | 162 | 3940 | 68 |
| 30.11.2020 | 192 | 4990 | 109 |
| 31.12.2020 | 223 | 5889 | 127 |
| 31.1.2021 | 254 | 6090 | 133 |
| 28.2.2021 | 282 | 6145 | 135 |
| 31.3.2021 | 313 | 6235 | 135 |
| 30.4.2021 | 344 | 7952 | 147 |
| 31.5.2021 | 375 | 15317 | 253 |
| 30.6.2021 | 404 | 20544 | 307 |

TABLE 32. Total number of COVID-19 confirmed cases and deaths in Sikkim.

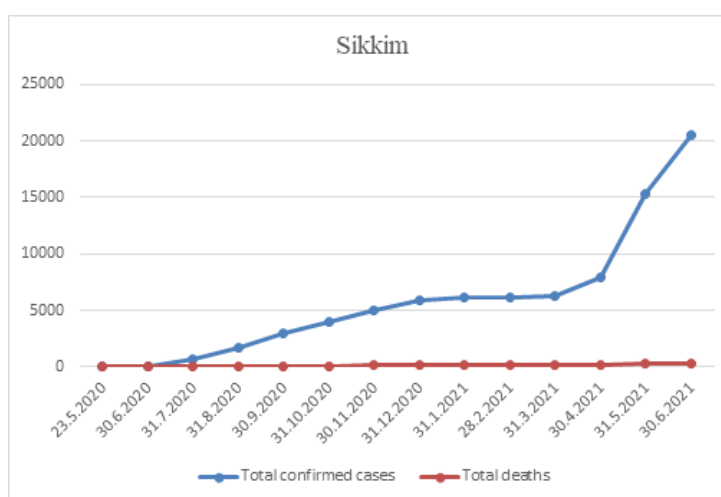


FIGURE 32. Confirmed cases and deaths in Sikkim.

Analysis of COVID-19 outbreak in Tamil Nadu

First COVID-19 affirmed case occur in Tamil Nadu on 7 March 2020. On Janata Curfew day 22 March 2020, Tamil Nadu has 9 active cases of COVID-19. On the first day of national lockdown 25 March 2020, the state has 26 active cases of COVID-19 and at the completion of first phase of lockdown 1111 COVID-19 active cases on 14 April 2020. Toward the finish of second phase of lockdown ended to 3 May 2020, right now 1614 COVID-19 active cases in Tamil Nadu and

afterward all prevention were followed by the government which result 9400 active cases of COVID-19 in Tamil Nadu on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 7.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 55 | 2323 | 27 |
| 31.5.2020 | 86 | 22333 | 176 |
| 30.6.2020 | 116 | 90167 | 1201 |
| 31.7.2020 | 147 | 245859 | 3935 |
| 31.8.2020 | 178 | 428041 | 7322 |
| 30.9.2020 | 208 | 597602 | 9520 |
| 31.10.2020 | 239 | 724522 | 11122 |
| 30.11.2020 | 269 | 781915 | 11712 |
| 31.12.2020 | 300 | 818014 | 12122 |
| 31.1.2021 | 331 | 838340 | 12356 |
| 28.2.2021 | 359 | 851542 | 12496 |
| 31.3.2021 | 390 | 886673 | 12719 |
| 30.4.2021 | 420 | 1166756 | 14046 |
| 31.5.2021 | 451 | 2096516 | 24232 |
| 30.6.2021 | 481 | 2479696 | 32619 |

TABLE 33. Total number of COVID-19 confirmed cases and deaths in Tamil Nadu.

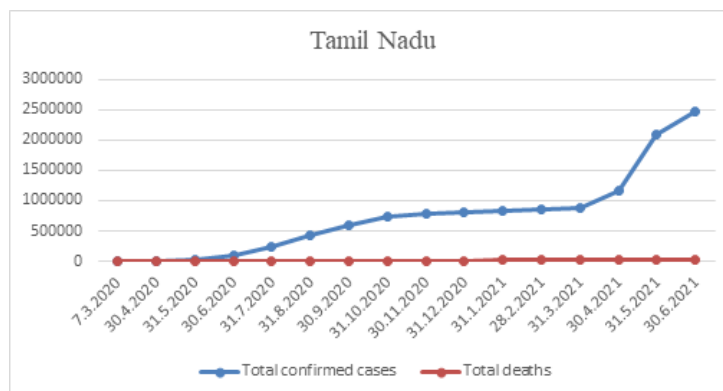


FIGURE 33. Confirmed cases and deaths in Tamil Nadu.

Analysis of COVID-19 outbreak in Telangana

First COVID-19 confirmed case occur in Telangana on 2 March 2020. On Janata Curfew day 22 March 2020, Telangana has 27 COVID-19 active cases. On the first day of national lockdown 25 March 2020, the state has 41 active cases and at the completion of first phase of lockdown 516 COVID-19 active cases on 14 April 2020. Toward the finish of second phase of lockdown 3 May 2020, at this point on time the state has 508 COVID-19 active cases and then afterward all prevention were followed by the government which result 1188 active cases of COVID-19 in Telangana on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 2.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 60 | 1038 | 28 |
| 31.5.2020 | 91 | 2698 | 82 |
| 30.6.2020 | 121 | 16339 | 260 |
| 31.7.2020 | 152 | 62703 | 519 |
| 31.8.2020 | 183 | 124963 | 827 |
| 30.9.2020 | 213 | 191386 | 1127 |
| 31.10.2020 | 244 | 238632 | 1336 |
| 30.11.2020 | 274 | 269816 | 1458 |
| 31.12.2020 | 305 | 286354 | 1541 |
| 31.1.2021 | 336 | 294469 | 1599 |
| 28.2.2021 | 364 | 298807 | 1634 |
| 31.3.2021 | 395 | 307889 | 1697 |
| 30.4.2021 | 425 | 435606 | 2261 |
| 31.5.2021 | 456 | 578351 | 3281 |
| 30.6.2021 | 486 | 623510 | 3661 |

TABLE 34. Total number of COVID-19 confirmed cases and deaths in Telangana.

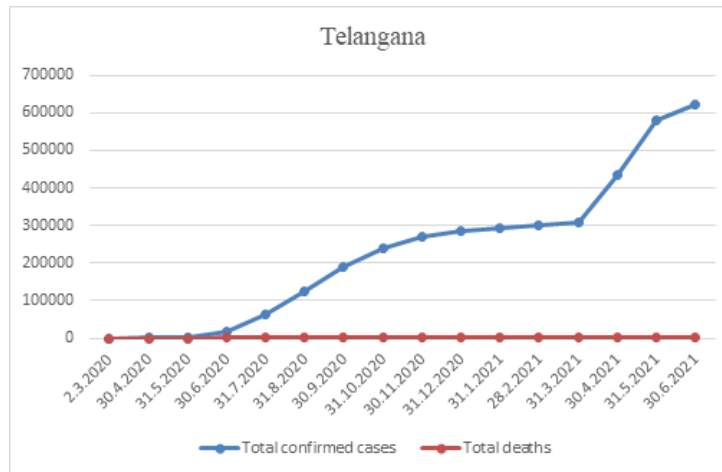


FIGURE 34. Confirmed cases and deaths in Telangana.

Analysis of COVID-19 outbreak in Tripura

First COVID-19 confirmed case occur in Tripura on 6 April 2020. At the completion of first phase of lockdown 14 April 2020, the state has 2 active cases of COVID-19. Toward the finish of second period of lockdown 15 active cases of COVID-19 on 3 May 2020 and then afterward all prevention were followed by the government which result 143 active cases of COVID-19 in Tripura on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 6.4.2020 | 1 | 1 | 0 |
| 31.5.2020 | 57 | 316 | 0 |
| 30.6.2020 | 87 | 1393 | 1 |
| 31.7.2020 | 118 | 4996 | 21 |
| 31.8.2020 | 149 | 11644 | 103 |
| 30.9.2020 | 179 | 25731 | 274 |
| 31.10.2020 | 210 | 30714 | 343 |
| 30.11.2020 | 240 | 32692 | 367 |
| 31.12.2020 | 271 | 33261 | 382 |
| 31.1.2021 | 302 | 33347 | 388 |
| 28.2.2021 | 330 | 33404 | 388 |
| 31.3.2021 | 361 | 33490 | 389 |

| Date | No. of days | Total confirmed cases | Total deaths |
|-----------|-------------|-----------------------|--------------|
| 30.4.2021 | 391 | 35166 | 393 |
| 31.5.2021 | 422 | 51130 | 510 |
| 30.6.2021 | 452 | 65767 | 674 |

TABLE 35. **Total number of COVID-19 confirmed cases and deaths in Tripura.**

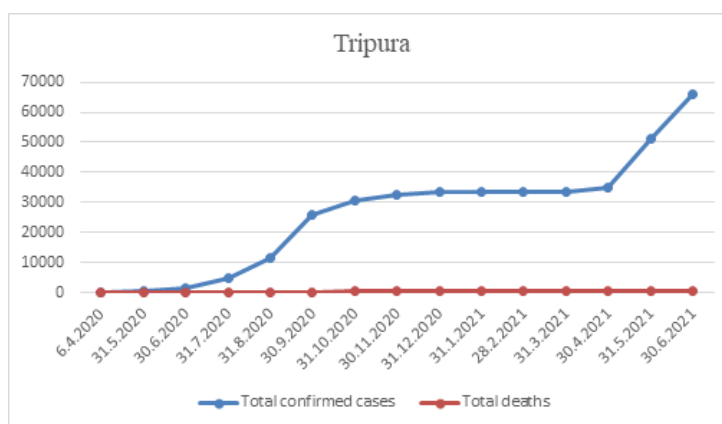


FIGURE 35. Confirmed cases and deaths in Tripura.

Analysis of COVID-19 outbreak in Uttar Pradesh

First COVID-19 confirmed case occur in Uttar Pradesh on 4 March 2020. On Janata Curfew day 22 March 2020, the state has 23 active case of COVID-19. On the first day of national lockdown 25 March 2020, the state has 38 active cases and at the completion of first phase of lockdown 602 active cases of COVID-19 on 14 April 2020. Toward the finish of second phase of lockdown Uttar Pradesh has 1848 active cases of COVID-19 on 3 May 2020 and afterward all prevention were followed by the government which result 3015 active cases of COVID-19 in Uttar Pradesh on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|-----------|-------------|-----------------------|--------------|
| 4.3.2020 | 1 | 7 | 0 |
| 30.4.2020 | 58 | 2211 | 40 |
| 31.5.2020 | 89 | 8075 | 217 |

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 30.6.2020 | 119 | 23492 | 697 |
| 31.7.2020 | 150 | 85465 | 1630 |
| 31.8.2020 | 181 | 230414 | 3486 |
| 30.9.2020 | 211 | 399082 | 5784 |
| 31.10.2020 | 242 | 481863 | 7025 |
| 30.11.2020 | 272 | 543888 | 7761 |
| 31.12.2020 | 303 | 584966 | 8352 |
| 31.1.2021 | 334 | 600299 | 8658 |
| 28.2.2021 | 362 | 603527 | 8724 |
| 31.3.2021 | 392 | 617194 | 8811 |
| 30.4.2021 | 422 | 1252504 | 12570 |
| 31.5.2021 | 453 | 1691488 | 20497 |
| 30.6.2021 | 483 | 1706107 | 22591 |

TABLE 36. Total number of COVID-19 confirmed cases and deaths in Uttar Pradesh.

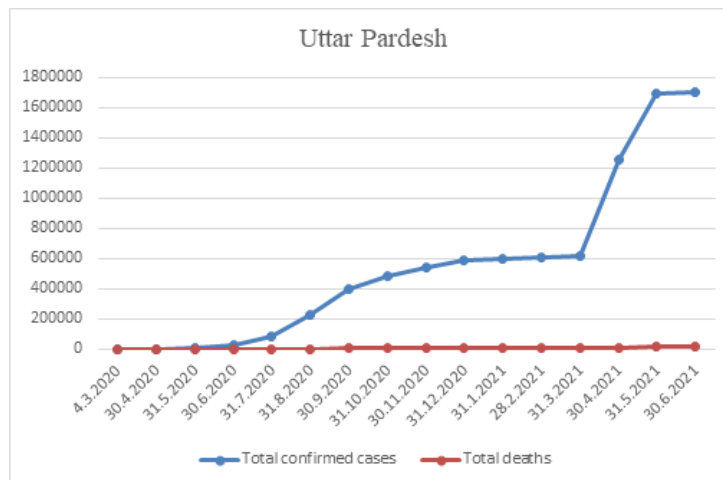


FIGURE 36. Confirmed cases and deaths in Uttar Pradesh.

Analysis of COVID-19 outbreak in Uttarakhand

First COVID-19 confirmed case occur in Uttarakhand on 15 March 2020. On Janata Curfew day 22 March 2020, the state has 3 COVID-19 active cases. On the first day of national lockdown 25

March 2020, the state has 5 active cases of COVID-19 and at the end of first phase of lockdown 28 active cases of COVID-19 active cases on 14 April 2020. Toward the finish of second period of lockdown 3 May 2020, at this point of time 20 COVID-19 active cases in Uttarakhand and afterward all prevention were followed by the government which result 797 active cases of COVID-19 in Uttarakhand on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 15.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 47 | 57 | 0 |
| 31.5.2020 | 78 | 907 | 5 |
| 30.6.2020 | 108 | 2881 | 41 |
| 31.7.2020 | 139 | 7183 | 80 |
| 31.8.2020 | 170 | 19827 | 269 |
| 30.9.2020 | 200 | 49000 | 611 |
| 31.10.2020 | 231 | 62328 | 1023 |
| 30.11.2020 | 261 | 74795 | 1231 |
| 31.12.2020 | 292 | 90920 | 1509 |
| 31.1.2021 | 323 | 96129 | 1644 |
| 28.2.2021 | 351 | 96992 | 1692 |
| 31.3.2021 | 382 | 100411 | 1717 |
| 30.4.2021 | 412 | 180521 | 2624 |
| 31.5.2021 | 443 | 329494 | 6452 |
| 30.6.2021 | 473 | 340255 | 7316 |

TABLE 37. Total number of COVID-19 confirmed cases and deaths in Uttarakhand.

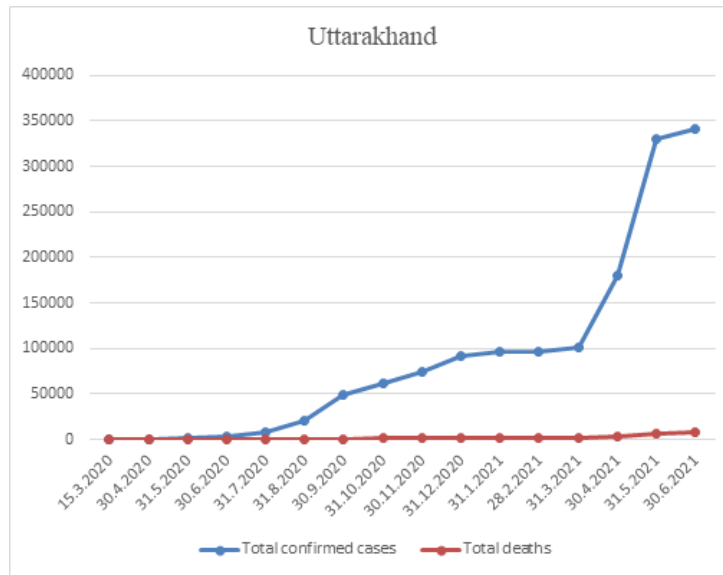


FIGURE 37. Confirmed cases and deaths in Uttarakhand.

Analysis of COVID-19 outbreak in West Bengal

First COVID-19 affirmed case occur in West Bengal on 17 March 2020. On Janata Curfew day 22 March 2020, the state has 7 active cases of COVID-19. On the first day of national lockdown 25 March 2020, West Bengal has 9 active cases and at the completion of first phase of lockdown 147 active cases of COVID-19 on 14 April 2020. Toward the finish of second phase of lockdown 944 active case of COVID-19 on 3 May 2020 and afterward all prevention were followed by the government which result 3027 active cases of COVID-19 in West Bengal on 31 May 2020.

| Date | No. of days | Total confirmed cases | Total deaths |
|-----------|-------------|-----------------------|--------------|
| 17.3.2020 | 1 | 1 | 0 |
| 30.4.2020 | 45 | 758 | 33 |
| 31.5.2020 | 76 | 5501 | 317 |
| 30.6.2020 | 106 | 18559 | 668 |
| 31.7.2020 | 137 | 70188 | 1581 |
| 31.8.2020 | 168 | 162778 | 3328 |
| 30.9.2020 | 198 | 257049 | 4958 |

| Date | No. of days | Total confirmed cases | Total deaths |
|------------|-------------|-----------------------|--------------|
| 31.10.2020 | 229 | 373664 | 6841 |
| 30.11.2020 | 259 | 483484 | 8424 |
| 31.12.2020 | 290 | 552063 | 9712 |
| 31.1.2021 | 321 | 569998 | 10173 |
| 28.2.2021 | 349 | 575118 | 10268 |
| 31.3.2021 | 380 | 586915 | 10329 |
| 30.4.2021 | 410 | 828366 | 11344 |
| 31.5.2021 | 441 | 1376377 | 15541 |
| 30.6.2021 | 441 | 1499783 | 17708 |

TABLE 38. Total number of COVID-19 confirmed cases and deaths in West Bengal.

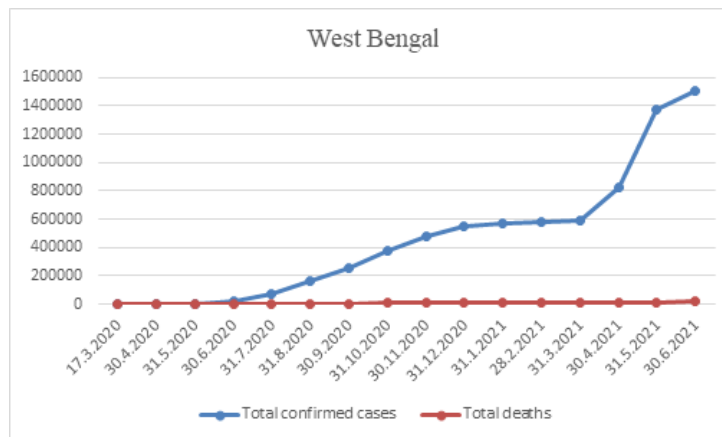


FIGURE 38. Confirmed cases and deaths in West Bengal.

5. CONCLUSION

For $\mu = 1$ (i.e. 100%), that means corona preventions are followed strictly, but for the economic point of view government does not implement 100% prevention.

For $34\% \leq \mu < 100\%$, infected population remains fixed and corona preventive measures as demonstrated in Table 2. In Table 2, $\mu = 0.50$ (i.e. 50%), $\mu = 0.75$ (i.e. 75%) infected population are stable and fixed to the value 0.5, 0.25 respectively.

For $28\% \leq \mu < 34\%$, μ decreases 34%, firstly oscillate between two values which is maximum or minimum values of infected values that means period 2 (2 fixed point) then oscillate between

4 period, 8 period and so on.

For $\mu < 28\%$, infected population follow neither regular nor periodically behavior. This system, represents the chaotic behavior of the COVID-19 transmission dynamics.

The goal of this paper is to examine the preventions over the COVID-19 pandemic.

This study will be useful for the Indian government, state government of India, researchers and scientists.

FUNDING AGENCY

The first author is thankful to UGC for financial support.

CONFLICT OF INTERESTS

The author(s) declare that there is no conflict of interests.

REFERENCES

- [1] M. Ausloos and M. Dirickx, The logistic map and the route to chaos: From the beginnings to modern applications, Springer Science and Business Media, (2006).
- [2] V. Bhatnagar, R.C. Poonia, P. Nagar, S. Kumar, V. Singh, L. Raja, P. Dass, Descriptive analysis of COVID-19 patients in the context of India, J. Interdiscip. Math. 24 (2021), 489–504.
- [3] M. H. A. Biswas and M. M. Haque, Nonlinear dynamical systems in modeling and control of infectious disease, In International Conference on Differential and Difference Equations and Applications, (2015), (pp. 149-158), Springer, Cham.
- [4] Bureau, Covid-19 lockdown estimated to cost India \$4.5 billion a day: acute Ratings, The Hindu business line, (2020).
- [5] K. Chatterjee, K. Chatterjee, A. Kumar and S. Shankar, Healthcare impact of COVID-19 epidemic in India: A stochastic mathematical model, Med. J. Armed Forces India, 76(2) (2020), 147-155.
- [6] R. Chugh, A. Kumar and S. Kumari, A novel epidemic model to analyze and control the chaotic behavior of COVID-19 outbreak, Bull. Transilvania Univ. Brasov, 13(62) (2020), 479-508.
- [7] Coronavirus Outbreak in India - covid19india.org
- [8] D. D. Dsouza, S. Quadros, Z. J. Hyderabadwala and M. A. Mamun, Aggregated COVID-19 suicide incidences in India: Fear of COVID-19 infection is the prominent causative facto, Psych. Res. 290 (2020), 113145.
- [9] A. Dutta and H. W. Fischer, The local governance of COVID-19: Disease prevention and social security in rural India, World Develop. 138 (2021), 105234.

- [10] A. Ghosh, S. Nundy and T.K. Mallick, How India is dealing with COVID-19 pandemic, *Sensors Int.* 1 (2020), 100021.
- [11] H. S. Gopalan and A. Misra, COVID-19 pandemic and challenges for socio-economic issues, healthcare and national programs in India, *Diabetes and Metabolic Syndrome: Clinical Research and Reviews*, (2020).
- [12] Government of India, <https://www.mygov.in/covid-19>
- [13] A. Gupta, S. Banerjee and S. Das, Significance of geographical factors to the COVID-19 outbreak in India, *Model. Earth Syst. Environ.* 6(4) (2020), 2645-2653.
- [14] R. Gupta, S. K. Pal and G. Pandey, A comprehensive analysis of COVID-19 outbreak situation in India, *MedRxiv*, (2020).
- [15] M. Kamrujjaman, M. S. Mahmud and M. S. Islam, Coronavirus outbreak and the mathematical growth map of COVID-19, *Ann. Res. Rev. Biol.* 35 (2020), 72-78.
- [16] A. J. Kucharski, T. W. Russell, C. Diamond, et al. Early dynamics of transmission and control of COVID-19: a mathematical modelling study, *Lancet Infect. Dis.* 20(5) (2020), 553-558.
- [17] B. Malavika, S. Marimuthu, M. Joy, A. Nadaraj, E. S. Asirvatham and L. Jeyaseelan, Forecasting COVID-19 epidemic in India and high incidence states using SIR and logistic growth models, *Clinic. Epidemiol. Glob. Health*, 9 (2021), 26-33.
- [18] M. Mandal, S. Jana, S. K. Nandi, A. Khatua, S. Adak and T. K. Kar, A model based study on the dynamics of COVID-19: Prediction and control, *Chaos Solitons Fractals*, 136 (2020), 109889.
- [19] R.M. May, Simple mathematical models with very complicated dynamics, in: B.R. Hunt, T.-Y. Li, J.A. Kennedy, H.E. Nusse (Eds.), *The Theory of Chaotic Attractors*, Springer New York, New York, NY, 2004: pp. 85–93.
- [20] D. Paraskevis, E. G. Kostaki, G. Magiorkinis, G. Panayiotakopoulos, G. Sourvinos and S. Tsiodras, Full-genome evolutionary analysis of the novel corona virus (2019-nCoV) rejects the hypothesis of emergence as a result of a recent recombination event, *Infect. Genet. Evol.* 79 (2020), 104212.
- [21] P. Samui, J. Mondal and S. Khajanchi, A mathematical model for COVID-19 transmission dynamics with a case study of India, *Chaos Solitons Fractals*, 140 (2020), 110173.
- [22] K. Sarkar, S. Khajanchi and J. J. Nieto, Modeling and forecasting the COVID-19 pandemic in India. *Chaos Solitons Fractals*, 139 (2020), 110049.
- [23] A. R. Tuite and D. N. Fisman, Reporting, epidemic growth, and reproduction numbers for the 2019 novel coronavirus (2019-nCoV) epidemic, *Ann. Internal Med.* 172(8)(2020), 567-568.
- [24] C. Wang, P. W. Horby, F. G. Hayden and G. F. Gao, A novel coronavirus outbreak of global health concern, *Lancet*, 395(10223)(2020), 470-473.
- [25] WHO Coronavirus Disease (COVID-19) Dashboard — WHO Coronavirus Disease (COVID-19) Dashboarddoi-<https://covid19.who.int/>

- [26] World Health Organization, <https://www.who.int/news-room/q-a-detail/q-a-coronaviruses#:text=symptom>, accessed: 2020-04-06.
- [27] J. T. Wu, K. Leung and G. M. Leung, Nowcasting and forecasting the potential domestic and international spread of the 2019-nCoV outbreak originating in Wuhan, China: a modelling study, *Lancet*, 395(10225) (2020), 689-697.
- [28] S. Zhao, P. Cao, D. Gao, et al. Epidemic growth and reproduction number for the novel coronavirus disease (COVID-19) outbreak on the Diamond Princess cruise ship from January 20 to February 19, 2020: a preliminary data-driven analysis. Available at SSRN 3543150, (2020).